Public Health Assessment for

LANE STREET GROUND WATER CONTAMINATION SITE
ELKHART, ELKHART COUNTY, INDIANA
EPA FACILITY ID: INNOO0510229

JULY 17, 2013

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 45-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.

Agency for Toxic Substances & Disease Registry.....Thomas R. Frieden, M.D., M.P.H., Administrator
Robin Ikeda, M.D., M.P.H., Acting Director

Division of Community Health Investigations .....(Vacant) Director
Tina Forrester, Ph.D., Deputy Director

Central Branch ……..Richard E. Gillig, M.C.P., Chief

Eastern Branch ……Sharon Williams-Fleetwood, Ph.D. Chief

Western Branch.....Cassandra Smith, B.S., M.S., Chief

Science Support Branch .....Susan Moore, M.S., Chief

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PUBLIC HEALTH ASSESSMENT

LANE STREET GROUND WATER CONTAMINATION SITE
ELKHART, ELKHART COUNTY, INDIANA

EPA FACILITY ID: INNOO0510229

Prepared by:

Eastern Branch
Division of Community Health Investigations
Agency for Toxic Substances and Disease Registry

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Summary

Introduction

The Agency for Toxic Substances and Disease Registry's (ATSDR) top priority is to ensure that the people living on or near Lane Street in Elkhart, Indiana have the best information possible to safeguard their health.

Elevated levels of volatile organic compounds (VOCs), primarily trichloroethylene (TCE), were identified in the groundwater under properties along Lane Street in 2007; in 2009, the U.S. Environmental Protection Agency (EPA) proposed the Lane Street Ground Water Contamination site to the National Priorities List (NPL, or "Superfund"). ATSDR is required to conduct public health activities on all sites proposed to the NPL.

The purpose of this Public Health Assessment (PHA) is to determine whether the community may have been harmed by exposure to VOCs in well water (in the past or currently) and what public health actions need to be taken to reduce harmful exposures. Because of limited available data, ATSDR focused its evaluation on exposure to VOCs in residential well water. Other potential exposure pathways may be evaluated as more data are collected from the site.

Conclusions

ATSDR reached three important conclusions in the PHA:

Conclusion 1

People who drank water from private wells containing TCE at the Lane Street Ground Water Contamination site had an increased risk of adverse health effects. ATSDR considers the site a past public health hazard. Levels of VOCs besides TCE in private wells were too low to cause harmful effects.

Basis for conclusion

Not all private wells showed TCE contamination. For the wells with TCE, ATSDR estimated past exposure for pregnant women and for children less than one year old (considered the most sensitive groups to TCE). ATSDR's evaluation showed a potential for kidney damage as well as an increased risk of cancer for past exposure to TCE in the contaminated wells for adults and children, especially young children. The wells with the highest concentrations of TCE could have increased the risk of immune system effects in the youngest children and could have increased the risk of heart or other birth defects in babies born to pregnant women who regularly drank from these wells.

Next steps

- Most homes were connected to municipal water in 2008 and are no longer using private wells. Municipal drinking water is

monitored by Elkhart's Public Works and Utilities Department.

- ATSDR will explore options for providing information to the community on possible health effects from past TCE exposures.

Conclusion 2

Current exposures at the site are not expected to cause harm. However, exposure from wells still in use may pose a potential future public health hazard if contaminant levels increase.

Basis for conclusion

Almost all homes in the Lane Street area, and all homes with well water containing VOC levels above drinking water standards, have been switched to municipal water. One or two homes in the area may still be using wells for drinking water, but these wells did not show VOC contamination above drinking water standards. Because the source of the contamination has not been identified, it is unknown how TCE or related VOC levels might change in any wells still in use. Wells that do not currently have harmful levels of contamination may become more contaminated in the future.

Next Steps

- Occupants in homes not connected to municipal water should have their well water tested regularly.
- ATSDR will evaluate additional data collected by EPA and update the findings of this PHA, if necessary.

Conclusion 3

More information is needed to assess whether VOC vapors from contaminated water underground may be entering and building up in homes (vapor intrusion).

Basis for conclusion

EPA collected indoor air samples in two homes with elevated levels of TCE in well water. The samples were taken to identify whether vapors from underground contaminated water could be building up inside the homes. The samples indicated that TCE and related VOCs were not present at harmful levels at the two homes sampled. However, vapor intrusion can vary seasonally and from house to house.

Next Steps

- EPA should conduct additional sampling to verify that Lane Street residents are not being exposed to groundwater contaminants from vapor intrusion.

For More Information

For further information about this public health assessment, please call ATSDR at 1-800-CDC-INFO and ask for information about the "Lane Street Ground Water Contamination Site". If you have concerns about your health, you should contact your health care provider.

List of Abbreviations

ADAF	Age Dependent Adjustment Factor
ATSDR	Agency for Toxic Substances and Disease Registry
Cal-EPA	California Environmental Protection Agency
CREG	Cancer Risk Evaluation Guide
CV	Comparison Value
1,1-DCA	1,1-Dichloroethane
ECHD	Elkhart County Health Department
EPA	U.S. Environmental Protection Agency
HED99	99th Percentile Human Equivalent Dose
IARC	International Agency for Research on Cancer
IDEM	Indiana Department of Environmental Management
IRIS	Integrated Risk Information System
MCL	Maximum Contaminant Level
MRL	Minimal Risk Level
NPL	National Priorities List
NTP	National Toxicology Program
OEHHA	Office of Environmental Health Hazard Assessment
OSHA	Occupational Safety and Health Administration
PCE	Tetrachloroethylene (or Perchloroethylene)
PHA	Public Health Assessment
RfD	Reference Dose
RSL	Regional Screening Level
TCE	Trichloroethylene (or Trichloroethene)
µg/L	Microgram per Liter
VOC	Volatile Organic Compound

Purpose and Statement of Issues

The Agency for Toxic Substances and Disease Registry (ATSDR) prepared this public health assessment (PHA) to evaluate, based on the information currently available, potential exposures to contaminants in drinking water from the Lane Street Ground Water Contamination site. This site is located in Elkhart County, Indiana. The properties on the site are either within or just outside the city limits of Elkhart.

The Elkhart County Health Department (ECHD) and the Indiana Department of Environmental Management (IDEM) alerted the U.S. Environmental Protection Agency (EPA) after discovering elevated levels of volatile organic compounds (VOCs), primarily trichloroethylene (TCE), in the groundwater under Lane Street in 2007. This was a concern because many homes in the area had private wells and used this groundwater as a drinking water source. Homes with levels of TCE higher than drinking water standards were provided with alternate water or filtration systems to remove contaminants, and almost all the homes in the area were added to the Elkhart municipal water system in Fall 2008.

The EPA proposed the Lane Street Ground Water Contamination site for inclusion on the National Priorities List (NPL) in April 2009; the listing was finalized in September 2009. ATSDR is mandated by Congress to conduct public health activities on all sites proposed to the NPL.

Public Comment

ATSDR released a draft of this PHA for public comment on March 14, 2013. The PHA was available for public review and comment at the main branch of the Elkhart Public Library in Elkhart, Indiana, and from the ATSDR web site. The public comment period was open through April 29, 2013. Two sets of public comments, both from staff of EPA Region 5, were received. The comments and responses are included in Appendix D of this document.

ATSDR had previously released a draft of this PHA for public comment from August 8 to September 23, 2011. In addition to announcing the release on local media outlets, ATSDR presented and discussed the finding of the PHA with community members at a public meeting held August 22, 2011 at the Osolo Elementary School in Elkhart. Copies of the PHA and handouts summarizing the findings were provided to the community during the meeting.

No public comments were received on the August 2011 PHA. However, after the closing of the public comment period, EPA finalized its TCE toxicological review and published revised noncancer and cancer health guideline values on its Integrated Risk Information System (IRIS) (EPA, 2011c, EPA 2011d). EPA also finalized its Exposure Factors Handbook in September 2011 (EPA, 2011e). ATSDR repeated its evaluation of potential exposures at the site using the 2011 TCE toxicological review and incorporating updated body weight and drinking water ingestion assumptions from the 2011 Exposure Factors Handbook. While these newly available resources did not change the overall findings of

the PHA, the re-evaluation did change some specific findings. The section "Potential Health Effects from TCE Exposure" provides further detail.

Because some of the specific findings of this PHA changed from the August 2011 draft, ATSDR re-released the PHA to give the public an opportunity to review and provide input on the findings.

Background

Introduction and Site Description

The Lane Street Ground Water Contamination Site ("the site", approximate location shown in Figure 1), is located around the intersection of Lane Street and County Road 106/Henke Street, in the northeast sector of the city of Elkhart, Indiana. Elkhart County is in North Central Indiana.

The site was proposed for the NPL in April 2009 due to elevated levels of VOCs, particularly TCE, in some private residential wells in the area. The discovery of this contamination resulted from community concerns about groundwater contamination at a nearby site, Geocel; however, the contamination around Lane Street is thought to be unassociated with the Geocel site. The source of the Lane Street groundwater contamination has not been determined.

