



Public Health Assessment for

**CONRAIL RAIL YARD
ELKHART, ELKHART COUNTY, INDIANA
EPA FACILITY ID: INDO00715490
AUGUST 11, 2005**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE**

Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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PUBLIC HEALTH ASSESSMENT

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Summary

At the request of community members and to update the 1989 preliminary public health assessment, the Agency for Toxic Substances and Disease Registry (ATSDR) conducted public health assessment activities at the Conrail Rail Yard Superfund site in Elkhart, Indiana. No one is known to currently be exposed to contaminants from the site at levels that would harm them. Although most people in the area are using or soon will be using a safe public water supply, ATSDR learned that more private wells are in use than previously thought. The exact number of private wells still in use is not known. People who are not using the public water supply may still be at risk of exposure, but unless that water is tested, exposure status cannot be evaluated. People are no longer exposed to harmful levels of contaminants that were entering their home as vapors from the groundwater because homes and buildings shown to have elevated carbon tetrachloride levels in indoor air had vapor mitigation systems installed. New buildings in the affected area are required to have these systems. Elkhart County Health Department and the Agency for Toxic Substances and Disease Registry (ATSDR) are working with building inspectors to ensure the restriction is understood and enforced.

People can avoid exposure to harmful levels of contaminants that might remain in the groundwater for several decades by always using a safe water supply for drinking, bathing, cooking, and other household purposes. A safe, municipal water supply is available for affected neighborhoods near the Conrail site. Strict enforcement of deed restrictions to prevent new well drilling in the contaminated groundwater and availability of affordable, safe water will help people avoid exposure. Most people are now using safe water. We know, however, that people were exposed to a wide range of levels of trichloroethylene and carbon tetrachloride in their drinking water in the past. Some people were exposed to very high levels of contaminants in their drinking water in the past, while others were exposed to very little or no contamination in their water.

We reviewed private well data for 598 homes and businesses. We do not have well water data for every home and business in the area; consequently, our estimation of the number of people who came in contact with contaminants from Conrail is likely an underestimate. Of the 598 wells sampled, 258 (43%) contained contamination. If, on average, four people lived in homes or worked every day in one of the businesses served by a contaminated well, then 1,032 people contacted the contamination from Conrail every day.

Of those people, about 32 were exposed to trichloroethylene at over 300 parts per billion and about 24 were exposed to carbon tetrachloride at levels over 3,000 parts per billion. Exposures to those levels could have resulted in serious health effects, including birth defects and cancer. Approximately 88 people were exposed to levels of trichloroethylene between 100 and 300 parts per billion, and about 128 people were exposed to carbon tetrachloride between 100 and 3,000 parts per billion. Although those people were at less risk of developing health effects than those exposed to higher levels, they were still at risk of developing health effects. Studies are not available, especially for carbon tetrachloride exposure, to determine whether health effects might occur at levels between 30 and 100 parts per billion. Of the people exposed, 192 were exposed to trichloroethylene at those levels, and 44 people were exposed to carbon tetrachloride at levels

between 30 and 100 parts per billion in their drinking water. Exposure to trichloroethylene and carbon tetrachloride at levels below 5 parts per billion are not expected to cause any harmful effects. Of those exposed to trichloroethylene, 520 were exposed to levels below 5 parts per billion, and 348 people were exposed to carbon tetrachloride at levels below 5 parts per billion.

About 608 people were exposed to both trichloroethylene and carbon tetrachloride found in water from 152 wells. Some wells contained higher levels of one contaminant or the other. Some health effects associated with carbon tetrachloride might occur at lower levels of exposure when people are also exposed to trichloroethylene. We do not know at what levels of trichloroethylene and carbon tetrachloride the risk of health effects becomes greater. We do know that people exposed to both chemicals at less than 5 parts per billion are not likely to have adverse health effects as a result of their exposure. About 260 people were exposed to both trichloroethylene and carbon tetrachloride at levels below 5 parts per billion.

We reviewed indoor air data for 35 homes and businesses. Of the 35 indoor air samples collected, 12 buildings contained carbon tetrachloride in the indoor air. Again, if four people were present each day in the buildings that contained carbon tetrachloride in indoor air, 48 people breathed the contaminant that was present in the areas where they lived and worked. Of those 48 people, at least 44 had contamination in their well water, too. The indoor air sample results suggest that contamination from vapor intrusion into indoor air contributed little to the overall exposure of people also exposed to well water contamination. However, the indoor air exposure is undesirable and can be eliminated by maintaining vapor mitigation systems. The Elkhart County Health Department and ATSDR will work with building inspectors to stress the importance of enforcing the code requiring new buildings to be equipped with vapor mitigation systems to prevent exposure to contaminants through vapor intrusion. For those people who have not had a vapor intrusion problem, the likelihood of a problem developing is small. However, conditions might change, such as installation of new underground utilities, which could put them at greater risk of exposure. Long-term monitoring is planned that should help identify any changes that might affect area homes and business. If changes are noted, then ATSDR is recommending that Conrail immediately take actions to ensure no one is exposed.

Community members asked us to investigate whether health effects they were experiencing could be linked to their exposure. Health effects that were of concern included birth defects, cancer, fibromyalgia, heart disease, kidney disease, liver disease, and polyneuropathy. We cannot tell any individual whether his or her condition was caused from exposure to contaminants from Conrail because many other factors can play a role in illnesses that people develop. We can, however, tell people what effects have been found in epidemiologic and toxicologic studies in both humans and animals exposed to trichloroethylene and carbon tetrachloride.

Human studies have suggested that trichloroethylene and carbon tetrachloride might affect the fetus when the mothers are exposed to these chemicals during pregnancy. More exposure-specific studies are needed to better understand those findings. Studies also link trichloroethylene exposure to possible increased risks of developing cancer, primarily lymphoma and leukemia. No studies were found where people developed cancer following exposure to

carbon tetrachloride, but mice and rats developed liver cancer when exposed to higher levels than those found in the Conrail area.

Preliminary evaluation of birth certificate data and cancer mortality data suggest that elevations of certain effects were found. A review of cancer incidence reports for 1990 through 1999 did not show elevated rates. We were not able to determine whether the adverse birth outcome and cancer mortality effects occurred more often in people exposed to the site-related contamination because the data were not available in a format that allowed us to look at the people exposed to contamination versus those who were not.

Exposure to trichloroethylene and carbon tetrachloride can damage the liver. Carbon tetrachloride can also affect the kidney. If the damage is not too severe, both the liver and the kidney can repair much of the damage when exposure stops. A specific heart condition—arrhythmias—has been associated with exposure to high levels of trichloroethylene and carbon tetrachloride. No one knows what causes fibromyalgia, but exposure to toxic chemicals has not been ruled out as a possible cause. Neither trichloroethylene nor carbon tetrachloride exposure has been associated with polyneuropathy.

Background and Statement of Issues

Purpose

In August 2000, the Agency for Toxic Substances and Disease Registry (ATSDR) received a letter from the Citizens League for Environmental Action Now (CLEAN), a citizens' group representing people affected by the Conrail Rail Yard Superfund site. The letter included background information about previous interaction with ATSDR and stated that new circumstances warranted further ATSDR involvement. CLEAN's letter described concerns about rising pollution and about trichloroethylene (TCE) and carbon tetrachloride (CCl₄) vapors found in homes. CLEAN shared with ATSDR how this new discovery led to more health concerns. CLEAN asked ATSDR to determine who and how many people have been affected and what diseases are now more prevalent or dangerous to health.

On November 15, 2000, ATSDR, the Indiana State Department of Health (ISDH), Elkhart County Health Department, and St. Joseph County Health Department officials met with CLEAN representatives to develop an action plan to address concerns. As part of that action plan, ATSDR committed to conducting a thorough public health assessment of the site. This public health assessment documents community concerns and addresses as many of those concerns as possible. This document also serves to update the 1989 preliminary public health assessment.

Public Health Involvement

Elkhart County Health Department has a long history of involvement with the Conrail Rail Yard site and with the people affected by the site. Elkhart County Health Department began investigating reported spills and community complaints at the Conrail site in 1976. Before that, the Indiana State Pollution Control Board had investigated spills. When Elkhart County Health Department tested the water of a resident who was complaining about the taste, they found TCE and CCl₄ in the water. The county requested Environmental Protection Agency (EPA) assistance immediately.

Public Health Involvement Highlights

1976	Elkhart County Health Department began investigating complaints about Conrail.
1986	Elkhart County Health Department finds contamination in private well water. Environmental Protection Agency starts providing alternative drinking water.
1988	ISDH and ATSDR begin an Interim Public Health Assessment identifying site-related exposure in neighborhoods; 236 area residents were added to ATSDR's newly formed TCE National Exposure Registry.
2000	Federal, state, and local health agencies start work on the community action plan.

Elkhart County Health Department continued to respond to residents' concerns about their health and their exposure to site-related contamination. As the EPA site investigation continued and people in St. Joseph County were identified as also being affected by the site, residents were asking St. Joseph County Health Department questions about their exposure and health.

In 1988, EPA proposed to include the Conrail Rail Yard site on the National Priorities List. ISDH, through a cooperative agreement with ATSDR, began the public health assessment process to evaluate exposures at the site. With documentation that people in the County Road 1 area had been exposed to TCE in their drinking water, ATSDR included 236 residents on the newly formed the TCE Subregistry of the National Exposure Registry, one of four active, ongoing health tracking programs for people exposed to the hazardous substances: benzene; dioxin; trichloroethane; and TCE. ATSDR reports on the TCE Subregistry of the National Exposure Registry are available for review at the Elkhart Public Library in Elkhart. Copies can also be obtained by calling 1-888-422-8737 and asking for the Exposure Registry Branch Chief of the Division of Health Studies.

In 2000, ATSDR received a request from CLEAN to provide more health status information to the community. ATSDR, ISDH, and Elkhart County Health Department officials met with CLEAN representatives. The group developed an action plan to address concerns. The action plan is presented in Appendix 1.

CLEAN, with help from Elkhart County Health Department and support of St. Joseph County Health Department, developed a questionnaire and surveyed interested community members in 2001. The community wanted to provide ATSDR with information about their health concerns that had not been addressed and with their well water status to determine if health effects might be associated with water use. More than 760¹ residents participated. ISDH and ATSDR received those questionnaires, which captured a number of community concerns. ATSDR provided a summary of the results of the questionnaire that was printed in a CLEAN newsletter. ATSDR is using results from the questionnaire to help guide information included in this document. That information is presented in the Health Issues section, which includes a discussion of various health conditions and health risk information derived from health data analyses.

Because of the preliminary health education efforts completed under the original site action plan, the health agencies recognized that more needed to be done at the local level. ISDH then coordinated a needs assessment with area residents and local health professionals to determine the kinds of information needed and how to provide that information. Elkhart County Health Department and St. Joseph County Health Department were eligible to receive money from the National Association of County and City Health Officials (NACCHO) to conduct activities to address the community's need for more information about the site and to develop materials for new residents to learn about the site and the contamination. The fact sheet, CD-ROM, and report that Elkhart County Health Department generated with NACCHO funding are in Appendix 2.

In 2001, ATSDR promised the community that a public health assessment would be completed for the Conrail Rail Yard site and that the document would include as much information as possible to help answer their questions. This public health assessment is comprehensive and includes data collected since the release of the 1989 preliminary public health assessment. The

¹ A *Community Assessment of the Environmental Health Education Needs of the Community* (Appendix 2) cites 751 returned questionnaires. Additional questionnaires were submitted later, and those that ATSDR received before summarizing the data were included.

1989 preliminary public health assessment said the site was of public health concern because of exposure to levels of contaminants that might cause adverse health effects. Only limited environmental data were available at the time that document was written. It was also written at a time when ATSDR did not work as closely with communities to be sure their concerns were addressed. This public health assessment was available for public comment from July through August 30, 2004. Community members were asked to further participate in the public health assessment process by commenting on this document, by correcting any errors, and by adding any missing information about the site that is important to our evaluation. Written comments are addressed in Attachment 1 of this document. Names of individuals submitting the comments are not identified to safeguard privacy. Comments received on behalf of the settling parties were identified as such.

On the morning of August 3, 2004, ATSDR met with Elkhart County Health Department officials, Elkhart City Officials, St. Joseph County Health Department officials, Elkhart water company representatives. ATSDR presented the public health assessment findings and answered questions. ATSDR then conducted public availability sessions and a public meeting on the evening of August 3, 2004. Elkhart County Health Department assisted us with logistics for all meetings. ATSDR presented the public health assessment findings, and EPA presented an update on site clean up. Elkhart County Health Department, St. Joseph County Health Department, and EPA helped answer many questions at the public meeting. More information gathered during all meetings and public availability sessions is presented in Attachment 1, Response to Public Comments.

Site Description and History

Conrail Rail Yard is a 675-acre facility with local administrative offices at 2600 West Lusher Avenue. The site is about 1 mile southwest of Elkhart, Indiana. U.S. Route 33 is on the north side of the site. Nappanee Street runs along the east side. Mishawaka Road is on the south side of the site, and State Route 219 borders the west side (Figure 1). The rail yard began operating in 1956. Freight cars carrying a wide variety of materials are classified at the site and are switched to tracks leading to their destinations. It is the primary connection between the Chicago, Illinois, area and Norfolk Southern's northeastern rail system (URS 2000). It is the second largest classification yard in the country. The yard has 72 classification tracks. Each day, about 74 trains are processed. Rail cars are repaired and engines are cleaned at the facility. A diesel refueling station is a prominent feature of the site. The fuel tanks are visible from U.S. Route 33.

Although complaints about spills from the rail yard might have started earlier, the first documented complaints began in 1962. Most complaints were about oil spills polluting the St. Joseph River or Crawford Ditch. Over the years, Elkhart County Health Department and Indiana State Board of Health investigators also found evidence at the facility of a caustic soda solution leak, a hydrochloric acid spill, a grain alcohol spill, a hydrofluoric gas leak, and diesel fuel spills. In 1978, Elkhart County Health Department found that the facility was using an unlicensed waste hauler. Then, in 1986, Elkhart County Health Department received information from a confidential source that waste, including track cleaner, had been buried on the site. The

confidential source also stated that the drinking water had tasted bad for 10 years. St. Joseph County Health Department also received a report that engines and other equipment had been degreased at the site and that the waste had not been contained (e&e 1989).