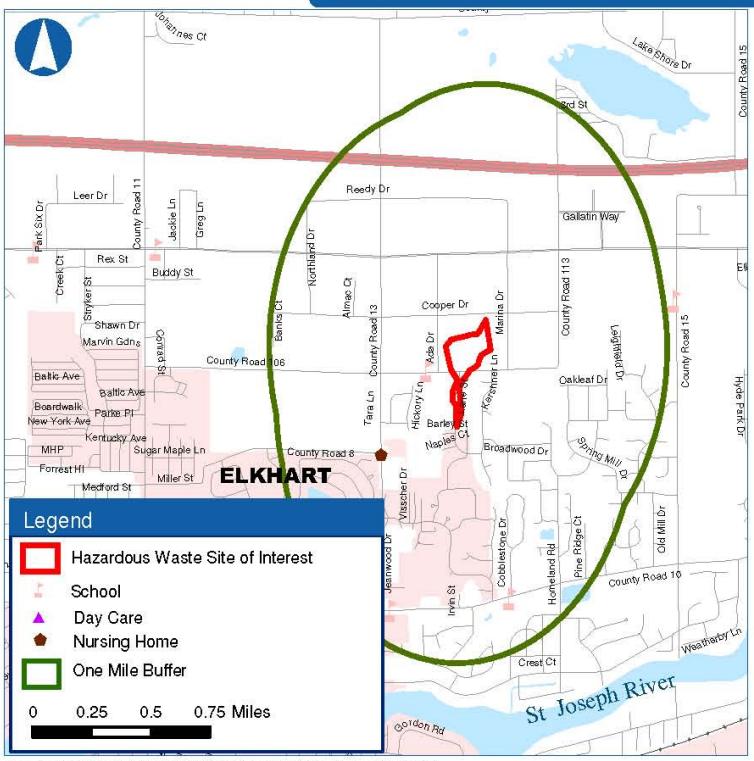
Demographics

Figure 1 shows that the estimated population within a one-mile radius of the site was about 4,000 people based on Census 2010 data. Among this population approximately 90% were White, 5% Black, 1% Asian, and less than 1% American Indian or Alaska Native. People identifying themselves as some other race alone made up 2% of the population, and those of two or more races made up 2.5%. A little less than 5% were Hispanic or Latino. Children 6 years of age and younger accounted for approximately 8% of the population; 22% were adults 65 years of age and older, and 15% were women aged 15 to 44 years. The total housing units were estimated at 1,808. ATSDR identified 4 schools and 2 nursing homes within a one-mile radius of the site.

Figure 1. Site Map and Demographic Information for the Lane Street Ground Water Contamination Site.

EPA Facility ID :
INN000510229

Lane Street Ground Water Contamination
Elkhart , IN



Base Map Source: Geographic Data Technology, May 2005.
Site Boundary Data Source: ATSDR Geospatial Research, Analysis, and Services Program, Current as of Generate Date (bottom left-hand corner).
Coordinate System (All Panels) : NAD_1983_StatePlane_Indiana_East_FIPS_1301_Feet

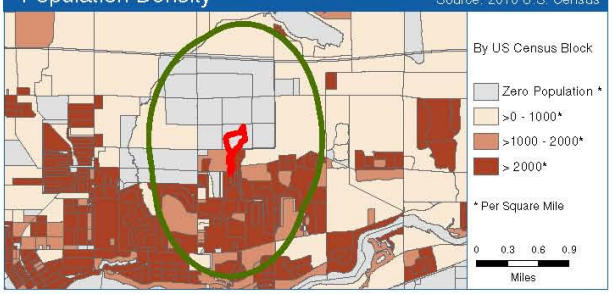
Site Location : Elkhart County , IN

Demographic Statistics
Within One Mile of Site*

Total Population	4,043
White Alone	3,633
Black Alone	185
Am. Indian & Alaska Native Alone	3
Asian Alone	42
Native Hawaiian & Other Pacific Islander Alone	0
Some Other Race Alone	81
Two or More Races	99
Hispanic or Latino**	193
Children Aged 6 and Younger	313
Adults Aged 65 and Older	910
Females Aged 15 to 44	620
Total Housing Units	1,808

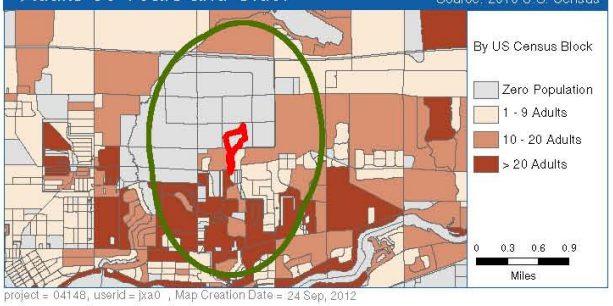
Demographics Statistics Source: 2010 U.S. Census
* Calculated using an area-proportion spatial analysis technique
** People who identify their origin as Hispanic or Latino may be of any race.

Population Density — Source: 2010 U.S. Census

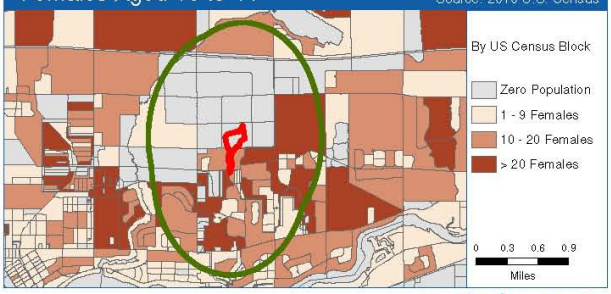


Children 6 Years and Younger — Source: 2010 U.S. Census

Adults 65 Years and Older — Source: 2010 U.S. Census



Females Aged 15 to 44 — Source: 2010 U.S. Census



project = 04148, userid = jxa0 , Map Creation Date = 24 Sep, 2012

GRASP

Centers for Disease Control and Prevention
Agency for Toxic Substances and Disease Registry

Geospatial Research, Analysis & Services Program

Land and Natural Resource Use

The exact site boundaries are still being determined, but the affected residential properties discussed in this report are primarily on Lane Street, a residential street less than a quarter mile long. The surrounding area consists of residential properties, some farmland to the west of Lane Street, and several commercial and industrial facilities to the north.

Before 2007, residents on Lane Street and in surrounding neighborhoods used private wells for household water uses, including drinking water. Since 2008, most of these homes have been connected to the Elkhart municipal water system. This system provides treated drinking water obtained from three well fields that are continually monitored for contamination by Elkhart's Public Works and Utility Department (EPWUD, 2008). Regional groundwater flow is south-southwesterly – generally, from the industrial park north of County Road 106/ Henke Street towards Lane Street (IDEM, 2008).

Site History and Previous Investigations

The groundwater contamination around Lane Street was identified in 2007 through investigations related to a nearby site. The company, Geocel Corporation, located approximately half a mile northeast of Lane Street, contacted IDEM and ECHD about possible groundwater contamination related to their operations. Geocel applied and was accepted into IDEM's Voluntary Remediation Program in July 2007 (IDEM, 2008).

On August 22, 2007, IDEM learned that a Lane Street resident, based on concerns about the reported Geocel contamination, had submitted samples of their well water to a private laboratory. The testing showed high levels of TCE and associated breakdown products (Weston, 2008). The TCE concentration exceeded the maximum contaminant level (MCL) for the National Primary Drinking Water Regulations, currently set at 5 micrograms per liter (µg/L) (Weston, 2008). However, because of different contaminant profiles (e.g., TCE was not identified in Geocel contamination), IDEM determined that Geocel was not the TCE source.

IDEM investigated well water in the area around Lane Street site in late August 2007 and found TCE exceeding drinking water standards in several wells. IDEM provided bottled water to 11 homes, including all whose wells exceeded drinking water standards, and contacted EPA to further investigate the issue. In September 2007, EPA confirmed the findings of elevated levels of TCE in several wells (Weston, 2008). On the basis of these findings, EPA provided point-of-entry (whole house) or point-of-use (tap) filters to 13 residences; the units were installed by November 2007 (EPA, 2009a). Testing in December 2007 showed that the filters were effective in removing TCE from the well water (Esserman, 2008).

Also in December 2007, EPA sampled indoor air at 2 homes with elevated TCE concentrations in well water. This was to assess the possibility for vapor intrusion, where volatile compounds can evaporate from groundwater and travel up through cracks or other conduits to enter homes. No TCE was detected in indoor air (Weston, 2008).

In spring 2008, IDEM collected 132 groundwater samples from wells serving residences and businesses in the area and from "direct push" samples directly from groundwater (*i.e.*, not from a permanent well). The results of this testing confirmed the previous findings of elevated TCE and other VOCs and assisted in further characterizing the extent of contamination (IDEM, 2008).

In October 2008, 26 residents signed a "Compact Agreement" with the city of Elkhart to be connected to the municipal water system and were connected in November 2008 (EPA, 2009a).

In April and May of 2011, EPA sampled groundwater at 25 different locations within the residential area as well as the industrial area of the Lane Street site. Approximately 170 groundwater samples and 14 soil samples were collected during the investigation, including two private groundwater well samples from a residential and a commercial property. Site related contaminants were not found in any of the soil samples. However, the contaminants TCE, 1,1-dichloroethane (1,1-DCA), and PCE were found in the groundwater samples.

EPA plans to continue sampling in the summer of 2013 for the remedial investigation along and adjacent to Lane Street, including the industrial park to the north. The goal of the sampling is to determine the source of the contaminants in the groundwater as well as the extent of the contamination within the Lane Street area.

Source of the Lane Street Groundwater Contamination

The contamination source has not been fully determined. Area groundwater flow is generally from the industrial park towards Lane Street. As previously stated, the company Geocel is not thought to be responsible for the Lane Street contamination. The Geocel contamination is confined to a specific area east of Lane Street, and the contaminant profiles are different in the Geocel and Lane Street groundwater (IDEM, 2007a). TCE and related breakdown products are present in the groundwater under Lane Street, while the Geocel site released a different solvent, tetrachloroethylene (also known as perchloroethylene, or PCE). This solvent degraded to form vinyl chloride and other substances in groundwater associated with that site. However, numerous other industrial companies exist or once existed in the area, and some of the industrial companies' manufacturing processes use or used the chemicals found in the Lane Street groundwater. EPA is continuing its efforts to determine the source(s).

Other Hazardous Waste Sites in the Area

Elkhart County has had four other sites listed on the NPL. Lane Street Ground Water Contamination is the fifth site listed. The other NPL sites are Himco Dump, the Main Street Well Field, Conrail Rail Yard, and Lusher Street Ground Water Contamination (EPA, 2011a). For more information on these sites, visit the ATSDR webpage at www.atsdr.cdc.gov. Other sites that are not listed on the NPL but were subjects of time critical removal or other actions include: the AccraPac Site, the Woodlawn Industrial Site, Sycamore Street, Geocel, Belmont-Huron Site, Gemeinhardt, and others. Many of

these sites are groundwater contamination sites. Of the Elkhart area sites, only the Geocel site discussed in this document is close (about ½ mile) to the Lane Street site. All of the other sites are more than 2 miles from Lane Street.

ATSDR Involvement

ATSDR is mandated by Congress to conduct an evaluation of sites proposed to EPA's NPL. This PHA is our evaluation of the Lane Street Ground Water site and its potential health implications. ATSDR visited the site and surrounding area from October 14-16, 2009. ATSDR contacted the Elkhart County Board of Commissioners to ensure they were aware of our upcoming visit. ATSDR gathered information on the Elkhart community and addressed any concerns expressed by board members or community members.

From October 14-16, 2009, ATSDR staff conducted individual interviews with some of the residents of Lane Street. The goal was to identify questions about health related issues, contamination concerns, and community data. This information is important because it helps us focus this assessment to better address community concerns and questions related to the Lane Street site.

On October 14, 2009, ATSDR staff met with ECHD, IDEM, and EPA to learn about the site. John Hulewicz, a representative and a supervisor from the ECHD, gave a drive-by tour of the site and surrounding area. The tour included Lane Street, the surrounding community, and nearby manufacturing companies. ATSDR learned the following during the visit:

- ECHD was aware of no health concerns expressed by residents, other than the initial concerns about safe drinking water.
- Information regarding background on the community, contamination, and possible future implications was obtained from ECHD and IDEM documentation, maps, and presentations.
- Some residences around Lane Street are still not connected to municipal water; those wells have not shown TCE levels above drinking water standards.

Discussion

Data Used

A major source of data evaluated in this report is the hazard ranking system package (EPA, 2009b). References listed in the package were provided by EPA Region 5, IDEM, and Elkhart County. These data sources describe groundwater sampling at many locations in the Lane Street area, including residences, businesses, and "direct push" samples collected directly from groundwater (not from a permanent well). The evaluation in this PHA focuses on residential wells only, from which long-term exposures were most likely. The residential private well sampling data evaluated in this PHA include:

- Sampling of 6 private wells by IDEM on August 23, 2007 (IDEM, 2007a): the report from this sampling event only included results for TCE, and raw laboratory results sheets were not available.
- Sampling of 25 private wells by IDEM on August 31, 2007 (IDEM, 2007b): ATSDR used raw laboratory results sheets from this sampling event available on IDEM's web site (Heritage, 2007).
- Sampling of 10 private wells by EPA in September 2007 (Weston, 2008): ATSDR used results as summarized in Weston 2008; raw laboratory results sheets were not available.
- Sampling of 36 private wells by IDEM in April 2008 (IDEM, 2008): ATSDR used results as reported in raw laboratory results sheets included in IDEM's Site Inspection Report dated September 2008.
- Sampling of two private wells from a residential and a commercial property by EPA in April and May 2011: ATSDR used results as reported by EPA in analytical tables and figures (EPA, 2013).
- ATSDR also considered limited indoor air sampling conducted by EPA in December 2007 and reported in the Site Inspection Report (Weston, 2008).

Note that the same well may have been sampled multiple times during each sampling event and may have been re-sampled in subsequent sample events. In addition, some of the above sampling events included residences on streets near Lane Street as well as Lane Street. For this evaluation, ATSDR did not consider samples collected from residences east of Lane Street. This area is considered part of a separate site (the Geocel site). ATSDR identified 30 residential wells which were part of the Lane Street Ground Water Contamination site and for which at least one set of sample results was available. A summary of these results will be presented shortly, but first the process by which ATSDR evaluates such environmental sampling data will be discussed.

Pathway Analysis

ATSDR determines whether people may have come into contact with chemicals from a site by examining exposure pathways. Exposure pathways consist of five elements which must all be present (in the past, now, or in the future) for exposure to occur. The five major elements and their relation to the Lane Street Ground Water site are listed below:

1. A contamination source: yes. Although the source of contamination for this site has not been identified, it is presumed because of the contamination present in groundwater.
2. Transport through an environmental medium: yes. VOC contamination has been measured in the groundwater beneath homes and businesses in the area.
3. An exposure point: yes, in the past. People obtained contaminated water from their private wells at drinking water and household taps.
4. An exposure route: yes. People drank the water and may have breathed in contaminant vapors from the water.
5. An exposed population: yes. People in the area used the water.

This analysis indicates that a complete exposure pathway existed in the past for those using contaminated well water. Twenty-six residences have been added to the municipal water system (EPA, 2009a). Any residential wells still in use that have not been tested or that may become contaminated in the future present a potentially complete exposure pathway. Completed exposure pathways are evaluated further by ATSDR to determine if there are health effects associated with the levels of exposure (ATSDR, 2005). For more information on ATSDR's pathway analysis process, please refer to Appendix A.

Evaluation Process

The process by which ATSDR evaluates the possible health impact of contaminants is summarized here and described in more detail in Appendix A.

- When presented with results of comprehensive environmental sampling for chemicals, ATSDR reduces the number of contaminants that need to be evaluated by screening the results for each chemical against *comparison values* (CVs)—concentrations of chemicals in the environment (air, water, or soil) below which no adverse human health effects are expected to occur. If a contaminant is present at a level higher than the corresponding CV, it does not mean that adverse health effects will occur; the contaminant is merely retained for the next step of evaluation.
- The next step of evaluation focuses on identifying which chemicals and exposure situations could be a health hazard. We calculate *exposure doses*—estimated amounts of a contaminant that people come in contact with and get into their bodies, on an equivalent body weight basis—under specified exposure situations, typically starting with "worst case" type assumptions to obtain the highest dose that could be expected. Each calculated exposure dose is compared against the corresponding *health guideline*, typically an ATSDR minimal risk level (MRL) or EPA Reference Dose (RfD), for that chemical. Health guidelines are considered safe doses; that is, if the calculated dose is at or below the health guideline, no adverse health effects would be expected.
- If the "worst case" exposure dose for a chemical is greater than the health guideline, then the exposure dose may be refined to more closely reflect actual exposures that occurred or are occurring at the site. The exposure dose is then compared to known health effect levels (for both cancer and noncancer effects) identified in ATSDR's toxicological profiles or the scientific literature. *These comparisons are the basis for stating whether or not the exposure presents a health hazard.*

We limited the exposure evaluation of this public health assessment to VOCs detected in residential private wells. These compounds are known to be contaminants in the groundwater, and residential exposures are of highest concern. Comprehensive data on other potential contaminants of concern and exposure pathways are not available at this time.

Contaminants of Concern

Several different VOCs were detected in at least one residential well at levels higher than drinking water CVs. The contaminants most frequently detected, shown in Table 1, were

TCE and 1,1-dichloroethane (1,1-DCA). These contaminants will be evaluated further in the ensuing sections of this report.

The compound methylene chloride was detected infrequently (in only 3 of 30 wells tested), and only slightly exceeded its CV in one instance. Methylene chloride is a very common laboratory contaminant and was detected in the lab and field blanks associated with this sampling. In this case, ATSDR does not consider methylene chloride to be a site-related contaminant of concern and will not evaluate it further.

Table 1. Contaminants Detected Above Comparison Values (CVs) in Lane Street Residential Wells and Selected for Further Evaluation

Contaminant	Highest Concentration Detected in Any Residential Well Sample, µg/L	# of Wells With Contaminant Detected	# of Wells With Contaminant Concentration Above the non-cancer CV	CV in µg/L and Source*
Trichloroethylene (TCE)	330	14 out of 30	9 out of 30	5 – MCL 0.76 – CREG
1,1-Dichloroethane (1,1-DCA)	11	11 out of 30	9 out of 30	2.4 - RSL

*Please see Appendix A for definitions and additional information about CVs.
MCL = maximum contaminant level
RSL = regional screening level
CREG = cancer risk evaluation guide
µg/L = microgram per liter
Data sources: as summarized in "Data Used" section beginning on page 6.

Evaluation of Exposure from Household Use of Residential Well Water

This exposure pathway was complete when people were still using wells that contained VOCs. We believe the subdivision was built in the late 1970s to mid-1980s. It is likely that the contamination present is relatively recent because TCE degradation products were not detected at higher levels than the TCE; however, because historical well testing is not available, we cannot confirm that the introduction of TCE into the groundwater here has only occurred recently. We also know that residences with contaminant levels above the MCL in their private wells were switched to bottled water or their well water was treated by filters beginning in 2007, and almost all area homes were connected to the municipal system in 2008.

ATSDR evaluated exposure to the levels of TCE and other VOCs detected in private wells in 2007-2008. It is possible that contaminant levels in some wells were higher in the past. No data on past levels of VOCs are available, and there is no way today to measure the past levels of contamination.

VOC exposure could have occurred in several ways:

- *Ingestion:* People could have drunk the water or drunk or eaten items prepared using the water.
- *Inhalation:* People could have breathed in VOCs that volatilized (moved into the air) from well water during showering, bathing, or other household use.
- *Dermal Exposure:* People could have absorbed VOCs through their skin during showering, bathing, or other use.

Often, ingestion exposure is the most significant source of exposure to hazardous substances from a site. In the case of VOC contamination, however, inhalation and dermal exposures can make a significant contribution to the total exposure dose (that is, the total amount of contaminant that enters and can affect a person's body). A precise estimate of these non-ingestion exposures is seldom achievable. A common estimation is that non-ingestion exposures yield a contaminant dose comparable to the ingestion dose (ATSDR, 2005). This estimation may underestimate exposures to people who may be exposed to TCE from shower water for periods of 30 minutes or more per day. However, for the purposes of this evaluation, we doubled ingestion exposure doses estimated using measured water VOC concentrations and default assumptions for the amount of water consumed per day and other exposure parameters to account for additional exposure from inhalation and dermal exposures.