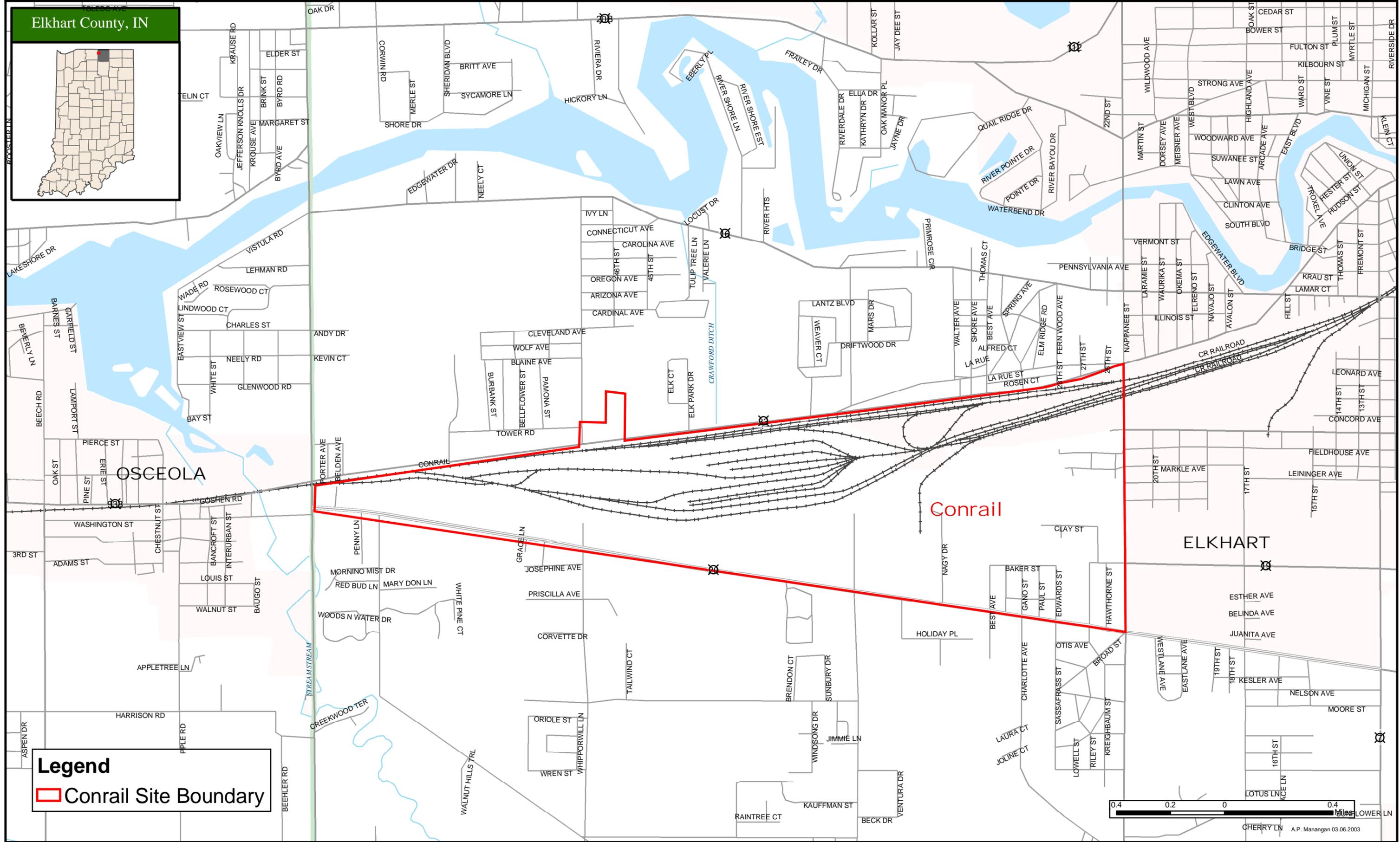
The Elkhart County Health Department tested the Conrail facility drinking water in 1986. Although small amounts of toluene and xylenes were found in the water, the levels were below those found to cause harm. Then, when a resident of the County Road 1 area complained about the bad taste of his well water, Elkhart County Health Department found levels of TCE and CCl₄ in the water that were much higher than the maximum contaminant levels allowed in public water supplies. Elkhart County Health Department immediately requested that EPA confirm their findings and provide help. In June 1986, EPA collected and analyzed water from two private wells. One of those wells contained 800 parts per billion (ppb) of TCE and 485 ppb of CCl₄. The other well contained 75.6 ppb TCE and 26.5 ppb CCl₄. The Maximum Contaminant Levels² (MCLs) for both of those compounds was 5 ppb. EPA started an emergency action that included testing more private wells in the area and providing safe water for those whose wells were contaminated. Limited data are available for 598 private wells in the area affected by the site. Well water samples were collected from areas designated as the County Road 1 area, the Vistula Avenue area, and the Charles Avenue area. Data are reported primarily for TCE and CCl₄ for those wells. From the LaRue Street area, data include information on TCE, CCl₄, trichloroethane, dichloroethane, and dichloroethylene (e&e 1989). Details are discussed in the Environmental Data section.

- EPA's investigations of the site contamination showed that contaminated groundwater extends into two specific areas. The contaminated area northwest of the site includes the County Road 1 area, the Vistula Avenue area, and the Charles Avenue area. The contaminated area north of the site is called the LaRue Street area (Figure 2). The contamination affects people living in part of Baugo Township in Elkhart County and a small part of Penn Township in St. Joseph County (Figure 3).

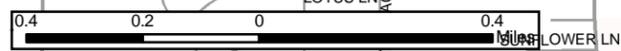
² The maximum contaminant level is the amount of a contaminant that is allowed in a public water supply.

Site Area and Containment Plumes - Conrail Railyard Site, Elkhart, In

Elkhart, Indiana

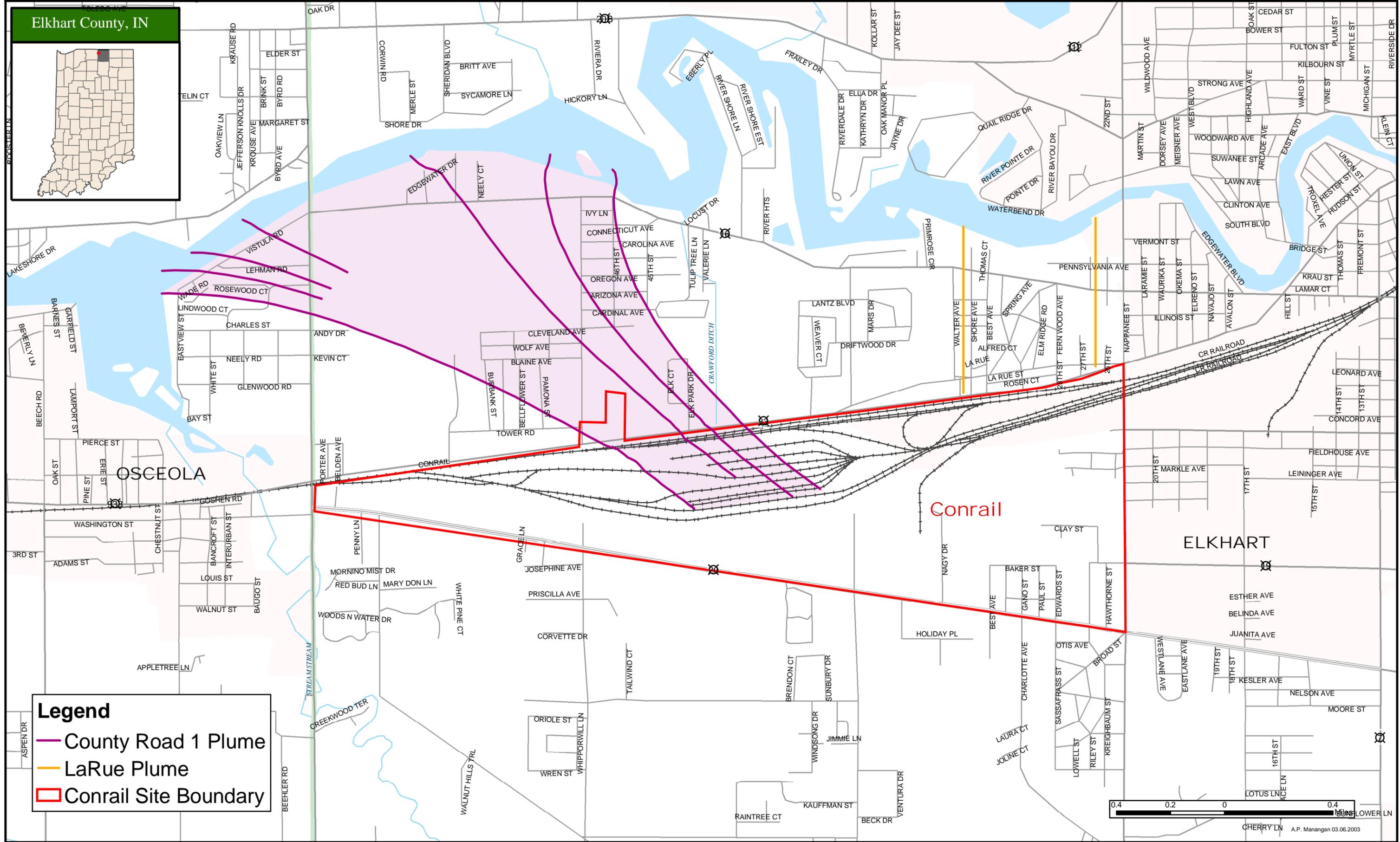


Legend
[Red Outline] Conrail Site Boundary



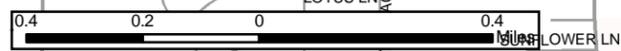
Site Area and Containment Plumes - Conrail Railyard Site, Elkhart, In

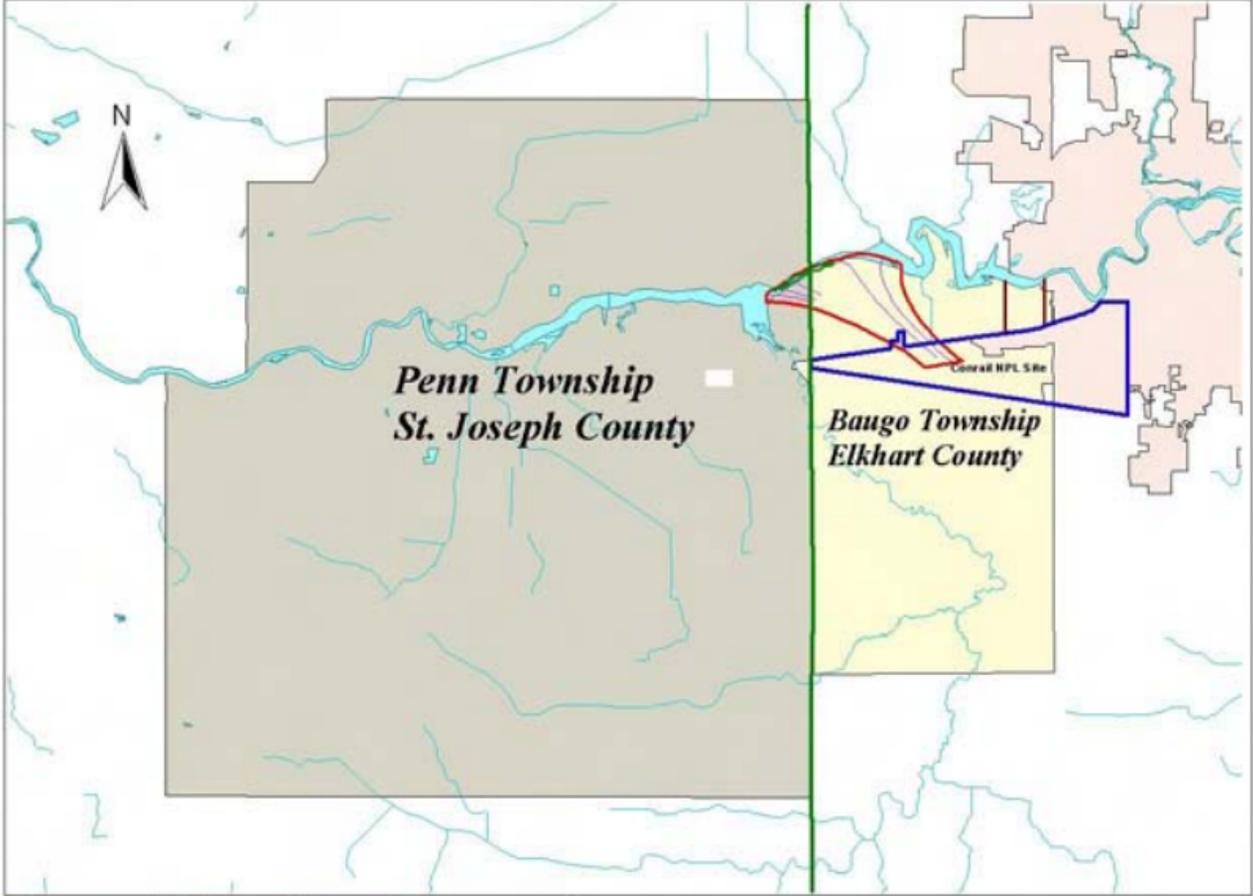
Elkhart, Indiana



Legend

- County Road 1 Plume
- LaRue Plume
- Conrail Site Boundary





**Penn and Baugo Townships
Conrail Railyard Site
Elkhart, Indiana**



Census information is readily available for people living in Baugo Township and in Penn Township, but those areas include many more people than were actually exposed to contaminants from the site. A summary of the population data is in Appendix 3. Some relevant information about residents of the two townships includes the following facts:

- Most people in both townships are white, although the African American and Hispanic populations are increasing. The fact that most people who were exposed to contamination were white is important because that helps guide us on appropriate comparison populations when conducting health outcome data evaluations.
- Since 1970, the older population, people 65 years and older, has increased in number and in percentage of the population for both townships. The median age of residents has also increased. These facts support what the community has told us about the area's stability and that people have remained in the area over time.
- Both townships have about the same percentage of children younger than 5 years, although the percentage of children in this age group has decreased over the last 30 years. This, again, might indicate that the population has remained fairly stable over the years when contamination was found in private well water as supported by information from community members.
- A smaller percentage of women of childbearing age live in Penn Township as compared to Baugo Township. If a mother used contaminated water during her pregnancy, then we would want to know whether the child had any birth defects or problems that might have occurred.
- Over 75% of the people 25 years and older in both townships have a minimum of a high school education. This suggests that the majority of people living in these communities are able to understand the implications of their exposure and how to avoid exposure.
- The average number of persons living in a household in 1970 was about 3.5 in Baugo Township and about 3.1 in Penn Township. Because those were the years that exposure most likely occurred, and more of the exposed population lived in Baugo Township, we used 4 people per household in estimating our exposed population. The number of people per household dropped to about 2.7 in 2000 for Baugo Township and to about 2.5 in Penn Township. The numbers suggest that the population in the area was following state trends. The overall state trend for the number of people per household declined from 3.2 people in 1970 to 2.6 people in 2000.

Members of the ATSDR public health assessment team have visited the area three times. The latest visit was in October 2003. Elkhart County Health Department took ATSDR and ISDH representatives on a tour of the affected neighborhoods. The tour helped confirm much of the information gathered from the census data. Most homes were moderate in size and well-kept. A few large homes were along the riverfront. Some small homes needed repair. Unkempt homes sometimes suggest the home is owned by an absentee landlord who might not provide tenants with private well water information. If the homes are rented, then new occupants are less likely to get important information on avoiding exposure. Financially stressed people might cut expenses by using unsafe well water to avoid costs of using a public water supply. Extension of

public water lines has stimulated developers to build within the contaminated area, thereby using land once used for agriculture (Community Assessment 2002).

We saw affected businesses along U.S. Route 33 and the large diesel fuel tanks on the Conrail property. We looked at Ferrethie/Baugo Creek County Park off Ash Road where some investigation has been conducted in response to a report that the area might have been used as a dump. To the east of Ash Road, we saw Osceola Drag Strip where CCl₄ has been found in soil gas as high as 4,700 parts per billion by volume (ppbv). The high levels of CCl₄ were found northwest of an old airplane hanger. As we toured areas west of Ash Road where CCl₄ and lesser amounts of TCE were found in indoor air, the terrain suggested that the CCl₄ at the drag strip could be contributing to the indoor air problem. Because of that, EPA and Conrail are addressing the drag strip contamination in their remedial action plan.

We saw many of the vapor extraction systems that had been placed in homes where CCl₄ vapors had been measured in indoor air at levels above 3.0 ppbv. Because of the vapor intrusion problems, Elkhart County now requires all new construction in the area to include vapor extraction systems. However, Elkhart County Health Department has learned that building inspectors need more information on the importance of enforcing the new plat restriction. We toured a new residential development. We saw no evidence that vapor mitigation systems were built into the homes. The homes reportedly do not have the systems that are required by the new building restriction, and we do not know if construction plans called for the systems. If the required vapor extraction systems were installed, the possibility of exposure to harmful levels of vapors entering the home from the groundwater plume would be eliminated. This issue was a concern at both the meeting with local officials and at the public meeting. ATSDR stressed that enforcement of the restriction was a sound and prudent public health practice. ATSDR also stressed to community members the usefulness of having a system installed in their homes and businesses if they were over the groundwater plume.

When we saw the homes in Elkhart County that were along the St. Joseph River, we could see that the terrain was higher. That might be a reason why vapors have not been detected in those homes. On the other hand, new construction, especially of underground utility lines, could put homes and businesses currently unaffected by underground vapors at risk.

We toured the LaRue Street area that has been affected by Conrail and possibly other sources of contamination. The levels of contaminants found there have not been as high as the contaminant levels found in the County Road 1 area, but EPA found the levels were high enough to warrant providing safe, alternative water to residents. When the contamination of both the County Road 1 area and the LaRue Street area was found in 1986, the Indiana Department of Environmental Management (IDEM) provided bottled water to those people whose well water was affected. Then 20 point-of-use filters and 56 whole-house filters were installed. IDEM maintained the filters until Conrail made arrangements to maintain them in 1992 (e&e 1994). Now most people in the affected area are either using public water or are in the process of getting public water to their homes and business. Two property owners have refused the offer for the free connection, and some property owners bought their homes after the original owners declined connection to

the public water supply (Communication with EPA 2003 and public meeting 2004). The exact number of people still using private well water is unknown.