Potential Health Effects from TCE Exposure

At the publication of ATSDR's August 2011 draft PHA for this site, EPA was reviewing the TCE health hazard oral and inhalation assessments for noncancer effects and the carcinogenicity assessment on IRIS. A draft toxicological review had been published but was not final and could not be cited. In late September 2011, EPA finalized the TCE toxicological review and published updated summary information for TCE on IRIS (EPA, 2011c; EPA, 2011d).

ATSDR has revised the evaluation of potential health effects from past TCE exposure at the Lane Street Ground Water Contamination using the new information from EPA. This evaluation also incorporates new recommendations for exposure assumptions such as body weight and drinking water ingestion rates from EPA's Exposure Factors Handbook, also finalized in September 2011 (EPA, 2011e).

People who used and drank water from residential wells with TCE levels below the MCL of 5 µg/L are unlikely to experience health effects from this exposure. Only 9 of the 30 residential wells tested in 2007-2008 had TCE levels higher than the MCL. Of those 9 wells, 3 wells had TCE levels at or below 25 µg/L; 3 had levels generally in the 50 to 100 µg/L range; and 3 had levels in the 200 to 300 µg/L range. For each of these general concentrations, the overall exposure dose of TCE was estimated for pregnant women and children less than one year old because unborn and very young babies are considered most sensitive to environmental toxins in many situations. For these groups, exposure doses (from ingestion, inhalation, and dermal exposure) were estimated using the assumptions and calculations detailed in Appendix A. Table 2 shows the exposure doses calculated for women or children exposed to water with 25, 100, or 300 µg/L of TCE.

Table 2. Estimated Past TCE Exposure Doses*, Lane Street Ground Water Contamination, Elkhart, Indiana

Group	Weight (kg)	Water Ingested (L/day)	Total Exposure Dose (mg/kg/day)		
			25 µg/L TCE	100 µg/L TCE	300 µg/L TCE
Pregnant Women	63.2	2.6	.002	.008	.02
Children Less Than One Year Old	7.8	1.1	.007	.03	.08

* Estimated dose includes ingestion, inhalation, and dermal exposure. Weight for pregnant women estimated as median weight of women of childbearing age (ages 15-44) from Table 8-10 of (EPA, 2011e). Weight for children from Table 8-1 of (EPA, 2011e), Water ingestion rates from Tables 3-1 and 3-3 of (EPA, 2011e). Please see Appendix A for details about exposure assumptions and calculations.

kg = kilogram
L/day = liters per day
mg/kg/day = milligram of TCE per kilogram body weight per day
µg/L = microgram per liter

Possible Noncancer Effects

Several epidemiologic studies describe noncancer effects associated with exposure to drinking water contaminated with TCE and other solvents. Note that a positive association does not mean causation. A study of a community in Arizona exposed to elevated levels (up to 239 µg/L) of TCE in drinking water showed an association between maternal exposure to TCE in water while pregnant and congenital heart defects in their newborns (Goldberg *et al.*, 1990). A study of communities in northern New Jersey with drinking water containing TCE greater than 5 µg/L (and other solvents) reported an association between TCE level and oral cleft defects, central nervous system defects, and neural tube defects (Bove *et al.*, 1995). A study of people in Woburn, Massachusetts exposed to up to 267 µg/L TCE in drinking water suggested an association between maternal exposure and a combination of eye and ear anomalies and a combination of central nervous system, chromosomal, and oral cleft anomalies in newborns (Lagakos *et al.*, 1986). However, other researchers have questioned the unusual groupings of these anomalies, and all the studies are limited by the presence of other contaminants in the water which may have led to an association with the observed health effects. Other limitations include small sample sizes and poorly defined TCE exposure levels. Animal studies have confirmed some of the suggested noncancer effects from epidemiologic studies. Rat studies have identified heart defects in newborn rats whose mothers were exposed to doses as low as 0.05 mg/kg/day (Johnson *et al.*, 2003).

In September 2011, EPA issued a revised oral reference dose (RfD) for TCE of 0.0005 mg/kg/day (EPA, 2011c; EPA, 2011d). The reference dose is an estimate, with safety factors built in, of the daily, life-time exposure of human populations to a chemical that is not likely to cause noncancerous health effects. EPA based its RfD on three principal toxicological studies:

- The Johnson study showing increased rates of heart defects in newborn rats born to female rats that were exposed to TCE in drinking water (Johnson *et al.*, 2003). EPA applied models of TCE metabolism in rats and humans to the study results to obtain a 99th percentile human equivalent dose (HED_{99}) of 0.0051 mg/kg/day. The HED_{99} can be interpreted as being the applied dose in humans for which there is 99% likelihood that a randomly selected individual will have an internal dose less than or equal to the internal dose derived from the animal study.
- A study in female adult mice showing immune system effects (decreased thymus weight) after exposure to TCE in drinking water (Keil *et al.*, 2009). EPA converted the study findings to obtain a HED_{99} of 0.048 mg/kg/day.
- A study in mice exposed from conception through early life to TCE in drinking water showing problems with immune system development (Peden-Adams *et al.*, 2006). Conversion of the study findings was deemed inappropriate, and EPA used the lowest study effect level of 0.37 mg/kg/day as a point of departure.

Two additional studies were also cited as supporting the RfD:

- A study showing increased kidney weights (a sign of stressed function) in female rats exposed to TCE by inhalation for 4 weeks (Woolhiser *et al.*, 2006). EPA obtained a HED_{99} of 0.0079 mg/kg/day for lifetime continuous exposure.
- A study showing kidney damage (toxic nephropathy) in female rats exposed to TCE by gavage for 2 years (NTP, 1998). EPA obtained a HED_{99} of 0.0034 mg/kg/day for lifetime continuous exposure.

ATSDR compared the above HED_{99} doses with the estimated doses in Table 2 for pregnant women and young children at the Lane Street Ground Water Contamination site to evaluate the potential for adverse health effects resulting from past exposure:

- At some of the wells, the estimated doses for pregnant women approach or exceed the HED_{99} of 0.0051 mg/kg/day for cardiac birth defects. Limited epidemiological studies have also shown associations between TCE exposure during pregnancy and birth defects. Pregnant women who drank water from these wells regularly may have had a greater risk of having children with heart or other birth defects.
- At the wells with the highest TCE concentrations, children less than one year old may have received doses that exceed the HED_{99} of 0.048 mg/kg/day for immune system effects such as decreased weight of the thymus gland. There may have been an increased risk of immune system effects in very young children who drank from the most highly contaminated wells.
- Several estimated doses approach or exceed the HED_{99} of 0.0034 mg/kg/day for kidney damage, indicating that adults and children, especially very young children, who drank TCE-contaminated well water may have had an increased risk of harm to their kidneys..

Possible Cancer Effects

The National Toxicology Program (NTP) classifies TCE as reasonably anticipated to be a human carcinogen. In humans, occupational exposure to TCE was associated with excess incidences of several cancers, particularly liver cancer, non-Hodgkin's lymphoma, and kidney cancer (NTP, 2011). Animal studies showed that oral or inhalation exposure to TCE caused tumors in mice and rats at several different organs, including liver and kidney (NTP, 2011). The International Agency for Research on Cancer (IARC) has determined that TCE is a probable human carcinogen based on epidemiological studies showing increased rates of liver cancer and non-Hodgkin's lymphoma, primarily in workers who were exposed to TCE and animal studies showing increased numbers of liver and kidney tumors upon oral administration (IARC, 1995). EPA characterizes TCE as carcinogenic to humans by all routes of exposure (EPA, 2011d). This conclusion is based on human epidemiology studies showing associations between human exposure to TCE and kidney cancer, non-Hodgkin's lymphoma, and liver cancer.

At the publication of ATSDR's draft PHA for this site in August 2011, an oral cancer slope factor (CSF) for TCE was not available in EPA's IRIS database. In the draft PHA, ATSDR followed interim guidance recommending use of an oral CSF developed by the California EPA (Cal-EPA), 0.0059 $(mg/kg/day)^{-1}$, for quantitative evaluation of TCE exposures (OEHHA, 2009). In late September 2011, EPA published a revised IRIS oral CSF for TCE of 0.046 $(mg/kg/day)^{-1}$ reflecting total incidence of kidney, non-Hodgkin's lymphoma, and liver cancers (EPA, 2011c; EPA, 2011d). The following updated evaluation uses the latest EPA oral CSF to evaluate the potential for increased risk of cancer resulting from past TCE exposures at this site.

EPA's latest assessment characterizes TCE as carcinogenic to humans by all routes of exposure (EPA, 2011d). An oral slope factor of 0.046 $(mg/kg/day)^{-1}$ is based on an increased risk of kidney cancer, non-Hodgkin's lymphoma and liver cancer (EPA, 2011c). EPA concluded that, for kidney cancer, TCE is carcinogenic by a mutagenic mode of action, which means that it acts by modifying the DNA of the cell. As a result, increased early-life susceptibility is assumed for kidney cancer, and age-dependent adjustment factors (ADAFs) are used for the kidney cancer component of the total cancer risk when estimating age-specific cancer risks (EPA, 2011d). ADAFs are factors by which cancer risk is multiplied to account for increased susceptibility to mutagenic compounds when people are exposed early in life. Standard ADAFs are 10 (for ages below 2 years old), 3 (for ages 2 up to 16 years old), and 1 (for ages 16 years old and greater) (EPA, 2005). Although technically the ADAF is only applied to the kidney cancer component of the TCE CSF, for the purposes of this PHA we apply the ADAFs to the entire CSF. This will overestimate the potential for increased cancer risk.

For a given period of exposure, the component oral CSF is multiplied by the daily exposure dose, appropriate ADAF, and a fraction equivalent to the years of exposure divided by 78 years (a lifetime). The result is the increased risk of cancer.

Everyone has a baseline risk of developing some type of cancer within their lifetime which may be associated with lifestyle (e.g., smoking) or heredity. The cancer risks calculated in this health assessment represent an increased cancer risk associated with exposure to TCE that is in addition to an individual's baseline risk. Therefore, if a cancer risk of 1 in 1,000,000 is derived for a dose of COC, it means that, in addition to their baseline cancer risk, one additional person out of a million people exposed to TCE may develop cancer during their lifetime.

For cumulative exposures, we assumed as a worst case that TCE exposure began at birth and occurred for up to 40 years. This is the approximate age of the neighborhood when TCE contamination of wells was discovered. Table 3 summarizes the estimated increased cancer risk for potential past exposures occurring at the Lane Street Ground Water Contamination site. Table 3 indicates that drinking and showering in TCE-contaminated water could have increased the risk of cancer above EPA's general target risk range of 1 in 1,000,000 to 1 in 10,000 (highlighted cells in the table). This would indicate a low to moderate increased risk of cancer for long-term exposure to lower concentrations of TCE, and a moderate to high increased risk of cancer for long-term exposure to the highest concentrations measured. For younger children using water from wells with higher TCE concentrations, shorter term exposures (months or years) could increase the cancer risk above the target range.

The actual cumulative risk of cancer from exposure to TCE at the site is probably lower than shown in the Table 3. Most people probably drank contaminated water for less than 40 years. Without historical data or knowledge of the origin of the contamination, it is impossible to determine exactly when exposures began and what past TCE contamination levels were. Today, no one at the site is drinking water containing TCE at levels that would measurably increase the risk of cancer. Although uncertainty exists in the estimated cancer risk from past TCE exposure, ATSDR's conclusions are driven by potential noncancer effects for past exposures and on the fact that use of water containing elevated levels of TCE was stopped shortly after the discovery of the contamination.

Table 3. Estimated Increased Risk of Cancer from Past Exposure to TCE in Drinking Water from Private Wells at Lane Street Ground Water Contamination Site, Elkhart, Indiana

Age Group	Average Body Weight, kg	Assumed Water Consumption, Liters/day	Years of Exposure / Lifetime	ADAF	Cancer Slope Factor, $(mg/kg/day)^{-1}$	Estimated Increased Cancer Risk, out of 10,000		
						25 µg/L TCE	100 µg/L TCE	300 µg/L TCE
Children from Birth Up To 2 Years Old	9.6	1.0	2/78	10	0.046	0.6	2.5	7.4
Children from 2 Years Old Up to Age 16	36.6	1.5	14/78	3	0.046	0.5	2.0	6.1
Children from 16 Years Old Up To Age 21	71.6	2.5	5/78	1	0.046	0.05	0.2	0.6
Adults from 21 Years Old Up To Age 40	80	3.0	19/78	1	0.046	0.2	0.8	2.5
Total			40/78			**1.4**	**5.5**	**16.6**

Estimated Cancer Risk = ADAF x CSF x Yrs Exp/Lifetime x 2 x Concentration x Consumption x 0.001 (conversion factor)/Body Weight
Maximum exposure duration of 40 years assumed – from when homes constructed until the use of wells for drinking water stopped in 2008.
Shading indicates estimated cumulative cancer risk greater than EPA's acceptable risk range for Superfund.
ADAF = age dependent adjustment factor
µg/L = micrograms per liter
kg = kilograms
mg/kg/day = milligrams TCE per kilogram body weight per day

Potential Health Effects from 1,1-DCA Exposure

People who used and drank water from residential wells with 1,1-DCA at the levels detected are unlikely to suffer any health effects. Only 9 of the 30 residential wells tested in 2007-2008 had 1,1-DCA levels higher than EPA's Regional Screening Level (defined in Appendix A) for tap water of 2.4 µg/L. The highest detected value in any well was 11 µg/L.

A child under 1 year old drinking water with the highest concentration (11 µg/L) of 1,1-DCA detected in private well water every day and also being exposed through inhalation and dermal exposure, is estimated to receive a total dose of 1,1-DCA of 0.003 mg/kg/day. A pregnant woman would be estimated to receive a dose of 0.0009 mg/kg/day. These doses are thousands of times smaller than health effect levels observed in animal studies ranging from 80 to 270 mg/kg/day (Cal-EPA, 2003). It is unlikely that drinking water containing 1,1-DCA at the levels detected at the site would result in any adverse health effects.

The NTP has not classified 1,1-DCA as to carcinogenicity. EPA classifies 1,1-DCA as a possible human carcinogen based on limited evidence of carcinogenicity in rats and mice. Human data are not available (EPA, 1996). The animal study leading to this classification did not provide conclusive evidence of carcinogenicity, and EPA did not perform a quantitative assessment of the cancer risk. The doses of 1,1-DCA which resulted in an increased number of tumors in rats or mice were thousands of times higher than doses estimated for the Lane Street population (ATSDR, 1990). Cal-EPA has published an oral cancer slope factor for 1,1-DCA of 0.0057 $(mg/kg/day)^{-1}$ (OEHHA, 1992). Based on this slope factor and the other information available, drinking water containing the highest level of 1,1-DCA detected in private well water at the site, every day for 40 years would result in an increased cancer risk of less than 3 in 1,000,000 – well within EPA's acceptable risk range for Superfund..

<u>Private Wells Not Tested</u>

The risk of cancer or non-cancer health effects to the residents who did not have their water tested is unknown. The risk depends on the actual contaminant level in the well and how the water is used. Area residents using well water should have it tested regularly. The residents could face an increased risk of health effects if the contaminant levels in their well water increase over time.

Evaluation of Vapor Intrusion Potential

If VOC levels are high enough in groundwater and the groundwater is close enough to the surface, sometimes VOCs can move up through the soil above the water table to reach the air. In some cases, VOCs might enter homes through foundation cracks and utility lines, and the contaminant can build up indoors. This is known as *vapor intrusion*, and in some cases vapors from contaminants can reach levels that are of health concern.

EPA tested indoor air in the two homes with elevated TCE levels measured in well water. TCE and 1,1-DCA were not detected. Two other volatile chemicals, benzene and

1,3-butadiene, were detected in one home at levels slightly exceeding air comparison values. These substances were not found in the Lane Street groundwater. The main indoor sources of benzene are environmental tobacco smoke, stored fuels and paint supplies, and automobile emissions in attached garages (EPA, 2011b). The main indoor source of 1,3-butadiene is environmental tobacco smoke. It may also result from incomplete combustion of fuels and thus occur in automobile exhaust (EPA, 2002).

The fact that VOCs present in contaminated groundwater were not detected in indoor air in these homes supports the hypothesis that vapor intrusion issues may not be a significant concern at the site. However, further sampling at more residences is needed to ensure that this is the case.

Child Health Considerations

ATSDR recognizes that infants and children might be more vulnerable than adults to exposures in communities with contaminated air, water, soil, or food. This potential vulnerability results from the following factors: 1) children are more likely to play outdoors and bring food into contaminated areas; 2) children are shorter and therefore more likely to contact dust and soil; 3) children's small size results in higher doses of chemical exposure per kg of body weight; and 4) developing body systems can sustain permanent damage if toxic exposures occur during critical growth stages. Because children depend completely on adults for risk identification and management decisions, ATSDR is committed to evaluating their special interests at the site.

ATSDR considered the special case of pregnant women in its evaluation because exposure during pregnancy to TCE, the major contaminant of concern at this site, may increase the risk of heart or other birth defects in the newborn children. In addition, because small children were potentially exposed to contaminated private well water, ATSDR estimated exposures specific to young children. A small child would have a higher exposure dose than older children or adults because of their smaller body weight. Conclusions based on exposure doses estimated for small children would therefore be protective for older children and non-pregnant adults.

Health Outcome Data

Health outcome data can give a more thorough evaluation of the public health implications of a given exposure. Health outcome data can include mortality information (e.g., the number of people dying from a certain disease) or morbidity information (e.g., the number of people in an area getting a certain disease or illness). The review is most effective when (1) a completed human exposure pathway exists, (2) potential contaminant exposures are high enough to result in measurable health effects, (3) enough people are affected for the health effect to be measured, and (4) a database is available to identify rates of diseases plausibly associated with the exposure for populations of concern.

A review of health outcome data was not performed for this site. People are not currently being exposed to contaminants because homes found to have TCE-contaminated water were provided with bottled water or filtration systems soon after discovery of the

contamination and were connected to municipal water in 2008. Although potential exposures in the past could have been high enough in a few homes to result in health effects, we do not have information about how long the contamination was present or the actual exposure levels. Even if we knew the levels of past exposure, the number of potentially exposed people would be too small to allow us to detect statistical differences in disease rates.

Community Health Concerns

ATSDR team members conducted in-depth interviews with 9 community members in Elkhart. The questionnaire used is included as Appendix B. Community members interviewed have lived there for a period ranging from six years through thirty-one years (when their homes were first built). Standard qualitative data analysis techniques were used to identify themes and code interviews accordingly. Interviews were audio recorded with the permission of residents, allowing interviewers to later double-check participant responses and capture direct quotes from those interviews. Below is a summary of community questions and concerns, with ATSDR responses, obtained from the interviews.

1. How could my health be impacted by the Lane St Contamination Site? Depending on the level of TCE in the well water you drank regularly, how much water you drank, and how long the exposure occurred, you may have had an increased risk of health effects including kidney problems and cancer. Pregnant women who drank TCE-contaminated water during pregnancy might have had an increased risk of having babies with heart defects or other birth defects. Children, especially very young children, may have had an increased risk of health effects. Please see the sections "Potential Health Effect of TCE Exposure" and "Conclusions" for details.

2. How long were we exposed? What could be done to help individuals who were exposed? There is no way to know how long exposure occurred. It's possible that the contamination is relatively recent because TCE degradation products were not detected at higher levels than the TCE; however, there is no historical data on when VOCs began contaminating residential wells. Most homes were connected to municipal water in 2008, stopping exposure.