Elkhart County Health Department representatives have some concerns about people continuing to use public water. Some of the people are paying what they feel is a lot of money for the public water. The health department is concerned that some people might not be able to afford the water bill and might install new wells in the contaminant plume. (ATSDR emphasized how important it is for people in the affected communities to have affordable access to safe water when we met with local officials in 2004.) As we toured the area, we looked for any signs that someone might have resumed using private well water. Because of the different ways and places wells can be installed, it is almost impossible to recognize one from the road. One way someone would know whether that has happened would be if someone noticed a sudden decline in public water use. That sort of information is not reported, and many other factors could contribute to a decline in water use.

We saw the former Harley Holben Elementary School—now Jimtown School—as we traveled along County Road 16. Elkhart County Health Department representatives said the school's well was tested and never contained contaminants. Now the school uses the public water supply. Indoor air was tested at the school. No chemicals were found that might cause harm to the children or school staff. ATSDR had met with community members in 2001 at the school. About 70 people attended that meeting. Elkhart County Health Department helped CLEAN arrange the meeting and establish the agenda. St. Joseph County Health Department and ISDH representatives also participated in the meeting.

At the 2001 meeting in the school, ATSDR presented information about the public health assessment process. We discussed what kinds of questions could be answered through the process and that the public health assessment was necessary before we could determine whether any other follow-up health studies would be considered. Community members asked questions about the TCE subregistry. Community members told ATSDR that the subregistry did not help all of them because the subregistry did not address exposure to CCl₄ and that only health conditions of those people included in the subregistry were tracked. Community members wanted to know what their exposure to CCl₄ meant to their health. They wanted to know what they should expect if they were exposed to both TCE and CCl₄. Some of the community members were concerned about the vapors found in indoor air of some of the homes and wanted to know what that exposure meant to them.

At that 2001 meeting, Elkhart County Health Department and CLEAN proposed conducting a community health survey. They asked whether the people at the meeting would be willing to participate in the survey. They explained this would be a good way to provide health concerns to ISDH and ATSDR and participate in the public health assessment process. Questions were answered about how ISDH and ATSDR would handle any information sent to them, especially in regard to confidentiality. ATSDR told the audience about our privacy policy. The community members voted to participate in the survey. In addition to having volunteers from the St. Joseph County nursing staff, some members of the community also volunteered to help administer the survey. The community agreed on the contents of the questionnaire. A copy of the

questionnaire and a summary of the results are presented in Appendix 4. About 760 residents and former residents participated in the survey. CLEAN was successful in demonstrating the high level of concern about health issues still remaining in the community and providing ATSDR with critical information to help guide our public health assessment activities. Moreover, CLEAN, Elkhart County Health Department, and St. Joseph County Health Department successfully fulfilled their commitment to take this action. ATSDR provided a summary of the information obtained in the questionnaires to the community that August and has focused much of the information in this document on the information obtained from those questionnaires.

CLEAN members expressed concern about the effects exposure to the contaminated drinking water might have had on babies born to mothers who used the contaminated water. ISDH volunteered to gather birth certificate data for zip codes 46561 and 46516 for the years 1967–1995 as one of the actions it would take to help find answers to the community’s questions. ISDH completed gathering the data set in 2002. ATSDR did an exploratory evaluation of birth certificates that ISDH provided. The results are presented in the Health Issues section.

ATSDR agreed to see if information could be gathered from the TCE Subregistry specific to the exposures of Conrail community members included on the subregistry. ATSDR also agreed to gather private well water data and get a current map of the plume that described where people were exposed to contaminants. Figure 2 shows the map where TCE and CCl₄ were found in the neighborhoods. The data are described in the Environmental Contamination section, and exposure to the contaminants is evaluated in the Health Implications of Exposure section. CLEAN members also were concerned about liver disease, cancer, and other health problems. These health concerns are addressed in the Health Issues section.

From these discussions, CLEAN said they felt it was important for local health care providers to have better information about health effects that might occur from their exposure and know more about the contaminants. CLEAN also said they wanted community members to know more about the site and about the possible health effects from exposure. They were concerned that people moving into the area might not be aware of contamination and could put their health at risk. ATSDR, ISDH, and Elkhart County Health Department agreed to provide health education for health care providers and for community members.

The health education plan was developed following the CLEAN community-based health survey conducted in 2001. The results of the survey and concerns expressed during both the CLEAN 2000 meeting and the 2001 public meeting provided the basis for CLEAN and the local health department to develop educational materials, two of which include the CD ROM presentation and the brochure entitled *Conrail Superfund Site, Elkhart County, Indiana*, that are in Appendix 2. The health education materials were used during several presentations to local physicians and local community members. ATSDR, ISDH, Elkhart County Health Department, and CLEAN collaborated in the implementation of the May 2002 physician training. The report regarding all the work performed with the NACCHO funds is also presented in Appendix 2.

The goal of continuing health education is to provide information and training about how to reduce exposure to environmental hazards. By reducing exposure, people can also reduce their

risk of developing illnesses as a result of exposure. The projected health education action plan for Conrail is to maintain collaboration with Elkhart and St. Joseph County Health Departments if there are additional health education needs. CLEAN disbanded after it reported the summary of survey data in its last newsletter. However, the Conrail Superfund Community Advisory Group, called CAG, was formed to assist the Elkhart County Health Department in developing actions conducted with NACCHO grant money. The last meeting with CAG was in April 2002, but any future health education needs will include collaboration with CAG representatives.

The first conclusion statement within the report generated by Elkhart County Health Department documenting their work with NACCHO funds summarizes the community status at this time:

“This community is worn down. The fight has been going on for so long that some residents have died and most have lost interest. Those that helped with the Assessment project are truly heroes. Most have lost their concern for themselves and are relegated to the fact that they were exposed for several years and what happens, happens. They all have stories about friends who have died from cancer or other illness they attribute to the ongoing contamination, in some cases for 40 years. Designation as a Superfund Site gave them hope, but that has waned as year after year goes by and site cleanup continues to be delayed. Some now understand the difficulty in trying to clean up the site given the extent of the contamination plumes but wish something would be done. They are hopeful that something will still be done but really are most concerned that no one else be exposed to the contaminants and that the community not forget that the site is contaminated.”

The report also contains recommendations for EPA, Indiana state agencies, and ATSDR. The recommendations include that EPA and Indiana state agencies reassess the role of the community and local health departments when working with these sites. They recommend that EPA and ATSDR take the concerns of residents seriously at the beginning of a project and not years later. They recommend that early encouragement of community input will facilitate better relations and support of EPA.

Regulatory History and Current Cleanup Plans

After the 1986 discovery of the private well contamination, regulatory authorities began site investigations through the Superfund process. EPA and IDEM responded to the Elkhart County Health Department’s findings by providing safe water to affected residents and by starting site investigations. After the private well contamination was found in 1986, initial site investigations and the site hazard ranking were completed, and safe drinking water was provided to those affected by contamination, the Conrail site was proposed in 1988 for the National Priorities List, the list of the most polluted sites in the nation (e&e 1994).

At that point, EPA regulation and cleanup followed the Superfund process (Appendix 5). Decisions were made on how to address the site and were documented in a 1991 interim remedial action and record of decision. In that action, approximately 500 residences and businesses had to be connected to city water, and the County Road 1 plume was to be contained

through a groundwater extraction and treatment system. The extraction and treatment was to include a series of wells that would pump contaminated groundwater. The treatment system

would take the volatile compounds out of the water, and then the treated water was to be released to Crawford Ditch or the St. Joseph River (Declaration for the Record of Decision 1994).

The 1994 record of decision fully addressed the groundwater contamination. The Elkhart municipal water lines were to be extended to an additional 700 residences and businesses, thereby providing a permanent and safe water supply. The remedy description also included taking actions to clean up the contaminated aquifer and cleaning contaminated soils in the areas where groundwater contaminant sources had been identified (ROD 1994). In 1995, the 500 residences and businesses identified in the interim remedial action and record of decision were connected to the Elkhart municipal water supply. From 1996 to 1997, the additional 700 residences and businesses identified in the 1994 record of decision were also connected to the Elkhart municipal water supply.

Conrail covered the cost of connecting residences and businesses to the public water. Individuals are now responsible for paying their water bill, though (ECHD 2004). Between January 1998 and September 2000, the first remedial design and remedial action was approved. As described in that remedial design, the following activities were accomplished:

- site source areas were investigated,
- the Osceola Drag Strip was investigated,
- vapor intrusion was investigated and vapor mitigation systems were installed in some buildings northwest of the drag strip, and
- a St. Joseph River ecological assessment of macroinvertebrates (primarily water insects) was completed.

The vapor intrusion investigation showed that people were being exposed to contaminants evaporating from groundwater and entering their indoor air. Installation of the vapor mitigation systems stopped that exposure. The macroinvertebrate study of the St. Joseph River provided information on the water quality of the river, but it did not provide information on any human exposures (URS 2000).

Regulatory Highlights	
1962-1986	Elkhart County Health Department and Indiana State Board of Health investigate numerous complaints about spills and issue citations.
1986	Elkhart County Health Department requests EPA's assistance to address contaminated wells.
1986	EPA and IDEM provide safe water to affected residents. Site investigations begin.
1988	Conrail is proposed to the National Priorities List.
1991	An interim remedial action is approved to provide city water to about 500 buildings.
1994	A record of decision is signed for the final site remedy.
2000	EPA approves a waiver to modify the original record of decision. A new remedial design was submitted.
2004	New recirculating wells are scheduled for installation to better contain site contamination.

With the second remedial design proposal developed upon approval of a request to modify the original record of decision on site cleanup, EPA is allowing a newer technology, hydraulic containment, of the TCE and CCl₄ source areas on the site. This newer technology allows groundwater to be pumped from the most contaminated part of the aquifer. The contaminants that are stripped from the water during containment on the site will be treated with a carbon filter before the vapor is released to the outdoor air. The system allows groundwater to be treated more than one time and avoids releasing the water to the surface (URS 2000). Construction on the wells is to begin in 2004 (Communication with EPA 2003). A monitoring program is proposed to see if the system is effective.

The second remedial design also includes further investigation of the Track 69 CCl₄ plume north of Old U.S. 33. The Osceola Drag Strip area is to be further investigated and cleaned up with either removal, treatment, or containment of the sources of contamination there (URS 2000). The LaRue Street area plume is to be addressed through natural attenuation. That means that natural biological and chemical activity will be allowed to decrease the contaminant levels over time.

Environmental Data

A summary of the environmental data findings is presented in the following text box. Details about environmental conditions at the time of exposure, including technical information about the types and levels of environmental samples, and current conditions are presented in the discussions following the text box.

- Private well water data and indoor air data provide the most information about how people were exposed to contamination from the Conrail site and the levels of exposure.
- Although other chemicals were found in some private wells, TCE and CCl₄ were the two chemicals found in well water at levels that could cause health effects.
- Although other chemicals were found in some of the indoor air samples, CCl₄ was the chemical found in indoor air at levels that could cause health effects.
- Recent data suggest that most people are now using safe water and homes and businesses that had unsafe levels of CCl₄ in indoor air are now vented.
- Some people in the Conrail area are still using private well water. We do not have current data for those wells to determine whether the water is safe to use.

Environmental Conditions at the Time of Exposure

When a resident had his well water tested in 1986 because the water tasted and smelled bad, Elkhart County Health Department notified authorities of the test results that showed his well water was contaminated. EPA sent a team to investigate the contaminated well on July 2, 1986. The team collected a water sample for testing. The water sample contained TCE at 800 ppb and

CCl₄ at 485 ppb. Because of that discovery, EPA began a groundwater investigation on July 17, 1986. EPA tested 88 residential wells during the initial investigation, and residents had 11 additional wells tested (e&e 1994; RI/FS).

IDEM provided bottled water for residents whose wells were affected. Additionally, 20 point-of-use activated carbon filter units (filters at the tap) and 56 whole-house filter units (filters that clean water to the entire house) were installed. IDEM maintained those filters until 1992 when Conrail became responsible for maintaining them (e&e 1994).

Conrail employees used on-site well water for drinking and hand washing. The water supply well was near the diesel fueling facilities and repair shop. Conrail well water samples collected in 1983 were primarily tested for oil and grease. In 1986, the main pump house well was tested for volatile organic compounds. Toluene and xylenes were found in the water, but they were not at levels that would cause harm. The well water did not contain TCE or CCl₄.

EPA began a Conrail site assessment in July and August 1986. Soil samples collected on the Conrail facility during that investigation contained TCE at a maximum of 5,850 ppb and CCl₄ at a maximum of 117 ppb. Also at that time, a private development company that wanted to build houses in the Charles Avenue area decided to test area groundwater before development. The company had six monitoring wells installed. The shallow wells that were less than 30 feet deep did not contain contamination; however, wells that collected water from deeper than 110 feet were all contaminated. TCE was found in those monitoring wells at a maximum of 2,495 ppb, and CCl₄ was found at a maximum of 388 ppb (e&e 1994).

EPA then arranged for a Conrail site remedial investigation to characterize the contamination and a feasibility study to address contamination clean-up alternatives. The firm ecology and environment, inc. [sic], conducted the investigation of the site for EPA. Phase I of the investigation included soil gas sampling, groundwater monitoring, an evaluation of the analytical results, and suggestions for interim remedial alternatives. In response to the findings from the phase I study, EPA screened and evaluated different alternatives for interim remedial actions outlined in a record of decision. The objectives of the interim action included providing a safe water supply for the affected residents and preventing exposure to contaminated groundwater. EPA signed the record of decision in June 1991 (e&e 1994).

The firm ecology and environment, inc., began phase II of the Conrail investigation in July 1991 and submitted a report to EPA in July 1992. Phase II included lead screen auger sampling to help determine the vertical extent of the contamination in the groundwater so that monitoring wells could be installed and screened at appropriate depths. Phase II of the investigation also included on-site soil sampling, groundwater monitoring and sampling, and investigation of aquifer characteristics that helped investigators determine the horizontal extent of the groundwater contamination.

Three groundwater zones were tested to determine their general direction of flow from the site. The shallow zone extends from the water table to 35 feet below ground surface. The intermediate zone is from 35 to 85 feet below ground surface. The deep zone extends from 85

feet below ground surface to the top of bedrock. All groundwater zones generally flow northwest from the site. The soil in the area is mostly sandy. Sandy soil promotes faster groundwater movement, both vertically and horizontally, than does clay soil. However, evaluation of tests from one shallow monitoring well on the site, MW43S, suggested that a groundwater mound was present. The mound suggested the presence of a clayey silt layer starting about 14–18 feet below the ground surface. Because of that, shallow groundwater flow in that area of the site might flow in other directions. That area was not well defined during phase II of the investigation.

Investigators also determined that groundwater in the LaRue Street area generally flows north rather than northwest and discharges into the St. Joseph River at a different location than the groundwater that flows northwest. The mean horizontal flow velocity from the site was 200 feet per year (e&e 1994). That suggests that nearby residential wells could have been contaminated within the first year after the groundwater on the site became contaminated. We assume that by at least 1980, and likely earlier, the contamination had reached all private wells that were later found contaminated.

As a result of that part of the investigation, Conrail agreed to provide resources to extend the Elkhart city water supply lines to affected residences and businesses within the defined plume boundaries. The company also agreed to abandon (permanently close) private wells as residences and businesses were connected to the public water supply. Until the water lines were available, Conrail agreed to provide bottled water and maintain filters at affected residences and businesses. Conrail further agreed to design, construct, and maintain a groundwater treatment system, commonly called a pump-and-treat system, and to ensure the integrity and safety of the treatment system and all off-site monitoring wells. The firm ecology and environment, inc., then began the phase III investigation in late November 1992 and completed it in February 1993 (e&e 1994).

Lead screen auger samples were again collected for this phase of the investigation to provide information on the best depths to screen monitoring wells. The samples also provided information on the locations and extent of on-site source areas—the areas on the site where the contaminants were spilled and remained in the soil or groundwater. The investigation also included collection and analysis of more soil samples, installation of additional monitoring wells and monitoring well sampling, site drainage network sampling, and on and off-site surface water and sediment sampling (e&e 1994).

Private Well Sampling Results

In January 1986, a confidential source told the Elkhart County Health Department that the facility's drinking water had tasted bad for the last 10 years (e&e draft work plan, 1989). When EPA conducted the site evaluation, or hazard ranking, in 1986 to determine whether Conrail should be included on the National Priorities List, the Conrail employees' drinking water well was tested for volatile organic compounds. Toluene was found in the main pump house well at

10 ppb, and total xylenes were found at 5.1 ppb. Those levels were below comparison values³. ATSDR uses comparison values to select contaminants for further exposure evaluation. Levels present below comparison levels are considered safe to drink, although ATSDR recognizes that any contamination of drinking water supplies is undesirable. A note on the laboratory reporting sheet stated that the “pump house had just been painted.” Although toluene and xylene are components of gasoline and diesel fuel, they are commonly found in paint and paint thinners (Groundwater Technology 1988).

Then an off-site private well was tested on July 2, 1986. The results of that testing showed that TCE and CCl₄ were present at levels 100 times or more of the MCLs for public water supplies. In response, the EPA Technical Assistance Team initiated an area sampling program on July 17, 1986. The Technical Assistance Team collected 88 well water samples, including some duplicates, from homes and businesses in the area, and 11 individual home owners provided results of well water tests conducted independently. Most water samples were tested for dichloroethylene, CCl₄, TCE, and tetrachloroethylene. Technical Assistance Team samples were also tested for chloroform, but the samples from independent tests were analyzed for 1,1,1-trichloroethane rather than chloroform. One independently tested water sample was analyzed for TCE and CCl₄ only (Weston-Sper 1986).

No contaminants were found in 32 of the 99 private wells tested. The highest level of dichloroethylene found in the well water was 60 ppb, which is above the EPA MCL of 7 ppb. The highest level of CCl₄ found at that time in private well water was 6,860 ppb. That level was well above the cancer risk evaluation guide of 0.3 ppb and the EPA MCL of 5 ppb. The highest level of TCE was 4,870 ppb, well above the EPA MCL of 5 ppb. The highest level of tetrachloroethylene was 2.4 ppb, which is below the EPA maximum contaminant level of 5 ppb and below other comparison values. The highest level of chloroform was 0.8 ppb, which was well below all comparison values. The presence of chloroform, however, is important because it suggested that CCl₄ in that area could have started breaking down into other compounds. The highest level of 1,1,1-trichloroethane found in the independently run samples was 19 ppb, which is below all comparison values (Weston-Sper 1986). Table 1 summarizes the data.

³ Comparison values are levels of a contaminant in a specific environmental medium, such as groundwater, considered safe. If a contaminant exceeds a comparison value, further evaluation is conducted with regard to human exposure to determine if the contaminant level is high enough to possibly harm someone’s health upon exposure.

Table 1. County Road Area 1 Private Well Water Test Results, 1986 Technical Assistance Team and Independent Sampling¹

Contaminant	# of Well Water Samples Containing the Contaminant	Range of Concentrations Detected (ppb)	General Location of the Maximum Levels Found	MCL (ppb)	Number of Samples With Levels Above the MCL	Comparison Value (ppb)
Dichloroethylene	9 out of 93 tested	ND-60	Burbank Area	7	4	6.0 LTHA ²
Carbon Tetrachloride	47 out of 94 tested	ND-6,860	Tower Area	5	37	0.3 CREG ²
Trichloroethylene	53 out of 95 tested	ND-4,870	U.S. 33 Area	5	41	5.0 MCL
Tetrachloroethylene	12 out of 94 tested	ND-2.4	County Road 1 Area	5	0	5.0 MCL ²
Chloroform	1 out of 84 tested	ND-0.8	Tower Area	80	0	70 LTHA
1,1,1-Trichloroethane	2 out of 9 tested	ND-19	County Road 17 Area	200	0	200 MCL

ppb = parts per billion

¹Data are from the 1986 Weston-Sper site assessment for Conrail Rail Yard. Although the text states that 11 home owners submitted independently tested well water results, only 10 of those results are presented in the tables. Where duplicate samples were collected, the analytical results were similar. Duplicate samples results were not counted because no discrepancies were found.

²LTHA = Lifetime Health Advisory
 CREG = Cancer Risk Evaluation Guide
 MCL = Maximum Contaminant Level

Information on 64 private wells was found for the LaRue Street area. Data are reported for TCE, CCl₄, trichloroethane, dichloroethane, and dichloroethylene. The samples were reported in the January 1989 draft remedial investigation and feasibility study work plan submitted by ecology and environment. How the samples were collected and by whom is not clear in that document; however, the text indicates the samples were collected in 1986. Only one sample per well was reported. No information was provided on the forms of dichloroethane, dichloroethylene, and trichloroethane reported; therefore, for a conservative public health approach, the more toxic forms are assumed to have been present. The highest level of TCE was found in a private well on U.S. Route 33. The level was 300 ppb. The highest level of CCl₄, found in a different well on U.S. Route 33, was 150 ppb. The LaRue Street area data are summarized in Table 2 (e&e 1989).

Table 2. LaRue Street Private Well Water Test Results, 1986*

Contaminant	# of Well Water Samples Containing the Contaminant	Range of Concentrations Detected (ppb)	General Location of the Maximum Levels Found	MCL ¹ (ppb)	Number of Samples With Levels Above the MCL	Comparison Value (ppb)
Carbon Tetrachloride	5 out of 64 tested	ND–150	U.S. Route 33	5	3	0.3 CREG ²
Dichloroethane	1 out of 64 tested	ND–17.5	Upper Parkway	5	1	0.4 CREG
Dichloroethylene	6 out of 64 tested	ND–67	U.S. Route 33	7	1	6.0 LTHA ³
Trichloroethane	24 out of 64 tested	ND–201	West Franklin	5	8	0.6 CREG
Trichloroethylene	43 out of 64 tested	ND–300	U.S. Route 33	5	15	5.0 MCL

ppb = parts per billion

*Data from ecology and environment, 1989

¹MCL = Maximum Contaminant Level

²CREG = Cancer Risk Evaluation Guide

³LTHA = Lifetime Health Advisory

The preliminary evaluation report of the phase I portion of the remedial investigation provides two tables of private well water sampling results collected between third quarter 1986 and third quarter 1989. Samples appear to have been tested for TCE and CCl₄ only. Some samples were collected using an EPA method that requires samples to be filtered; other samples were collected as unfiltered. Only unfiltered sample results were considered for public health evaluation because people drank unfiltered water. The filters used for sample collection were not the water purification filters installed on home and business water supplies to prevent exposure.

While some private well water samples collected contained no contamination, TCE was found at levels as high as 7,350 ppb and CCl₄ at levels as high as 27,500 ppb (e&e April 1990). For phase II of the remedial investigation, a total of 63 private well water samples contained TCE and CCl₄. Of those, 32 well water samples contained levels above the 10-day health advisory of 128 ppb for TCE and 12 ppb for CCl₄ (e&e 1994).

In February 1989, EPA collected 13 residential well water samples, and Compu Chem, a certified laboratory, analyzed the samples for semivolatile organic compounds. No semivolatile organic compounds were found in those samples at levels above comparison values (EPA data acceptance sheet and laboratory results, 1989).

For most sampling rounds, different wells were tested. Some private wells were tested only once. That means that we do not know: (1) whether private wells that contained the highest levels of contaminants were actually tested; (2) how many people were exposed to TCE and CCl₄, TCE

alone, or CCl₄ alone; and (3) exact levels in water that individuals used. Those factors make evaluating any trends in the well water difficult.

EPA provided ATSDR with some compiled private well water data analyzed from 1986 through 1995, though only TCE and CCl₄ test results were reported. The data were presented in a format that captured results for 521 wells that were tested once and more than once. That allowed ATSDR to look at concentration trends over time. Wells that previously contained no contamination appeared to remain TCE and CCl₄ free. TCE levels appeared to remain fairly constant, at the same order magnitude of contamination. Some fluctuations were noted, as expected, because of varying groundwater conditions during different seasons and years. For example, the well that contained the maximum TCE level of 7,350 ppb in 1988 still contained 2,600 ppb in 1993. For the most part, similar trends were seen with the CCl₄ contamination.

One notable exception was in the well that contained 27,500 ppb CCl₄ in 1988. The next highest level in that well was in 1987, when the level was 12,000 ppb. From 1988 through 1995, levels in that well were at the same order of magnitude, between 2,800 ppb and 4,880 ppb. One explanation might be degradation of CCl₄ in that area. Chloroform is a compound that can form when CCl₄ begins to break into other chemicals that can be detected in well water samples. That degradation process usually occurs as a result of natural processes such as microbes using some of the compound for energy. Because chloroform and other break-down products of CCl₄ were found in the groundwater plume, ATSDR cannot be sure of the cause of the decreased level in that well. The change could be attributed to biodegradation, a wave of higher concentrations moving through the plume for a short period, an incorrectly recorded analytical result, or a laboratory error.

The highest levels of TCE were found along County Road 1; the highest levels of CCl₄ were found along Tower Road. Some residential well sampling continued through 2000, but the wells were not necessarily the same wells that had been tested previously. By 1996, most private wells that were highly contaminated had been abandoned and were no longer tested. Low levels of TCE were found in some private wells that were still being monitored from 1996 to 2000, but no CCl₄ was found in those wells.

Table 3 summarizes all data found for contaminated private wells. Not all private wells were tested. Of the data found for 598 private wells, 340 wells contained no contaminants. However, many of those were tested only one time. Of the 258 wells that contained contamination, 77 contained TCE only, 12 contained CCl₄ only, 152 contained both TCE and CCl₄, and 13 wells contained other volatile organic compounds at levels below comparison values. Figures 4 and 5 show the areas where private well water was tested and the ranges of concentrations of trichloroethylene and carbon tetrachloride present in those areas (e&e 1994).

Table 3. All Available Private Well Water Test Results

Concentrations (ppb)	Number of Wells with TCE Only	Number of Wells with CCl ₄ Only	Number of Wells with Both TCE and CCl ₄		TCE and CCl ₄ Levels Added for Wells Containing Both Contaminants	Comparison Value (ppb)	
			TCE	CCl ₄		TCE	CCl ₄
>30,000	0	0	0	0	0	5.0 ²	0.3 ³
>10,000	0	0	0	1	1	5.0	0.3
>3,000	0	0	2	6	7	5.0	0.3
>1,000	3	0	2	14	17	5.0	0.3
>300	3	0	5	20	29	5.0	0.3
>100	4	0	27	37	49	5.0	0.3
>30	15	2	65	46	72	5.0	0.3
>5	26	5	81	73	87	5.0	0.3
<5	65	7	68	80	65	5.0	0.3

> = greater than

< = less than

ppb = parts per billion

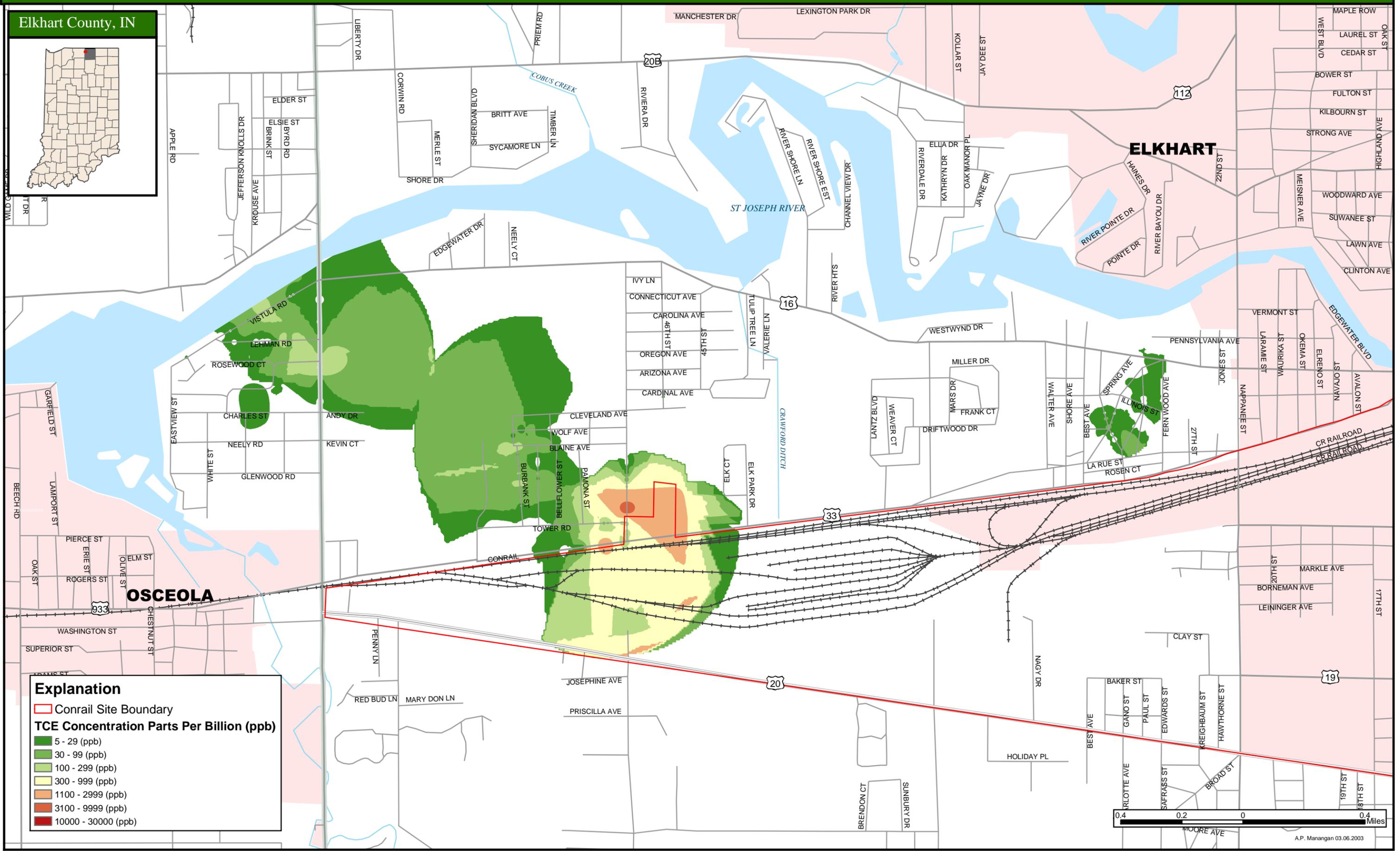
¹ Data sources include ecology & environment, April 1990; EPA compiled list, September 4, 1996; Weston Sper, October 1986; and ecology & environment, July 1989. Different wells were tested at different times. Some wells were tested only one time.

²Maximum Contaminant Level

³Cancer Risk Evaluation Guide

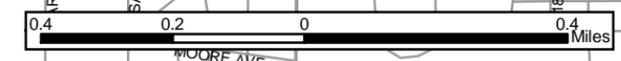
Number of wells are cumulative. The one home that had levels of TCE greater than 3,000 ppb also had levels greater than 1,000 ppb.