Tests to determine whether people were exposed recently are available, but not at most doctors' offices. Special laboratories with the right equipment can test levels of TCE in the body. TCE can be detected in the blood or urine for up to 1 week after exposure (ATSDR, 1997). At this site, tests are not recommended because use of contaminated water stopped several years ago.

3. Where can people go to get help and answers as it relates to chemical exposure and background information on the site? People can visit their local health departments, contact their doctor, gather information from the state, local, and federal websites listed in this assessment, or call 1-800-CDC-INFO.

4. What if my doctor does not know what to do about exposure to contaminants? If your doctor does not have this information, ATSDR can coordinate a consultation between your doctor and a physician specializing in environmental and occupational medicine. Please contact ATSDR Region 5, which serves the state of Indiana. Contact information is:

Mark Johnson, Regional Director
ATSDR Region 5
77 W. Jackson Blvd., MS: ATSD-4J
Chicago, IL 60604
(312) 353-3436

5. Is there information about numbers of specific types of cancer among Lane Street residents (within the last three years) including lymphoma and bile duct cancer? Is there information about specific organs (i.e., kidneys and liver) that could be affected by chemicals in groundwater in the Lane Street area? The Indiana State Cancer Registry is notified and keeps records on cases of malignant cancer (except for certain skin and cervix), as well as other tumors and precancerous diseases (such as benign brain and CNS tumors) that are treated or diagnosed in Indiana. The information is usually collected from hospitals and reported annually to the Centers for Disease Control and Prevention's National Program of Cancer Registries and the North American Association of Central Cancer Registries. However, cancer registries on the smallest geographic unit usually provide data at the county or census tract level. The registry cannot provide data specified to Lane Street itself. More information can be found on the following websites:

- Indiana Cancer Registry: http://www.in.gov/isdh/24968.htm
- North American Association of Central Cancer Registries: http://www.naaccr.org/
- CDC National Program of Cancer Registries: http://www.cdc.gov/cancer.npcr

6. How does TCE affect the liver and kidneys? Animal and human epidemiology studies have shown that chronic exposure to TCE can cause kidney damage, liver changes, and cancers of the kidney and liver. TCE and its metabolites damage cells in the kidney's tubules, which carry out the main filtering function of the kidneys. TCE also has been shown to cause increases in kidney weight. Animal studies have shown that TCE can cause a number of structural changes in the liver indicative of altered function, including increased liver weight and enlarged liver cells.

There is convincing human and animal evidence that TCE causes kidney cancer. TCE is thought to cause kidney cancer through reactive metabolic by-products causing changes in DNA (mutations) in the kidney. Evidence associating TCE with liver cancer is less strong, but associations have been observed in human studies, with supporting evidence found in experimental animal studies.

7. How do high levels of TCE affect children? Can children be affected after drinking the water for 15-20 years? Young children who regularly (even for just a year or two) drank or breathed vapors from TCE-contaminated water at the highest concentrations measured

could have an increased risk of kidney damage, immune system effects, and an increased risk of cancer. Depending on how much water they drank, children who may have been exposed for longer periods, such as 15-20 years, could have an increased risk of kidney damage or cancer at lower TCE concentrations.

8. Is it in the soil? Is it dangerous to the health of people/children/pets playing in the yard? How about when it rains or when it's hot outside and you see the vapors? Most of the TCE deposited in surface waters or on soil surfaces evaporates quickly into the air, where it dissipates immediately and breaks down in a few days. TCE is very mobile in soil, so it can be washed down to subsurface regions where it will not degrade or evaporate quickly. The TCE below Lane Street moved from an as yet unidentified location, with subsurface groundwater flow. Therefore, the soils above the groundwater beneath Lane Street are most likely free of high amounts of TCE or other VOCs. Small amounts of TCE or other VOCs can slowly evaporate from the groundwater and move up through the soil to the atmosphere, but the amounts would be too small to cause any significant exposure to people, children, or pets present outside, even in hot weather. The only time this could potentially be a problem is if the small amounts of vapors coming from the groundwater move through the soil into a basement, house, or crawl space where they are trapped and build up to higher levels. In this report, ATSDR recommends further assessment of the potential for this phenomenon, called vapor intrusion, to occur at this site.

9. Can it (contamination) become airborne and be toxic? TCE and related VOCs can become airborne. These substances can be inhaled if contaminated water is used when taking showers, irrigating gardens, car washing, and using water for other household uses. All of these scenarios were possible while people were using water from contaminated private wells in the past. Our exposure estimates included a correction factor to account for additional exposures from inhalation exposures from these normal household uses. Municipal water was connected to 26 homes in the Lane Street area in November 2008, so the household use of contaminated water has stopped. VOCs can also evaporate from the subsurface groundwater and move up through the soil to enter homes; this is known as vapor intrusion. EPA collected air samples in December 2007 at two homes with high levels of contamination in their wells and found no evidence of vapor intrusion. In this report, ATSDR recommends further assessment of the potential for vapor intrusion to occur at this site.

10. What effect did showering with contaminated water have on me and my kids? Is there any concern for my body? What test can I take (medical test)? The exposure estimates in this report account for additional exposures from skin exposure and breathing during household use of contaminated water, including showering. ATSDR found that exposure to TCE in private well water could cause kidney problems in children and adults, and increase the risk of cancer if exposure lasted many years. Please see the sections "Potential Health Effect of TCE Exposure" and "Conclusions" for details.

Methods are available for measuring TCE or its metabolic byproducts in breath, blood, or urine (ATSDR, 1997). However, background levels of TCE in these biological matrices

for the general population are not well defined, making it difficult to differentiate between normal background exposure and excess exposure. In addition, TCE is efficiently metabolized in the human body, so detecting traces of exposures from weeks or years ago is not possible.

11. Could an unborn baby be affected by contamination? Yes, in the past pregnant women who drank and bathed in well water containing high concentrations of TCE might have had an increased risk of having babies with heart or other birth defects.

12. "We lost our dog. Our dog was healthy in 2004. It developed cancer in its leg 2 years later and died in 2008. Ice tasted funny. Tasted like motor oil. Water had rainbow film like oil."
We are sorry for the loss of your dog. Regarding TCE's association with cancer, long-term TCE exposure was shown to cause kidney cancer in rats and liver cancer in mice. No studies were found to indicate that TCE exposure may be associated with cancer in muscles or bones (ATSDR, 2007). Although there are many differences between how people and different species of animals are exposed and may develop cancer, we cannot tell whether your dog developed cancer from TCE. TCE in concentrated form has a somewhat sweet odor and a sweet, burning taste, but people would not be able to smell or taste the relatively low levels detected at Lane Street.

13. After a year in our house we stopped drinking water (5 years ago). Could we have cancer? Did it affect our brains? Why?" The increased risk of cancer depends on the concentration of the TCE and how long the exposure occurred. Very young children drinking from private wells with the highest TCE concentrations may have a low to moderate increased risk of cancer from one year of exposure. Older children or adults, or those drinking from wells with lower TCE concentrations would not have a substantially increased risk of cancer from one year of exposure. Very high exposures to TCE can affect the brain and nervous system; however, the concentrations of TCE present in wells at the Lane Street site are well below those that might cause such effects.

General Environmental Concerns

1. Could there be additional exposures in the future or long-standing problems?
Residences that had contaminated wells are connected to municipal water that is regularly monitored and subject to local, state, or federal drinking water standards. People who are not using contaminated well water can no longer be exposed to VOCs through general household water use. However, it is possible that some VOCs could evaporate from the groundwater, move up through the soil, and enter and build up in some homes – this is known as vapor intrusion. ATSDR is recommending additional sampling to confirm that vapor intrusion is not an issue for homes located above the known area of groundwater contamination. Also, EPA is currently investigating the site and will be developing options for cleanup.

2. Who is responsible for this contamination and can it be cleaned up? IDEM and the EPA started testing for contamination in 2007. The EPA is continuing its efforts to find

the responsible party. The source may or may not be determined. There are several manufacturing companies in this area and it may be difficult to determine where the contamination originated. A number of techniques for cleaning VOC contamination from groundwater may be considered through EPA's Superfund process.

3. Does groundwater affect the roots of the plants and vegetables we are growing? TCE does not build up significantly in plants (ATSDR, 2003). The surface of the groundwater in this area is generally located 6 to15 feet below the ground surface, below the typical root zone of plants and vegetables (IDEM, 2008). If VOCs evaporated from the groundwater, they could move through the soil, but they are volatile and would generally continue moving through the soil until they were released to the atmosphere.

4. Can we still be exposed to TCE even though we are now connected to municipal water? There is now very little risk, if any, for exposure to TCE for Lane Street residents connected to municipal water. The city regularly monitors the municipal water, and the water is subject to state and federal drinking water standards. (For information on the municipal water quality, please contact the Elkhart Public Works and Utilities Department at (574) 293-2572 or visit http://www.elkhartindiana.org/department/index.asp?fDD=34-0. Homes that still use private wells have the potential to be exposed if the groundwater is or becomes contaminated. Limited testing has indicated vapor intrusion is not occurring in the homes with elevated levels of TCE in well water. However, ATSDR is recommending further sampling to confirm that vapor intrusion is not an issue for homes located above the known area of groundwater contamination.

5. We are concerned about fumes; we have a water heater, water softener, and toilet tank; did TCE affect them and could it still be present in them?
Once TCE or other VOCs evaporate into the air, they dissipate and are degraded relatively quickly. It is unlikely that these systems are so airtight that the vapors would build up to a significant level or have any effect on the systems. Now that homes are on municipal water free of VOC contamination, any vapors that would have been left are long dissipated.

6. In pipes, we were told it (TCE) is slowly cleaned out, however the local health department stated that the contaminated groundwater was immediately eliminated when residents were connected to city water; is there more information on this? Municipal water was connected in November 2008. Any TCE or TCE-contaminated water should have been flushed out of the homes' piping systems quickly.