Elkhart County, IN



Explanation

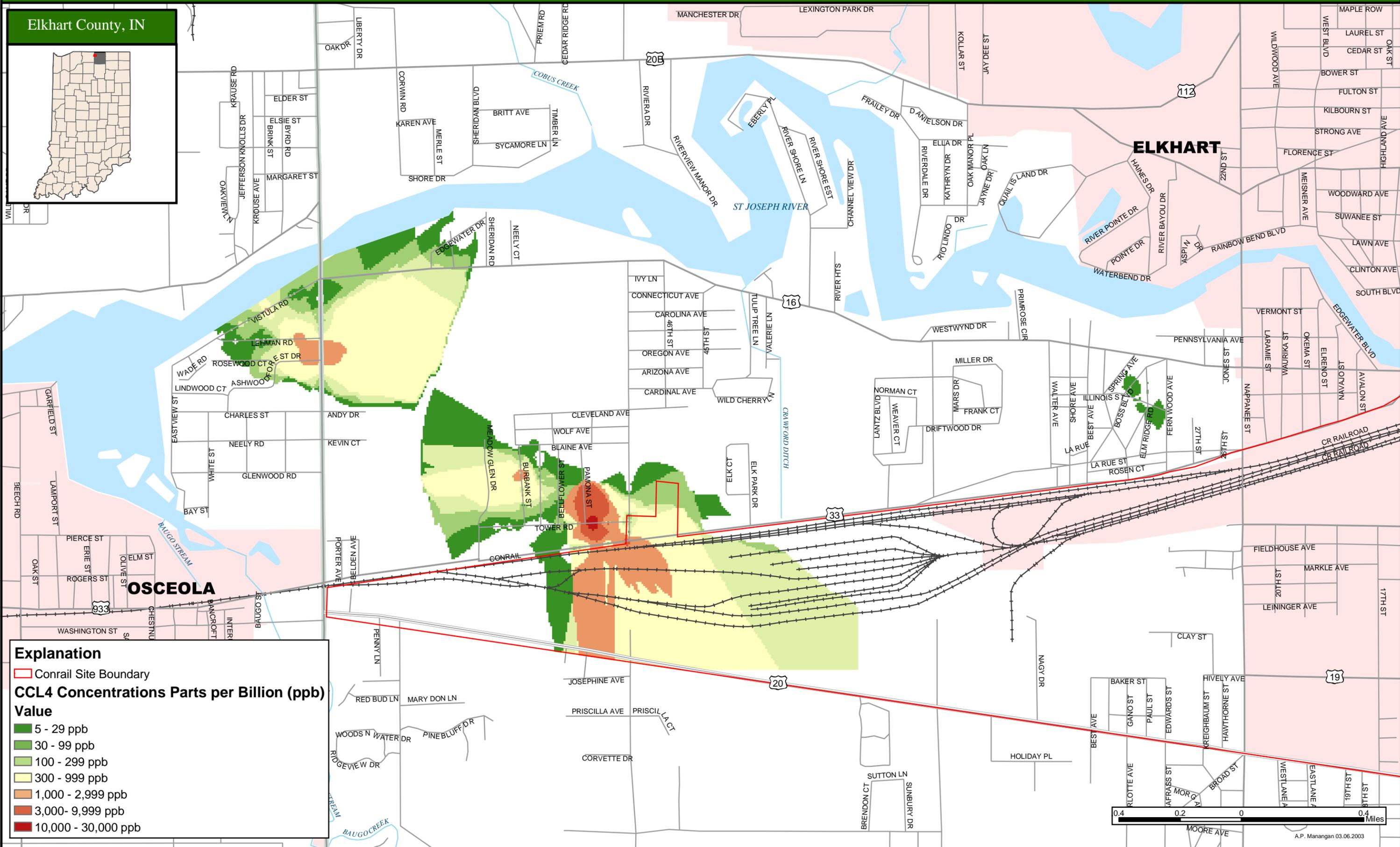
- Conrail Site Boundary
- TCE Concentration Parts Per Billion (ppb)**
- 5 - 29 (ppb)
- 30 - 99 (ppb)
- 100 - 299 (ppb)
- 300 - 999 (ppb)
- 1100 - 2999 (ppb)
- 3100 - 9999 (ppb)
- 10000 - 30000 (ppb)



Conrail Site Carbon Tetrachloride Concentrations

Elkhart, Indiana

Elkhart County, IN



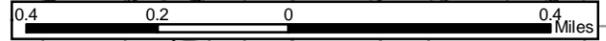
Explanation

□ Conrail Site Boundary

CCL4 Concentrations Parts per Billion (ppb)

Value

- 5 - 29 ppb
- 30 - 99 ppb
- 100 - 299 ppb
- 300 - 999 ppb
- 1,000 - 2,999 ppb
- 3,000 - 9,999 ppb
- 10,000 - 30,000 ppb



Monitoring Well Sampling Results

Monitoring wells help EPA define the horizontal and vertical extent of contamination. Although the data from monitoring wells do not provide direct information on the levels of contamination present in drinking water, the data help us evaluate where the contamination is and who might be exposed. In the absence of drinking water data, monitoring well data can also be used to define levels of contamination that people might contact if private wells are in use. For the Conrail site area, we have actual drinking water data to help evaluate exposure. However, the monitoring well data help us understand areas where well water might have been affected and what might happen in the future. For those reasons, relevant site monitoring well data were examined.

Lead screen auger samples were used to determine where to install phase II and phase III monitoring wells. Details of the lead screen auger sampling and results are described in ecology and environment's remedial investigation report of March 1994. As a result of the lead screen auger tests, monitoring wells were installed to supplement or replace monitoring wells used to test groundwater before conducting the remedial investigation. In ecology and environment's 1994 remedial investigation report, information is provided on monitoring well construction so that the quality of the monitoring wells and depths of the water screened, or collected, for each well can be evaluated. Sampling methods used were EPA-approved. For phase II of the investigation, 31 phase I and 32 phase II wells were sampled. Samples were analyzed for volatile organic compounds, semivolatile organic compounds, and metals.

Chloroform, CCl₄, tetrachloroethylene (PCE), and TCE were all present in monitoring well water at levels above comparison values. Cadmium, a metal, was also present at a level above the comparison value; however, the level was low and found in only one sample on site. Because it was not found in other monitoring wells, especially in neighborhoods where groundwater was used as a drinking water supply, cadmium was not listed as a contaminant for further evaluation. The compounds 1,1,2-trichloroethane and 1,1-dichloroethane were present at very low levels in one sample from two different monitoring wells.

The laboratory quantitative limit used for all volatile organic compounds was 10 ppb for the phase II samples (e&e 1994). That level is acceptable for screening purposes; however, some of the volatile organic compound comparison values are much lower than the laboratory detection limit. For instance, the MCL, the highest amount allowed in a public water supply, for vinyl chloride is 2 ppb. Some compounds might have been present in samples but not detected. Also, the levels of contaminants recorded below 10 ppb might not be as reliable as those recorded above 10 ppb. Table 4 provides information on chemicals found above ATSDR comparison values. Other contaminants were found in the monitoring well samples; however, levels were below comparison values. Figure 6 provides information on where samples were collected and how the contamination was distributed throughout the site and affected neighborhoods.

Table 4: Results of Phase II Monitoring Well Sampling (e&e 1994)

Contaminant	Range of Concentrations (ppb)	Location of Maximum Concentration	Detection Frequency¹	Comparison Value² (ppb)
Carbon tetrachloride (CCl ₄)	2.0–1,900	MW38D-1	16/63	0.3 (CREG)
Chloroform	2.0–120	MW38D-1	13/63	70 (LTHA)
Tetrachloroethylene (PCE)	6.0–7.0	MW34D-1	3/63	5.0 (MCL)
Trichloroethylene (TCE)	2.0–11,000	MW41-1	25/63	5.0 (MCL)

ppb = parts per billion

¹Detection frequency refers to the number of samples found that contain the contaminant/the total number of samples that were analyzed for that contaminant.

²CREG = Cancer Risk Evaluation Guide

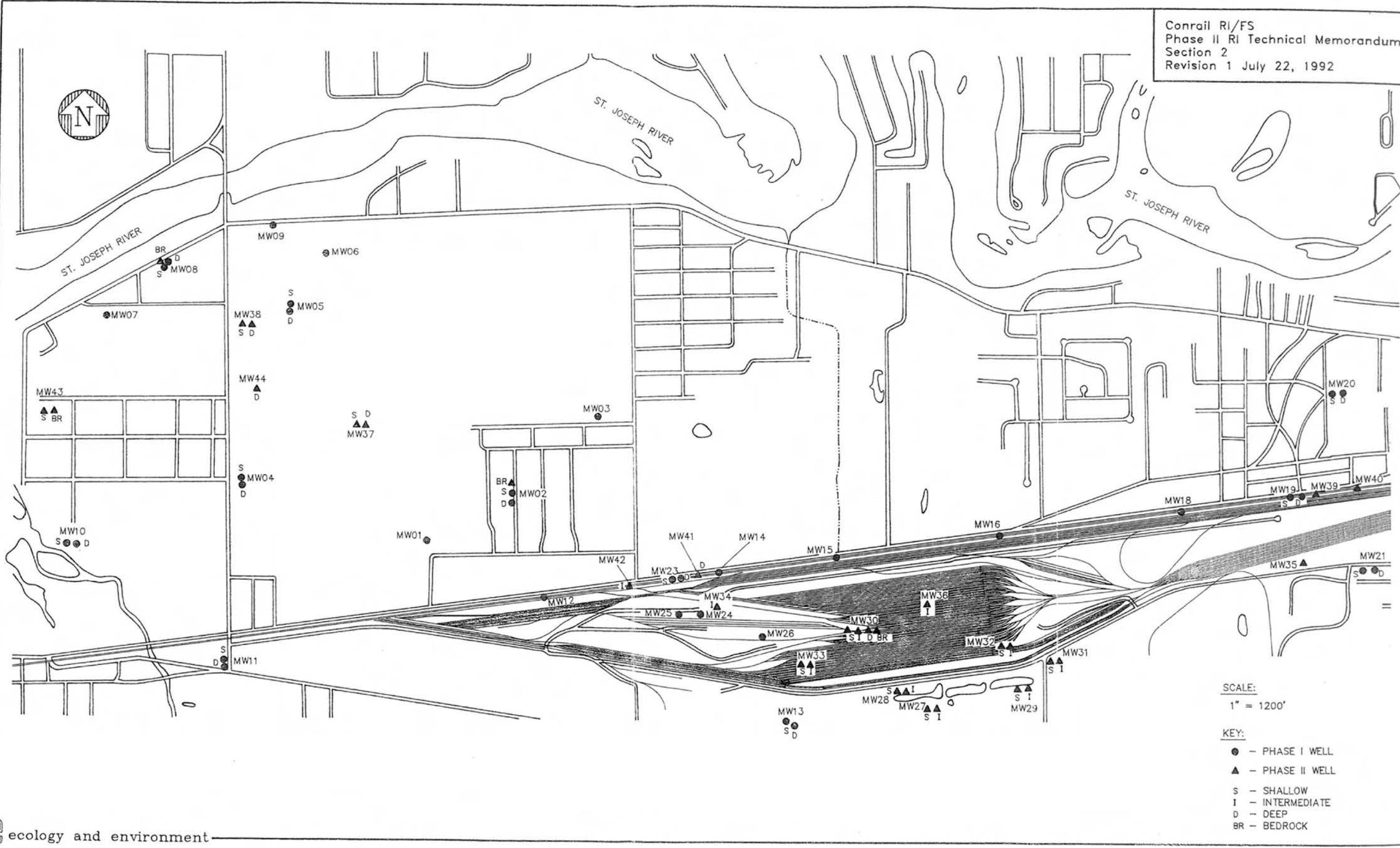
LTHA = Lifetime Health Advisory

MCL = Maximum Contaminant Level

The fact that chloroform was found in 13 of 63 samples suggested CCl₄ was degrading. On the other hand, TCE degradation products, such as vinyl chloride, were minimal or lacking. That suggested that TCE was not degrading to a measurable extent at the time the phase II sampling was done. Tetrachloroethylene levels and locations found suggested that the compound was on the site at low levels, and it was not moving from the site into neighborhood drinking water wells (e&e 1994).

From January 5–12, 1993, 10 new monitoring wells were installed as part of phase III of the remedial investigation. For phase III, 67 phase I and II wells were sampled from November 16–19, 1992. The 10 phase III wells were sampled from January 26–27, 1993. Duplicate samples were collected and field blanks prepared for at least every 10 groundwater samples collected. Trip blanks were prepared and transported by the sampling team. All samples, including trip and field blanks, were shipped with samples to one of two laboratories.

Since 1994, the investigation has continued. Figure 7 shows the results of monitoring well data as of June 2000. That figure also shows the proposed locations for new monitoring wells, MW-52, MW-53, and MW-54 (URS 2000).



ecology and environment

Figure 6 PHASE I AND II MONITORING WELL LOCATIONS MAP

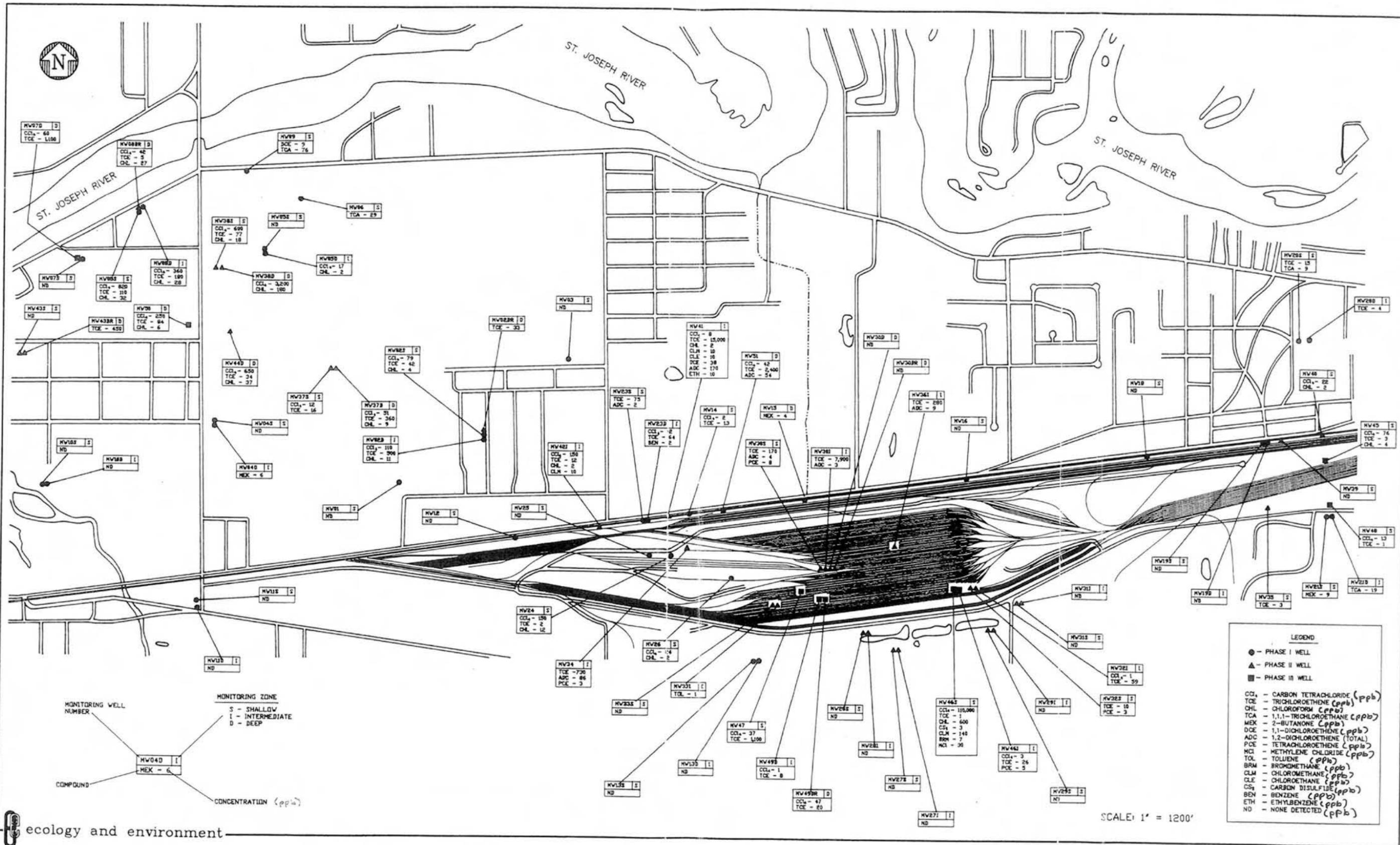


Figure 7
 CONRAIL SITE
 MONITORING WELL
 LOCATIONS AND
 GROUNDWATER RESULTS

Soil Sampling Results

For phase II of the remedial investigation, soil samples were collected from the site at locations identified through lead screen auger tests as possible contaminant source areas. Although on-site soil sampling was used to help identify the source areas and the extent of contamination on the site, samples might also provide some information about levels of contaminants employees might have contacted if they had worked in the areas tested. Because the primary contaminants of concern included the volatile organic compounds TCE and CCl₄, most of the contamination had evaporated from surface and near-surface soil or moved into the groundwater soon after major spills. Little of the historical levels were left in the soil. All samples collected were at depths of two feet or more. People would not contact soil at those depths. Employees would be expected to only contact about the first 3 inches of soil unless they were digging holes. We do not have information on levels of contaminants that might have been present in the first few inches of soil at the time spills occurred; therefore, we cannot further evaluate employee exposure to contaminated soil. None of the contaminants found in deeper soils collected and analyzed during investigations were at levels that warrant further evaluation (e&e 1994).

The soil samples, however, were useful in defining various contaminant source areas on the site. Source areas were found at the track 69 area at the eastern end of the classification yard and at the track 65 and 66 area at the western end of the classification yard. Sample results, followed by monitoring well results, suggested that a dense, non-aqueous phase layer (DNAPL) of CCl₄ was present at the track 69 area. A TCE DNAPL was tentatively identified at the track 65 and 66 area. The presence of the DNAPL means that a layer of product exists that has not blended with the groundwater. The DNAPL represents a source that will continue to contribute to groundwater contamination. Also, DNAPL is very difficult to eliminate through use of conventional technologies. For those reasons, these areas are addressed differently for the proposed second remedial action. EPA granted a waiver for the two source areas, thereby allowing the DNAPL source areas to go untreated. Realistically, the contamination that has migrated into the community will likely remain there until it naturally degrades, although some biological treatment might help degrade the CCl₄ a little more quickly (Communication with EPA 2003). The second remedial action calls for a hydraulic containment system that is designed to contain the contamination and not allow more contaminant migration from the site (URS 2000). EPA is also hopeful that by preventing further contamination off site, that levels already in communities will decrease much more quickly than if the off site groundwater continues to be contaminated.

Three subsurface soil sample locations at the receiving yard contained low levels of CCl₄, which suggested that an area of the receiving yard might be contributing to groundwater contamination found in the LaRue Street area north of the site (e&e, 1994). The LaRue Street area plume, which does include the track 69 and track 65 and 66 areas, is to be addressed through natural attenuation (URS 2000).

Surface Water and Sediment Sampling Results

As part of the remedial investigation, surface water and sediment samples were collected from the drainage ditch network that discharges into Crawford Creek north of the site, from Baugo Bay, from the St. Joseph River, and from three retention ponds on the Conrail site that are south of the identified on-site source areas. All drainage network samples were analyzed for volatile organic compounds. Baugo Bay samples were analyzed for volatile organic compounds, semivolatile organic compounds, pesticides, polycyclic biphenals (PCBs), and inorganic chemicals. One surface water sample, SW16, was not analyzed for pesticides and PCBs. Three surface water and three sediment samples were also collected from Baugo Bay at an area upstream of the groundwater discharge points. Those samples were used to determine what chemicals were present in the bay naturally or from sources other than the Conrail site. The other surface water and sediment samples were tested for the same chemicals as the Baugo Bay samples (e&e 1994).

No TCE or CCl₄ were found in sediment or surface water samples collected from the drainage network system tested during phase III of the remedial investigation. However, benzene, toluene, ethylbenzene, and xylenes, all components of gasoline and diesel fuel, were found in samples collected at a location immediately upstream of the secondary oil and water separator. Acetone and methylene chloride were also found in those samples; however, the levels found suggested those compounds were likely present as a result of laboratory contamination (e&e 1994). The areas that contained contamination are on or very close to the site where people are not likely to contact contaminants. People responsible for the upkeep of the oil and water separator could contact the contaminants if they do not protect themselves when maintaining it, but any contact would be infrequent. Infrequent contact is not expected to be harmful. For those reasons, the contamination in the drainage network system is not further evaluated.

The three background Baugo Bay surface water samples were collected from Baugo Creek, upstream of its discharge point to Baugo Bay. No contaminants were found at levels above comparison values. Likewise, the three sediment samples collected from Baugo Creek did not contain any contaminants at levels above comparison values. Baugo Bay surface water samples did not contain contaminants at levels above comparison values. Baugo Bay sediment samples contained some polycyclic aromatic hydrocarbons (PAHs) that are commonly found in soils and sediments (e&e 1994 and ATSDR 1995). PAHs are by-products of wood burning and other natural and man-made processes. The PAHs were not unusual and not site-related. Some general information about skin contact with PAHs is provided in Appendix 6. One Baugo Bay sediment sample contained Aroclor-1254, a PCB. It was found in only one of five samples at a level of 130 ppb. Occasional contact with that level of Arochlor-1254 is not likely to be of health concern. The Arochlor-1254 is not site related. Some general information on PCBs, including Aroclor-1254, is also provided in Appendix 6.

No volatile organic compounds were found in any of the six surface water samples collected from the St. Joseph River upstream of the Crawford Ditch discharge point. However, a small amount, 35 ppb, of TCE was found in one of the eight surface water samples collected from the County Road 1 plume discharge area. Sediment samples collected from both areas contained

PAHs at low levels, some pesticides at low levels, and Aroclor-1254 at a similar level as Baugo Bay. Sediment samples from the County Road plume discharge area also contained low levels of TCE and CCl₄, both of which are site related. TCE was found in two of eight samples at a maximum of 100 parts per million (ppm), and CCl₄ was found in one of eight samples at a maximum of 67 ppm (e&e 1994). Occasional contact with those levels of TCE and CCl₄ is not likely to result in adverse health effects; therefore, contact with sediments in the St. Joseph River is not evaluated further.

The retention ponds are on the southern side of the site, south of the source areas. Neither the pond sediments nor the surface water were expected to contain contaminants associated with the TCE and CCl₄ source areas. Nothing was present at levels of concern, and no one is expected to have contact with the water in the ponds or the sediment (e&e 1994). For those reasons, the pond water and sediments are not further evaluated.

Vapor Intrusion from Soil Gas

When volatile organic compounds are present in groundwater, then vapors are often present in the spaces between soil particles. This is called soil gas. The contaminants present in soil gas can move through the soil and into buildings. Soil gas often prefers to move through areas where soil has been disturbed and where openings are large, such as where underground utilities have been installed or where pipes are inserted into the ground. For that reason, soil gas often migrates through those preferred areas rather than, or in addition to, the direction that groundwater flows.

Soil vapor screenings were conducted during the 1986 site assessment to help determine contaminant source areas and where soil and water samples were to be collected. A soil gas survey was also conducted during the remedial investigation to help determine source areas. That survey included a limited number of tests conducted in the residential and industrial area north of the site. The survey was used to identify contaminant source areas and to determine areas where soil samples were to be collected (e&e, Phased Feasibility Study Report, 1991).

However, indoor air of homes and businesses located over the groundwater plume were not tested until February 1998 as part of the activities required under the 1994 record of decision. For the first sampling round, 15 homes were tested for TCE and CCl₄. TCE was present at levels below comparison values; therefore, the TCE in indoor air did not pose a health concern. At two homes, CCl₄ was found at levels above comparison values. Those homes were in the neighborhood bounded by Ash Road, Vistula Avenue, and Lehman Avenue. The findings prompted further sampling for CCl₄ in homes in that neighborhood. Nine homes were found that required remediation.

IDEM performed additional sampling at the extreme eastern end of the site in the area near Baugo/Ferretie Park. At least one house was included in the sampling that was outside the defined Conrail site boundaries. Samples, collected in Summa canisters, were analyzed by a certified laboratory. Although many compounds were present, CCl₄, benzene,

hexachlorobutadiene, acrylonitrile, and acrolein were the compounds present that exceeded comparison values.

In February 2000, IDEM again sampled the one house outside the defined Conrail plume home and one or two other houses outside the plume to confirm the previous findings. IDEM included collecting samples from outside the homes. IDEM found no CCl₄, and levels of the other contaminants were either not found or were much lower than in 1998 samples. Soil gas samples were collected in the area to determine whether another source was present. An old dump site east of the home was reportedly used from 1945 to the 1960s that might have been contributing to the contamination. The samples did not contain contaminants that confirmed the presence of another source (IDEM email, 2000). The home might have originally contained cleaning or other household products that influenced the results, or a preferential pathway, such as an underground utility line, might have existed that allowed vapors to enter the home. Conditions might have changed that influenced the direction of vapor flow. At this time, we know little about area underground conditions that influence vapor intrusion into buildings.

EPA used CCl₄ as the compound for deciding in which buildings to install vapor extraction systems. EPA used CCl₄ because it was the contaminant that easily could be linked to Conrail site contamination and was present at higher levels than TCE. Once vapor extraction systems were in place, then any contaminant that was present as a result of vapor intrusion was eliminated. Household and other chemicals stored in buildings might release TCE and other volatile organic compounds into the indoor air. Those kinds of vapors are not removed through the vapor extraction systems, which collect vapors from soil around the building. Table 5 shows levels of contaminants found during the investigation that exceeded comparison values.

Table 5. 1998 Indoor Air Sampling Results

Contaminant	# of Buildings Sampled	Range of Concentrations Detected (ppbv ¹)	Number of Samples With Levels Above the Comparison Value	Comparison Value (ppb)
Acrolein	2	10–13	2	5.0 EMEG ²
Acrylonitrile	2	2.1–2.2	2	0.06 CREG ³
Benzene	2	1.9–2.0	2	0.6 CREG
Carbon Tetrachloride	2	ND–3.5	1	0.3 CREG
Hexachlorobutadiene	2	ND–7.2	1	0.4 CREG

¹ppbv = parts per billion by volume

²EMEG = Environmental Media Evaluation Guide

³CREG = Cancer Risk Evaluation Guide

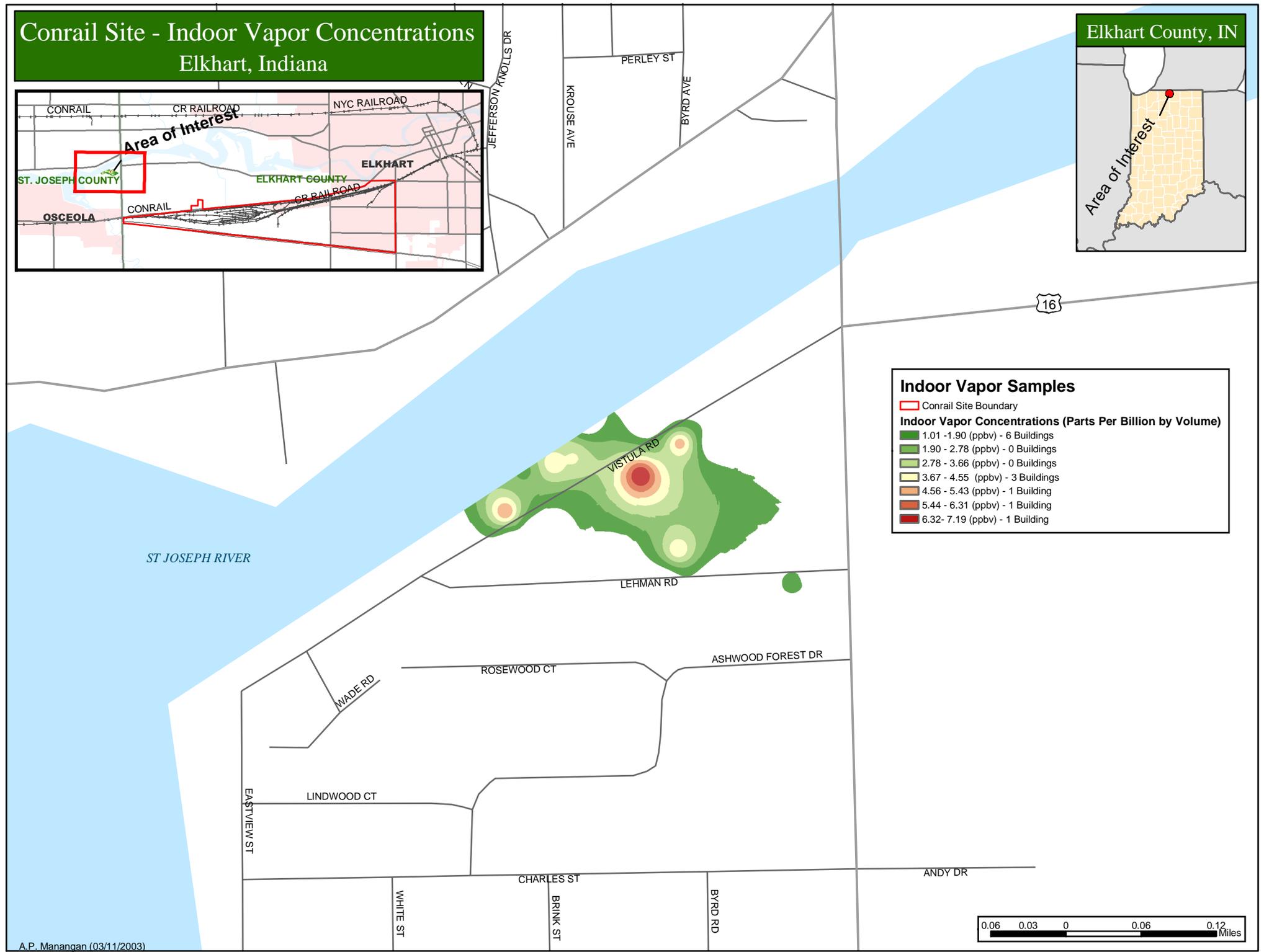
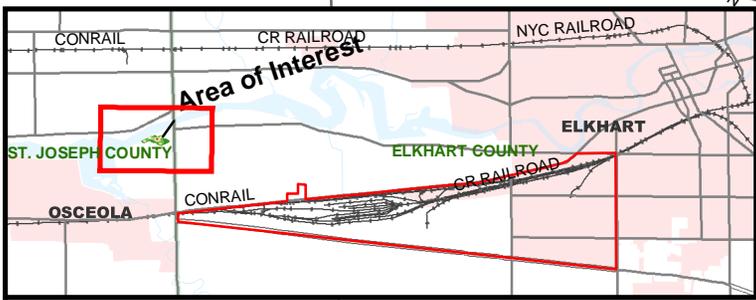
Figure 8 shows the CCl₄ results for the buildings tested (Dames and Moore 1999). The figure shows the area where 35 buildings were tested for CCl₄. Of those, 12 buildings contained CCl₄. The highest CCl₄ level was 7.2 parts per billion by volume. A number of buildings in the area were not sampled. Of the buildings sampled that contained CCl₄, one had no contamination in the drinking water well serving that location. Another building contained CCl₄ in the indoor air, but corresponding well water data were not found. All other buildings tested that contained CCl₄ in the indoor air also contained CCl₄ in the corresponding well water. Table 6 shows the levels of CCl₄ present in indoor air and the corresponding levels of contamination in the well water. There does not appear to be a correlation between the level of CCl₄ present in well water and the level found in the indoor air. Although the indoor air contaminant levels do not seem to correlate with groundwater levels, the contamination appears to follow a corridor from southeast to northwest. The pattern suggests that the contamination may be following some preferential pathway such as an underground utility.

EPA used 3.0 ppbv of CCl₄ as the action level for installing vapor extraction systems. ATSDR agreed that level was an appropriate action level for areas of buildings that were not occupied all the time. Those areas might include unfinished basements and workshops. ATSDR also stated that other buildings could be affected in the future (ATSDR Health Consultation 2000). Enforcing the new construction restriction in the affected area to include vapor extraction systems would prevent future exposure (Elkhart County Health Department 2003).

The highest levels of CCl₄ in indoor air were found in the Vistula Avenue area. That fact has led EPA to believe that the CCl₄ found at the drag strip off Ash Road is likely the source of the indoor air contamination. Samples taken from areas upgradient of the drag strip have not contained contaminants associated with the groundwater plumes from Conrail (Communication with EPA 2003). Figure 9 shows the CCl₄ soil gas sampling results taken at the drag strip (URS 2000).

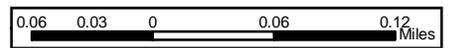
To date, the drag strip and Conrail are the only sources of contamination that have been found to explain indoor air findings in residences that were sampled, including the CCl₄ found once in the home that is considered outside the Conrail plume. Because of the soil gas results found at the drag strip area, the extent of contamination from the drag strip was further investigated during the second remedial action begun in 2004 (URS 2000).