7. Given the number of contaminated sites in the area, how can authorities keep this from happening again? There is no sure way of knowing if contamination will occur again. There are ways to try to prevent contamination by manufacturing companies keeping an active account of their chemicals and their amounts. Current environmental regulations are designed to reduce chances for environmental contamination to occur. Residents or workers can get involved by reporting illegal dumping or workplace practices to their local health departments and the state.

8. Is there more information on the remediation process? When will more testing be done by the EPA? EPA is the lead agency for the remediation process. The current EPA Region V Representative for the Lane Street Site is Leslie Blake. She can be contacted at 312-353-7921. EPA will begin further sampling in the spring of 2013. ATSDR is working with the EPA to ensure that further sampling is conducted to evaluate remaining public health issues.

9. Residents that worked at one of the nearby companies were told not to drink the water because it causes cancer. Was the water safe to drink at my former job? If you were told not to drink the water, there may have been a known problem with the water, but ATSDR does not have any data or information to confirm this or evaluate whether the water at your former place of employment was safe. In general, ATSDR's authority does not extend to active work facilities. The company you worked for may be able to provide information about past water quality issues.

Conclusions and Next Steps

Conclusions

ATSDR reached three important conclusions in the PHA:

Conclusion 1

People who drank water from private wells containing TCE at the Lane Street Ground Water Contamination site had an increased risk of adverse health effects. ATSDR considers the site a past public health hazard. Levels of VOCs besides TCE in private wells were too low to cause harmful effects.

Basis for conclusion

Not all private wells showed TCE contamination. For the wells with TCE, ATSDR estimated past exposure for pregnant women and for children less than one year old (considered the most sensitive groups to TCE). ATSDR's evaluation showed a potential for kidney damage as well as an increased risk of cancer for past exposure to TCE in the contaminated wells for adults and children, especially young children. The wells with the highest concentrations of TCE could have increased the risk of immune system effects in the youngest children and could have increased the risk of heart or other birth defects in babies born to pregnant women who regularly drank from these wells.

Next steps

- Most homes were connected to municipal water in 2008 and are no longer using private wells. Municipal drinking water is monitored by Elkhart's Public Works and Utilities Department.
- ATSDR will explore options for providing information to the community on possible health effects from past TCE exposures.

Conclusion 2

Current exposures at the site are not expected to cause harm. However, exposure from wells still in use may pose a potential future public health hazard if contaminant levels increase.

Basis for conclusion

Almost all homes in the Lane Street area, and all homes with well water containing VOC levels above drinking water standards, have been switched to municipal water, stopping the exposure. One or two homes in the area may still be using wells for drinking water, but these wells did not show VOC contamination above drinking water standards. Because the source of the contamination has not been identified, it is unknown how TCE or related VOC levels might change in any wells still in use. Wells that do not currently have harmful levels of contamination may become more contaminated in the future.

Next Steps

- Occupants in homes not connected to municipal water should have their well water tested regularly.
- ATSDR will evaluate additional data collected by EPA and update the findings of this PHA, if necessary.

Conclusion 3

More information is needed to assess whether VOCs may be building up in homes (vapor intrusion).

Basis for conclusion

EPA collected indoor air samples in two homes with the highest amounts of TCE in well water. The samples were taken to identify whether vapors from underground contaminated water could be building up inside the homes. The samples indicated VOCs were not present at harmful levels at the two homes sampled. However, vapor intrusion can vary seasonally, from house to house, and with changes in groundwater contaminant levels over time.

Next Steps

- EPA should conduct additional sampling to verify that Lane Street residents are not being exposed to groundwater contaminants from vapor intrusion.

Site Team

Ron Milam, MPH, CFSM[1]
Environmental Health Officer
LT, U.S. Public Health Service

Jill Dyken, PhD, PE
Environmental Health Scientist

Mark Johnson, PhD, DABT
Regional Director

Rose Jackson, BA
Health Communication Specialist

Carla Galindo, MPH, CHES[1]
Health Education Specialist

[1] No longer with ATSDR.

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Appendix A. Explanation of Evaluation Process

Screening Process

In evaluating these data, ATSDR used comparison values (CVs) to determine which chemicals to examine more closely. CVs are health-based contaminant concentrations found in a specific media (air, soil, or water) and are used to screen contaminants for further evaluation. CVs incorporate assumptions of daily exposure to the chemical and a standard amount of air, water, and soil that someone might inhale or ingest each day.

As health-based thresholds, CVs are set at a concentration below which no known or anticipated adverse human health effects are expected to occur. Different CVs are developed for cancer and noncancer health effects. Noncancer levels are based on valid toxicological studies for a chemical, with appropriate safety factors included, and the assumption that small children or adults are exposed every day. Cancer levels are based on a one-in-a-million excess cancer risk for an adult exposed to contaminated soil or drinking contaminated water every day for a lifetime. For chemicals for which both cancer and noncancer levels exist, we use the lower level to be protective. Exceeding a CV does not mean that health effects will occur, just that more evaluation is needed.

CVs used in preparing this document are listed below:

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations that would be expected to cause no more than one additional excess cancer in one million persons exposed over a lifetime. CREGs are calculated from U.S. Environmental Protection Agency (EPA) cancer slope factors (CSFs).

Maximum Contaminant Levels (MCLs) are enforceable standards set by EPA for the highest level of a contaminant allowed in drinking water. MCLs are set as close to MCL goals (MCLGs, the level of a contaminant in drinking water below which there is no known or expected risk to health) as feasible using the best available treatment technology and taking cost into consideration.

EPA Regional Screening Levels (RSLs) are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. EPA considers RSLs to be protective for humans (including sensitive groups) over a lifetime.

Determination of Exposure Pathways

ATSDR identifies human exposure pathways by examining environmental and human components that might lead to contact with contaminants of concern. A pathway analysis considers five principal elements: a source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and an exposed population. Completed exposure pathways are those for which the five elements are evident, and indicate that exposure to a contaminant has occurred in the past, is now occurring, or will occur in the future. Potential exposure pathways are those for which exposure seems possible, but one or more of the elements is not clearly defined. Potential

pathways indicate that exposure to a contaminant could have occurred in the past, could be occurring now, or could occur in the future. The identification of an exposure pathway does not imply that health effects will occur. Exposures might be, or might not be, substantive. Therefore, even if exposure has occurred, is now occurring, or is likely to occur in the future, human health effects might not result.

ATSDR reviewed site history, information on site activities, and the available sampling data. On the basis of this review, ATSDR identified household use of private well water as the main pathway of concern at the Lane Street Ground Water Contamination site.

Evaluation of Public Health Implications

The next step is to take those contaminants present at levels above the CVs and further identify which chemicals and exposure situations are likely to be a health hazard. Child and adult exposure doses are calculated for the site-specific exposure scenario, using our assumptions of who goes on the site and how often they contact the site contaminants. The exposure dose is the amount of a contaminant that gets into a person's body. Following is a brief explanation of how we calculated the estimated exposure doses for the site.

Exposure to Contaminants in Private Well Water

The overall exposure doses were estimated for pregnant women and young children – considered the most sensitive to environmental toxins in many situations. For estimating cumulative cancer risk, combined exposures from drinking and showering were estimated for various age groups. Assumed body weights and drinking water ingestion rates are presented in Table A1 (EPA, 2011e).

Table A1. Estimates for Body Weight and Drinking Water Ingestion – Lane Street Ground - Water Contamination, Elkhart, Indiana -

Group	Body Weight in Kilograms (Pounds)*	Ingestion of Drinking Water in Liters per Day†
Children from Birth Up to 1 Year Old	7.8 kg (17 lb)	1.1 L/day
Pregnant Women	63.2 kg (139 lb)	2.6 L/day
Children from Birth Old Up to Age 2	9.6 kg (21 lb)	1.0 L/day
Children from 2 Years Old Up To Age 16	36.6 kg (80 lb)	1.5 L/day
Children from 16 Years Old Up To Age 21	71.6 kg (158 lb)	2.5 L/day
Adults Greater Than 21 Years Old	80 kg (176 lb)	3.0 L/day

Sources:
* Weight for pregnant women obtained from Table 8-10 of (EPA, 2011e), median weight of women ages 15 to 44. Weight for children and adults obtained from Table 8-1 of (EPA, 2011e), recommended values for body weight (males and females combined). (Weighted averages used to obtain body weight for specific age ranges listed in this table.)
† Obtained from Tables 3-1 and 3-3 of (EPA, 2011e), consumers-only ingestion of drinking water, 95th percentile. (Weighted averages used to obtain ingestion for specific age ranges listed in this table.)
kg = kilogram lb = pound L/day = liters per day

As discussed in the body of the text, the estimated ingestion exposure was doubled to account for additional exposure from inhalation and dermal exposure. The overall exposure dose is given by the following equation:

$$Dose\ in\ mg/kg/day = 2 \times \frac{Concentration\ in \frac{\mu g}{L} \times Ingestion\ in \frac{L}{day}}{1000\ \frac{\mu g}{mg} \times Body\ weight\ in\ kg}$$

For example, the calculation of exposure of a child weighing 7.8 kg drinking 1.1 liter per day of water containing 100 µg/L TCE is estimated as:

$$2 \times \frac{100\ \frac{\mu g}{L} \times 1.1\ \frac{L}{day}}{1000\ \frac{\mu g}{mg} \times 7.8\ kg} = 0.03\ mg/kg/day$$

Noncancer Health Effects

The calculated exposure doses are then compared to an appropriate health guideline for that chemical. Health guideline values are considered safe doses; that is, health effects are unlikely below this level. The health guideline value is based on valid toxicological studies for a chemical, with appropriate safety factors built in to account for human variation, animal-to-human differences, and/or the use of the lowest study doses that resulted in harmful health effects (rather than the highest dose that did not result in harmful health effects). For noncancer health effects, the following health guideline values are used.

Minimal Risk Level (MRLs) —Developed by ATSDR

An MRL is an estimate of daily human exposure – by a specified route and length of time – to a dose of chemical that is likely to be without a measurable risk of adverse noncancer effects. An MRL should not be used as a predictor of adverse health effects. A list of MRLs can be found at http://www.atsdr.cdc.gov/mrls.html.