Conrail Site - Indoor Vapor Concentrations Elkhart, Indiana



Indoor Vapor Samples

- Conrail Site Boundary
- 1.01 - 1.90 (ppbv) - 6 Buildings
- 1.90 - 2.78 (ppbv) - 0 Buildings
- 2.78 - 3.66 (ppbv) - 0 Buildings
- 3.67 - 4.55 (ppbv) - 3 Buildings
- 4.56 - 5.43 (ppbv) - 1 Building
- 5.44 - 6.31 (ppbv) - 1 Building
- 6.32 - 7.19 (ppbv) - 1 Building



ROUTE 219 (ASH ROAD)

APPROXIMATE PROPERTY LINE

DRAG STRIP AREA

⊕ MW-5

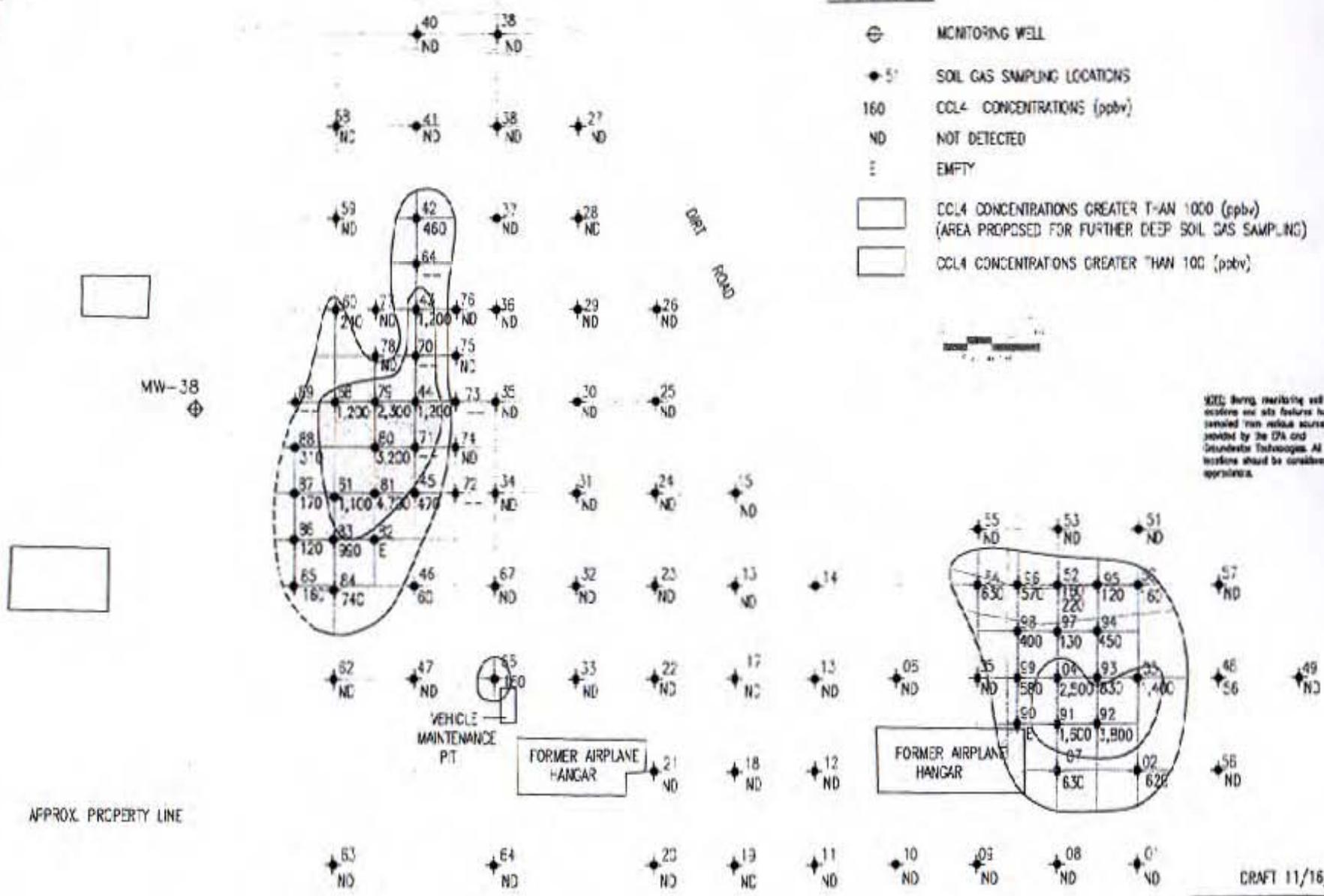


EXPLANATION

- ⊕ MONITORING WELL
- ◆ 5' SOIL GAS SAMPLING LOCATIONS
- 160 CCL4 CONCENTRATIONS (ppbv)
- ND NOT DETECTED
- ⋮ EMPTY
- CCL4 CONCENTRATIONS GREATER THAN 1000 (ppbv)
(AREA PROPOSED FOR FURTHER DEEP SOIL GAS SAMPLING)
- CCL4 CONCENTRATIONS GREATER THAN 100 (ppbv)



NOTE: Shallow monitoring well locations and site features have been provided from various sources provided by the EPA and Groundwater Technologies. All locations should be considered approximate.



APPROX. PROPERTY LINE

CRAFT 11/16/00

Figure 9 Soil Gas Concentrations at the Drag Strip



Table 6. 1999 Indoor Carbon Tetrachloride Air Levels and Corresponding Well Water Contaminant Levels

Building Number	CCl ₄ Level in Indoor Air (ppbv ¹)	CCl ₄ Concentration in Well Water (ppb)	TCE Concentration in Well Water (ppb)	CCl ₄ Comparison Value in Air (ppb)	Comparison Values in Drinking Water (ppb)	
					CCl ₄	TCE
1	ND	ND	ND	0.01 CREG	0.3 CREG	5.0 MCL
2	ND	70	77	0.01 CREG	0.3 CREG	5.0 MCL
3	ND	17	37	0.01 CREG	0.3 CREG	5.0 MCL
4	ND	83	260	0.01 CREG	0.3 CREG	5.0 MCL
5	ND	220	164	0.01 CREG	0.3 CREG	5.0 MCL
6	3.8	29	56	0.01 CREG	0.3 CREG	5.0 MCL
7	4.4	ND	ND	0.01 CREG	0.3 CREG	5.0 MCL
8	1.7	226	181	0.01 CREG	0.3 CREG	5.0 MCL
9	5.4	160	77	0.01 CREG	0.3 CREG	5.0 MCL
10	ND	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL
11	ND	ND	ND	0.01 CREG	0.3 CREG	5.0 MCL
12	ND	ND	ND	0.01 CREG	0.3 CREG	5.0 MCL
13	ND	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL
14	ND	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL
15	1.0	95	133	0.01 CREG	0.3 CREG	5.0 MCL
16	7.2	1,200	250	0.01 CREG	0.3 CREG	5.0 MCL
17	5.0	150	68	0.01 CREG	0.3 CREG	5.0 MCL
18	ND	73	97	0.01 CREG	0.3 CREG	5.0 MCL
19	ND	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL
20	ND	155	377	0.01 CREG	0.3 CREG	5.0 MCL
21	ND	3,400	105	0.01 CREG	0.3 CREG	5.0 MCL
22	1.0	1,100	67	0.01 CREG	0.3 CREG	5.0 MCL
23	ND	9.3	ND	0.01 CREG	0.3 CREG	5.0 MCL
24	ND	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL
25	1.0	1,700	185	0.01 CREG	0.3 CREG	5.0 MCL
26	0.9	22	5.7	0.01 CREG	0.3 CREG	5.0 MCL
27	ND	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL
28	ND	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL
29	ND	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL
30	1.1	1,800	150	0.01 CREG	0.3 CREG	5.0 MCL
31	ND	21	40	0.01 CREG	0.3 CREG	5.0 MCL
32	ND	ND	ND	0.01 CREG	0.3 CREG	5.0 MCL
33	ND	ND	ND	0.01 CREG	0.3 CREG	5.0 MCL
34	4.3	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL
35	ND	No Data	No Data	0.01 CREG	0.3 CREG	5.0 MCL

¹ppbv = parts per billion by volume
ppb = parts per billion
ND = Not detected
CREG = Cancer Risk Evaluation Guide
MCL = Maximum Contaminant Level

Food

No fruits, vegetables, or other edible plant materials growing in the area contaminated by the site have been tested. However, volatile compounds such as TCE and CCl₄ are not expected to accumulate in edible plants (ATSDR 1997 and 2003). For that reason, home-grown fruits and vegetables and native edible plants are expected to be safe to eat.

No fish data from Baugo Bay or the St. Joseph River were available for evaluation. However, the volatile organic compounds associated with the site are not expected to accumulate in fish tissue at levels that are of concern (ATSDR 1997 and 2003). On the other hand, non site-related contaminants, primarily Aroclor-1254, and some metals, primarily mercury, which were found at very low levels in the sediment, can accumulate in fish, other edible river animals, and water fowl at levels that could cause harm (ATSDR 1997 and 2003). Fish and other possibly affected food are not further evaluated because the contamination found in the water and sediment is not related to the Conrail site. A fish-consumption advisory has been issued for the river because of non site-related contamination. That advisory contains information the community can use to make decisions about eating food from the river. Because food is not expected to be affected by contaminants from Conrail, food consumption is not evaluated.

Current Environmental Conditions

Because the 1994 record of decision included requirements for a more comprehensive pump-and-treat system, EPA agreed to waive the pump-and-treat requirements of the original remediation decision. The current plan is to install containment wells on the rail yard to keep the contamination on the site. This means that the levels of contaminants that are in the groundwater under the impacted communities will likely remain the same for several decades, as determined by Conrail contractors. It will take that long for the contaminants to naturally degrade and flush from the groundwater. The CCl₄ might degrade more quickly with natural biological activity. Evidence of that includes the fact that some CCl₄ degradation products have been seen in groundwater monitoring wells. On the other hand, TCE does not appear to be degrading. When TCE degradation begins, however, some of the degradation products, vinyl chloride in particular, could be more toxic than the TCE.

In 2000, 35 property owners had refused to abandon their water wells and refused the opportunity to connect their property to the public water supply. In 2003, the EPA remedial project manager said he understood two people were still refusing to connect their properties to the public water supply. At the public availability sessions and public meeting held on August 3, 2004, ATSDR and EPA learned that a number of other private wells were still being used in the area either for irrigation or for whole house use. At least some of the wells still in use for drinking water purposes have filters. Some homeowners who had purchased those homes did not know who was maintaining the filter or what contaminant levels were before they bought the homes or what levels might be present now. Although many private wells did not contain contamination when they were tested, no one can guarantee those people their well water will remain contaminant free. For those people who use the public water supply, which is routinely monitored for contamination, exposure to the site-related compounds previously found in private well water has stopped.

Elkhart County Health Department is concerned that the high cost of monthly water bills might prompt a return to use of private well water for individuals who cannot afford the municipal water. If people discontinue using safe water, then they run the risk of exposing their families, and the families who occupy the property many generations into the future, to the contaminants in the groundwater.

In addition to exposure to contaminated drinking water, some people have also been exposed to vapors entering homes and businesses from the groundwater plume. New development offers opportunities for soil vapors to travel through excavated areas and contaminate buildings in other areas, both inside and outside the defined groundwater plume. Occupants of new buildings that are equipped with vapor extraction systems should not be at risk of exposure to those vapors. Likewise, occupants of existing buildings that were fitted with vapor extraction systems are not likely at risk of further exposure. Homes that were previously tested and found safe are likely to remain safe unless new development takes place nearby or new utility lines are run to their homes or businesses. Even then, the risk of vapors entering those buildings likely remains low, but the possibility exists. Vapor extraction systems are effective if people choose to incorporate them into their existing homes and businesses. An added benefit of the vapor extraction systems is that occupants are also protected against exposure to naturally occurring radon, which has been found in the area (Communication with Elkhart County Health Department 2003).

Site-related contaminant levels are expected to remain low in Baugo Bay and the St. Joseph River. Occasional contact with the water and sediment is not expected to cause harm. The site-related contaminants should not affect food. However, fish, waterfowl, and other edible animals from the bay and the river could contain contaminants from other sources. A fish advisory is available to guide people on amounts and types of fish that are safe to eat.

Discussion

When chemicals were released or spilled at the Conrail site, people started to come into contact with the chemicals. That contact is called a completed exposure pathway. People can come into contact with chemicals in the environment through eating or drinking the contaminant if it is in food or water, breathing the contaminant if it is in air, or touching the contaminant if it is in water, soil, air, or food. People came in contact with Conrail-related contaminants that were in their drinking water. People whose well water was contaminated also breathed contaminants that evaporated into the air when people showered and performed other household chores. People also touched the contaminants present in the well water when they bathed and washed their hands. CCl_4 vapors also seeped from the ground into some homes and businesses where people breathed the CCl_4 present in the indoor air. TCE was found at lower levels than CCl_4 in at least one home, but it was not found when the home was resampled. TCE is often present in buildings because many consumer products contain it. For that reason, it is often difficult to distinguish what amount might be from consumer products and what amount might be contributed from underground vapors.

ATSDR assumed people were exposed to CCl_4 in their drinking water within about a year of a reported tank car spill—from 1968 until safe water was provided, beginning in 1986. Indoor air

exposures continued until 1999, when vapor extraction systems were installed on homes and businesses following discovery of the vapor intrusion problem. Some community members estimated TCE exposures might have spanned 40 years. ATSDR assumed that exposure occurred for at least the 18 years that CCl₄ exposure is believed to have occurred.

Conrail employee exposures were different from those of residents and business owners and patrons. ATSDR assumed Conrail employees who were working in the area at the time of and shortly after the CCl₄ tank car spill breathed high levels of CCl₄ for a short period. They may have touched the CCl₄ if they tried to clean it up and were not protecting themselves. Those employees that worked in areas where TCE or other solvents were used breathed TCE vapors and touched TCE solutions while at work. The well water sample from the well that served Conrail employees did not contain volatile organic compounds at levels associated with harmful health effects. Therefore, the employees likely did not drink water or wash their hands in water that might have harmed them. The employee drinking water well was replaced with public water soon after contamination was found in on-site groundwater. The exact date the well was replaced is not known.

People who swim and boat in Baugo Bay and the St. Joseph River are not at risk of harm from the contaminants from the site. However,

contamination from other sources may be affecting fish and waterfowl. Therefore, people should understand and follow the fish consumption advisory that is posted for the river.

Exposure Pathways

Completed exposure pathways that are further evaluated are past use of contaminated drinking water and past exposure to vapors intruding into indoor air. People drank contaminated water, cooked with it, bathed in it, and cleaned with it. They also breathed vapors from the water, and some people also breathed vapors that entered their homes and businesses from the groundwater plume.

Potential exposures that are further evaluated include the possible use of contaminated groundwater as a drinking water supply, as irrigation for lawns and gardens, and to fill swimming pools. Additionally, potential exposure to vapors intruding into homes and businesses is further evaluated. The following table presents information on completed and potential exposure pathways.

Site Exposure Highlights
1986—Private well found contaminated and site investigation begins.
1986—IDEM provides bottled water and filters for affected residences.
1992—Conrail agrees to provide resources to extend city water lines to affected area.
1996—Elkhart city water lines extended and most residences are connected.
1998—Indoor air of some residences found to contain carbon tetrachloride.
1999—Residences have vapor extraction systems installed to prevent contamination of indoor air. New buildings are now required to have vapor extraction systems installed at the time of construction.
2003—Most, but not all, affected residences are connected to or are in the process of connection to the public water supply.

Table 7. Exposure Pathway Analysis for Contaminants from Conrail Rail Yard and Drag Strip

Pathway	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population	Exposure Activities	Chemicals of Concern	Completed Pathway
Residential drinking water use	Groundwater	Drinking water tap	Ingestion Inhalation Dermal	About 1,028 residents and business owners and patrons; potential current and future number is unknown	Drinking, cooking, bathing, showering, routine household chores requiring water use	TCE, CCl ₄	Yes (past); potential (current and future if using impacted well)
Residential water use	Groundwater	Point of water use (sprinkler, hose, outdoor spigot)	Inhalation Dermal	Unknown number of residents and business owners	Non-potable use of water (e.g., lawn and garden watering, filling pools)	TCE, CCl ₄	Potential (current and future if using impacted well)
Breathing vapors in indoor air	Indoor air	Interior space of residences	Inhalation	About 48 residents; potentially affected number exposed is unknown	Breathing in affected areas of homes and businesses	TCE, CCl ₄	Yes (past); potential current, and future for homes and businesses without vapor extraction systems
Contact with vapors at spill areas	Outdoor air	Air in spill area	Inhalation	Unknown number of employees	Breathing in spill areas	TCE, CCl ₄ , possible other chemicals at site	Potential past, current, and future
Contact with contaminated soil in spill areas	Surface and subsurface soil	Spill area where digging to clean contamination	Inhalation Dermal Ingestion	Unknown number of employees	Digging soil in spill area without using proper protective gear	TCE, CCl ₄ , possible other chemicals at site	Potential past, current, and future

To evaluate exposures, ATSDR makes assumptions about the exposed population. We generally base our assumptions on worst-case examples so that we make decisions that are protective for the most sensitive people in the exposed population. At Conrail, people were exposed to a wide range of contaminant levels. Some people who lived over the contaminated areas were not exposed to any contamination, while others were exposed to very high levels of both TCE and CCl₄.

Our Conrail exposure assumptions were:

- People were exposed to contaminants for a minimum of 18 years, which is chronic exposure.
- Both adults and children were exposed to the contamination.
- The most sensitive population exposed was the unborn child (fetus).
- People were exposed only to TCE and CCl₄ from the Conrail site. Anyone exposed to TCE or CCl₄ at work would have to include those exposures to determine their total exposure dose.