Reference Dose (RfD) —Developed by EPA

An RfD is an estimate, with safety factors built in, of the daily, life-time exposure of human populations to a possible hazard that is not likely to cause noncancer health effects. RfDs can be found at http://www.epa.gov/iris.

If the estimated exposure dose for a chemical is less than the health guideline value, then the exposure is unlikely to cause a noncancer health effect in that specific situation. If the exposure dose for a chemical is greater than the health guideline, then the exposure dose is compared to known toxicological values for that chemical and is discussed in more detail in the public health assessment. These toxicological values are doses derived from human and animal studies that may be summarized in EPA Toxicological Reviews and the ATSDR *Toxicological Profiles*. A direct comparison of site-specific exposure and

doses to study-derived exposures and doses that cause adverse health effects is the basis for deciding whether health effects are likely or not.

Cancer Health Effects

The estimated risk of developing cancer resulting from exposure to the contaminants was calculated by multiplying the site- and age-specific exposure doses by EPA's corresponding CSF (which can be found at http://www.epa.gov/iris), a fraction to account for duration of exposure out of a 78-year lifetime, and (if applicable) age-dependent adjustment factors (ADAFs). Contributions of risk from different ages are summed to obtain the cumulative risk over the time period of interest. (For cumulative exposures at this site, we assumed 40 years as a worst-case exposure duration, because the neighborhood was not built before the late 1970s.)

ADAFs are applied for substances that cause cancer by a mutagenic mode of action and account for the greater risk of exposures to these substances that occur in early life. (A current list of substances EPA considers mutagenic can be found at http://www.epa.gov/oswer/riskassessment/sghandbook/chemicals.htm). An ADAF of 10 is applied for exposures taking place from birth up to 2 years old, and an ADAF of 3 is applied for exposures taking place from age 2 up to age 16. No adjustment is applied for exposures at age 16 or above (EPA, 2005).

The actual increased risk of cancer is probably lower than the calculated number, which gives a theoretical worst-case excess cancer risk. The method used to calculate EPA's cancer slope factor assumes that high-dose animal data can be used to estimate the risk for low dose exposures in humans. The method also assumes that no safe level exists for exposure. Little experimental evidence exists to confirm or refute those two assumptions. Lastly, the method computes the upper 95th percent confidence limit for the risk. The actual cancer risk can be lower, perhaps by several orders of magnitude (EPA, 1989).

Because of uncertainties involved in estimating carcinogenic risk, ATSDR employs a weight-of-evidence approach in evaluating all relevant data (ATSDR, 1993). Therefore, the increased cancer risk is described in words (qualitatively) rather than giving a numerical risk estimate only. The numerical risk estimate must be considered in the context of the variables and assumptions involved in their derivation and in the broader context of biomedical opinion, host factors, and actual exposure conditions. The actual parameters of environmental exposures must be given careful consideration in evaluating the assumptions and variables relating to both toxicity and exposure.

Appendix B. Questionnaire for Community Interviews

1. How long have you lived here?
2. What do you see as the major problems facing the community of Elkhart regarding the Lane Street Ground Water Contamination Site and why?
    a. Listen for environmental concerns or health concerns related to the environment.
    b. If not mentioned ask: Do you think the environment of the community is a problem?
    c. Why/Why not?
3. How much do you know about the environment of the community? Are you worried that the environment in your community might be affecting people's health? Why / why not? (Listen for specific concerns).
    a. Probe for who they think might be responsible for causing the environmental problems).
4. Are you aware of any previous or current effort to address any environmental or environmental health concerns through a community-wide effort? If yes: Please describe what happened during that situation. Do you know who are/ were the key players? How effective do you think it was/is?
5. What / who do you think is causing the environmental problems in the community? (Listen for specifics—like a company or an industrial plant.
    a. Do you think that others in the community would agree with you? Why or why not? What problems do you think that others might list?
6. Do you think your community has the resources to address these concerns? What are those resources? Note: Listen and probe for:
7. On a scale of 1-5 (5 being very high; and 1 being very low) how concerned do you think the community is about the potential environmental hazard in Lane St.
8. Who do you think is responsible for addressing those concerns?
9. Do you think most people are upset about the environmental health of their community? Who are they upset with? Listen for what is or is not being done. Probe, if not mentioned: Do you think the community believes their health has been or could be impacted?

10. Has the state/local/federal government been responsive to the concerns?
11. Do you think the agencies are doing enough? Does the community?
12. What level of trust do you have in the government taking care of this issue? Listen for specific government agency or level (state/local/federal)
13. Do you think there is anything that a person can do to help change the environment here?? Probe: Do you think the average community member would agree with you?
14. What kind of information do you think the community needs to know? Probe: Any suggestions on the most effective strategies for communicating to your community about environmental health concerns?
    a. How would you like to be kept informed about our community involvement activities in your community?
        i. Direct mail
        ii. Internet
            1. e-cards
            2. web page

Appendix C. Glossary of Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency in Atlanta, Georgia, with 10 regional offices in the United States. ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases from 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 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. For additional questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

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].

Adverse health effect
A change in body function or cell structure that might lead to disease or health problems

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 a lifetime. The true risk might be lower.

Carcinogen
A substance that causes cancer.

Central nervous system
The part of the nervous system that consists of the brain and the spinal cord.

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]

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. The Superfund Amendments and Reauthorization Act (SARA) later amended this law.

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.

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].

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

Dose
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.

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

Epidemiologic study
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

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 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.

Groundwater
Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].

Health outcome data
Information from private and public institutions on the health status of populations. Health outcome data can include morbidity and mortality statistics, birth statistics, tumor and disease registries, or public health surveillance data.

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].

Metabolism
The conversion or breakdown of a substance from one form to another by a living organism.

Metabolic byproduct
Any product of metabolism.

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.

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.

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).

Prevention
Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

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.

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.

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.

Risk
The probability that something will cause injury or harm.

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].

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.

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.

Substance
A chemical.

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.

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.

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.

Volatile organic compounds (VOCs)
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Appendix D. Public Comments Received and ATSDR Responses

ATSDR released a draft of this PHA for public comment on March 14, 2013. The PHA was available for public review and comment at the main branch of the Elkhart Public Library in Elkhart, Indiana. The document was also available for viewing or downloading from the ATSDR web site. The public comment period was open from March 14, 2013 through April 29, 2013.

ATSDR had previously released a draft PHA for public comment in August 2011. ATSDR updated the PHA to include new toxicological information for TCE and new exposure factors finalized by EPA after that date. The PHA was re-released for public comment in March 2013 to give the public another opportunity to comment on the evaluation.

Two sets of public comments, both from staff of EPA Region 5, were received. ATSDR received two sets of comments from EPA Region 5. The comments received are listed in their entirety below. ATSDR responses are inserted as italicized text.

Comments from an EPA Region 5 Remedial Project Manager:

EPA has included some comments that ATSDR may want to consider including in the Public Health Assessment for the Lane Street Groundwater Contamination Site under the public comment period.

Under "Site History and Previous Investigations" on Page 4 of the Public Health Assessment, EPA suggests adding two paragraphs to this section to discuss the sampling efforts from April and May 2011 and efforts moving forward, such as follows:
In April and May of 2011, EPA sampled groundwater at 25 different locations within the residential area as well as the industrial area of the Lane Street site. Approximately 170 groundwater samples and 14 soil samples were collected during the investigation, including two private groundwater well samples from a residential and a commercial property. Site related contaminants were not found in any of the soil samples. However, the contaminants TCE, 1,1-dichloroethane (1,1-DCA), and PCE were found in the groundwater samples.

EPA plans to continue sampling in the summer of 2013 for the remedial investigation along and adjacent to Lane Street, including the industrial park to the north. The goal of the sampling is to determine the source of the contaminants in the groundwater as well as the extent of the contamination within the Lane Street area.

Under "Discussion", "Data Used" on Page 6 of the Public Health Assessment, EPA suggests adding a bullet point to include the following information:

- Sampling of two private wells from a residential and a commercial property by EPA in April and May 2011: ATSDR used results as reported by EPA in analytical tables and figures.

Under "General Environmental Concerns" on Page 23 of the Public Health Assessment, EPA recommends changing the current EPA Region V Representative for the Lane Street site from Bernie Schorle to Leslie Blake. She can be contacted at 312-353-7921. Also, add that EPA will begin further sampling in the spring of 2013.

Please note that although these additions may not change the overall conclusions of the Public Health Assessment, they do provide the reader with additional information related to sampling and current contact information at the Site.

ATSDR Response: Thank you for this information. ATSDR obtained the April and May 2011 sample results from the commenter and examined the private well results. The results did not indicate any need for changes to the conclusions and recommendations of the PHA. Therefore, the commenter's additions and changes were made as suggested.

Comments from an EPA Region 5 Toxicologist:

I have a slight concern with the Draft PHA for Lane Street. The last paragraph on page 1 states, "ATSDR repeated its evaluation of potential exposures at the site using the 2011 TCE toxicological review and incorporating updated body weight and drinking water ingestion assumptions from the 2011 Exposure Factors Handbook."

However, US EPA has not made any formal changes to the default exposure assumptions based upon the 2011 EFH. As of April 15th 2013, they are still recommending using the 1997 EFH for default exposure assumptions. It is recommended that the 1997 EFH be used for default exposure assumptions for the Lane Street Groundwater Contamination PHA instead of the 2011 EFH as described in the draft PHA.

ATSDR Response: Thank you for this comment. ATSDR recognizes that EPA default exposure assumptions may not have changed with finalization of the 2011 Exposure Factors Handbook. ATSDR has flexibility to use alternative exposure assumptions in its evaluations, and in this case decided to update the exposure assumptions along with the TCE toxicological evaluation. The use of different exposure assumptions did not affect the overall conclusions and recommendations for the site.