Magnitude of Exposure

We have data for 598 private wells. A total of 258 (43%) of the wells tested contained some contamination. Of those, 241 wells contained at least small amounts of TCE, CCl₄, or both compounds. Seventeen other wells contained trichlorethane or dichloroethylene at levels below comparison values. Many of the wells that did not contain contamination were tested only one time. We do not know whether contamination ever reached those wells while they were in use. Likewise, we do not know exactly when each well was abandoned or which one(s) might still be used. The levels of the contamination vary greatly, and whether a well was contaminated appears to depend more on the depth of the well rather than where it was located geographically. If an average of four people used each well, then 1,032 people were exposed to some level of contamination. Because we do not have data for all private wells that were used in the area, we believe this number of people is an underestimate of those actually exposed. The following table provides information on the number of people, figured on an average of four people using a contaminated well, who were exposed to contamination.

Table 8. Estimated Number of People Exposed to Different Concentrations of Trichloroethylene, Carbon Tetrachloride, or Both Contaminants Present in Well Water *

Concentration (ppb)	Number of People Estimated to Have Been Exposed to TCE Only	Number of People Estimated to Have Been Exposed to CCl ₄ Only	Number of People Estimated to Have Been Exposed to Both TCE and CCl ₄		Number of People Estimated to have Been Exposed to TCE and CCl ₄ (Levels Added)
			TCE	CCl ₄	
>30,000	0	0	0	0	0
>10,000	0	0	0	4	4
>3,000	0	0	8	24	28
>1,000	12	0	8	56	64
>300	12	0	20	80	116
>100	16	0	108	148	192
>30	60	4	260	184	288
>5	104	8	324	292	348
<5	260	32	272	320	260

> = greater than

< = less than

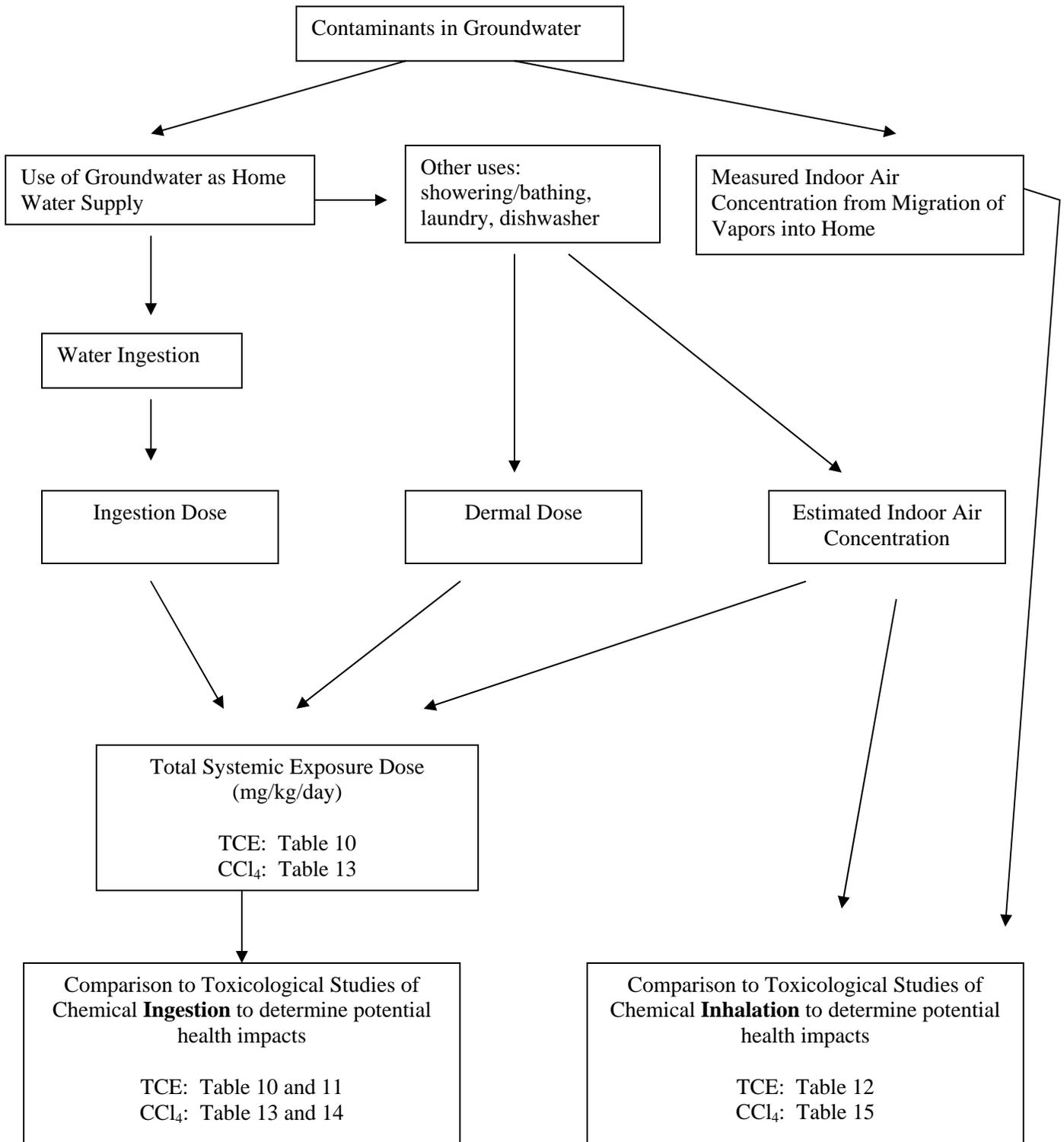
ppb = parts per billion

*The exposed population numbers are cumulative. That is, someone exposed to TCE at 1,000 parts per billion was also exposed to 300, 100, 30, and 5 parts per billion.

Of the 35 homes and buildings tested for CCl₄ in indoor air, 12 contained CCl₄. If we assume that four people were present in each of those buildings every day, then 48 people were exposed to CCl₄ in their indoor air. Well water data that were available for homes and businesses that were tested for indoor air contamination indicate that of those 48 people, a minimum of 40 were also exposed to CCl₄ in their well water. Four of the 48 people (or one building) had no contamination in their well water when the well was sampled. Another four people occupied a building where the well water was not tested.

To fully evaluate exposure, we consider all ways that people take contaminants into their bodies. The following flow chart describes how we approached the exposures that occurred in communities affected by contaminants from the Conrail site.

Figure 10: Evaluation of Multi-Pathway Exposure to Groundwater Contaminants



Health Implications of Exposure

Our findings about the health implications of exposure are summarized in the following box. Detailed technical information on how we arrived at these conclusions is presented after the summary. For those people wishing to know more about the technical aspects of our work, please refer to that discussion.

- Approximately 36 people used well water containing TCE at levels greater than 300 ppb. Those people were at risk of developing cancer, primarily leukemia or non-Hodgkins lymphoma. Some of those people (more than 20 people) used water containing TCE at 500 ppb or more. Those people were also at risk of having non-cancer health effects such as heart and respiratory effects.
- Approximately 80 people used well water containing CCl₄ at levels greater than 300 ppb. Those people were at greater risk of experiencing liver and kidney damage.
- TCE makes the toxicity of CCl₄ worse when someone is exposed to both chemicals at the same time. More than 600 people were exposed to both TCE and CCl₄ present in their well water.
- Of those people drinking water containing both chemicals, about 48 of them were using water with levels too low to likely cause them harm.
- Approximately 288 people were exposed to both TCE and CCl₄ in water where CCl₄ exceeded the drinking water standard of 5 ppb. Of those 288 people, approximately 136 people were at low risk of experiencing health effects, and approximately 152 people were at a greater risk of experiencing health effects. Those effects might be mild to severe liver damage, fluid in the lungs, kidney damage, and some neurological effects. A pregnant woman who used the contaminated water might have had a smaller baby than if exposure had not occurred.

Sources of information about chemical exposure

To help us better understand the possible health impacts contaminated drinking water had on the communities near Conrail, ATSDR evaluated several different information sources. ATSDR reviewed animal studies, worker studies of occupational exposure, and studies of residential exposure to environmental contamination. Each of these study types has strengths and weaknesses:

Animal exposure studies are generally conducted under controlled conditions, with a known concentration(s) of a specific chemical administered for a defined period. This allows us to observe the impact of the chemical concentration and the duration of exposure. Any resulting health effect can also be observed. The effect of that exposure on the development of cancer, the function of specific organ structures, and fetal

development can be observed in great detail. However, most animal exposure studies are conducted at a relatively high dose to enhance the likelihood of observing an effect. As a result, these studies are limited in their ability to predict health effects at low doses. The use of animal studies to predict effects in humans introduces a level of uncertainty because humans and experimental animals may differ in their sensitivity to a chemical. Whether humans are more sensitive or less sensitive to the effects of a specific chemical than experimental animals is not easily determined.

Occupational exposure studies have the unfortunate advantage that the effects of chemical exposure are being directly evaluated in humans, thereby reducing the uncertainty of relying on animal studies to predict health impacts. However, the results of these studies are complicated by the fact that the chemical concentrations that specific workers were exposed to are seldom known with certainty. There is also the confounding effect that most occupational environments are associated with exposure to multiple chemicals, complicating the determination that any observed health effect is the result of exposure to any one chemical. In addition, men fill most jobs in which chemical exposures occur, so effects on women and the developing fetus are difficult to determine from these studies. Unlike animal studies, where the pathologic effects of a chemical can be evaluated in detail, the effects of exposure on the health of workers are usually less precise and adverse effects might be missed. Occupational studies are usually retrospective and are often limited to severe effects such as those reported in death certificates.

Environmental exposure studies also have the advantage of evaluating human exposure, usually involving exposure levels that are well below those evaluated in animal and occupational exposure studies. However, these studies generally involve a relatively small number of people and use inherently insensitive epidemiological methods to correlate chemical exposure to a specific health effect. Although detailed environmental sampling is generally conducted to characterize current levels of exposure, the level of past exposure is usually only estimated. As with occupational studies, environmental exposure studies are complicated by the presence of multiple chemicals in the water or air. Because environmental exposure studies usually involve residential exposures, the impact on the elderly, women, children, and the developing fetus is more likely to be observed than for occupational studies.

Interpretation of Potential Health Effects from TCE Exposure

Summary of Exposure Estimates

The total estimated TCE exposure dose for individuals using well water as the sole source of drinking water and other uses such as showering and bathing is summarized in Table 9. The exposure doses are estimated for specific ranges of TCE concentration in water, from less than 5 ppb (the federal drinking water standard) to greater than 30,000 ppb. Exposure occurred through ingestion of the water, dermal contact during showering or bathing, and inhalation of TCE vapors released during water use. The total dose from all of these routes of exposure are added and compared to the doses in the toxicological studies that were reviewed. The specific effects,

based on animal studies, occupational studies, and residential exposure studies, associated with exposure to TCE through ingestion of contaminated water are also summarized in Table 9.

Comparison to Human Studies

The National Institutes of Health (NTP 2005) classified TCE to be ‘reasonably anticipated to be a human carcinogen’ based on limited evidence of carcinogenicity from studies in humans (7 studies) and from sufficient evidence of carcinogenicity from studies in experimental animals; there was evidence of cancerous and noncancerous tumors at multiple tissue sites. Most of the information about the effects of TCE in humans is based on studies of exposure to workers where TCE is used as a common solvent and degreasing agent. The National Institute for Occupational Safety and Health (NIOSH) considers TCE to be a potential occupational carcinogen. The International Agency for Research on Cancer classifies TCE as a probable human carcinogen. EPA characterizes TCE as likely to be carcinogenic to humans. The occupational studies have generally evaluated the effects of inhalation of high concentrations of TCE vapors, with evidence of associations with increased incidence of kidney cancer (Henschler, et. al. 1995) and non-Hodgkin’s lymphoma (Anttila, et al. 1995). Other studies have shown weaker associations with cancer risk (ATSDR 1997).

There is a much greater level of uncertainty about estimating the potential risk associated with exposure to low levels of TCE, particularly in the range of 30 ppb to 300 ppb.

There are several studies of communities where residents have been exposed to TCE in their municipal water supply. One study was initiated as an investigation of a cancer cluster study of childhood leukemia cases in Woburn, Massachusetts, in 1986. The area with the reported leukemia cases corresponded to a part of the city where TCE and other solvents had been detected in two of the eight municipal drinking water wells, dating to 1979. This study is of interest because the levels of TCE found in the Woburn wells (maximum TCE detection of 267 ppb) were within the range of concentrations detected in the private wells affected by Conrail. Results of the epidemiologic analysis of these cases identified a weak association between the potential for exposure to contaminated water during maternal pregnancy and leukemia diagnosis in the child. However, a child’s potential for exposure from birth to diagnosis showed no association with leukemia risk (Costas 2002).

Another study of the health effects of exposure to TCE-contaminated drinking water was conducted in New Jersey where 75 towns were evaluated from 1979–1987. Study investigators compared towns without detectable TCE in drinking water to towns with the highest TCE level (greater than 5 ppb) in their drinking water. The comparison revealed an increase in the incidence of total leukemia among females, particularly for acute lymphocytic leukemia in females under 20 years old. The study also noted an elevated incidence of chronic myelogenous leukemia among females, chronic lymphocytic leukemia among males and females, non-Hodgkins lymphoma (NHL) in females, diffuse large cell NHL in females and males, and non-Burkitt’s high-grade NHL among females and males. The results suggest a link between TCE and leukemia/NHL incidence. However, the conclusions are limited by lack of information about the long-term exposure levels to TCE and the confounding influence of other chemicals found in the drinking water (New Jersey, 2003). The levels of TCE found in the New Jersey

study are relatively low (maximum detection = 67 ppb) compared to the levels found in some private wells affected by the Conrail site.

Health effects other than cancer have also been examined. A study of people in Arizona exposed to TCE in their drinking water identified an association with congenital heart malformations (Goldberg, et al. 1990). This observation is consistent with the results of an animal study described in the next section (Dawson 1993).

Comparison to Animal Studies

The effects of TCE have been more extensively studied in experimental animals. TCE is associated with the development of liver and kidney tumors in animals, but only at relatively high doses. Heart defects have been detected in newborn rats that were exposed to TCE during embryo development (Dawson, et al. 1993; Johnson, et al. 1998; Johnson, et al., 2003). However, other animal studies have not demonstrated these effects (ATSDR 1997). In Table 10A, the total estimated exposure dose for ingestion, dermal, and inhalation routes for specific intervals of TCE concentrations in water. These levels are then compared to several health-based criteria based on studies of TCE ingestion, including the minimal risk level (MRL) and lowest observed adverse effect level (LOAEL) values for developmental (Johnson, et al., 2003), liver (Elcombe et al., 1985), and kidney effects (Berman et al., 1995). To include a comparison to studies that have evaluated the effects of TCE inhalation, Table 10B shows the comparison of the estimated indoor air concentrations that would result from evaporation and accumulation of TCE during bathing activities. These levels are compared to several health-based criteria from studies of TCE inhalation, including the acute and intermediate inhalation MRL and LOAEL values for immune (Aranyi et al., 1986), lung (Odum et al., 1992), and liver (Kjellstrand et al., 1983) effects. The purpose of these comparisons is to better define the levels of exposure where there is confidence that no adverse health effects occur.

The first step in this comparison is to determine the Hazard Quotient (HQ), which is the ratio of the estimated exposure dose in a population to the health-based comparison value, MRL. An HQ of less than 1.0 indicates that exposures at that level are not expected to cause non-cancerous adverse health effects. HQ values greater than 1.0 do not necessarily mean that health effects would occur, but that further evaluation is needed. The higher the HQ value, the greater the potential for health effects to occur.

When the HQ is greater than 1, then a comparison of the estimated exposure doses to the levels that have been found to cause specific, adverse health effects in animals and humans is helpful in further evaluating exposures. As the estimated exposure doses approach the LOAEL for different organ systems and endpoints the likelihood of specific adverse effects increases. The most sensitive effects of TCE exposure are on the developing embryo, associated with heart defects in exposed animals, followed by adverse effects to the lungs, the kidneys, the liver, and the nervous system. Levels of exposure to TCE in water that may be associated with these effects are about 500 ppb or greater.

Conclusions about Potential Health Implications for Exposure to TCE

This analysis is intended only to characterize the magnitude of the risk that residents may have experienced from their exposure to the contaminants found in their drinking water wells. There is a great amount of uncertainty in attempting to characterize the magnitude of the health risk associated with exposure to TCE. There is conflicting information regarding the health effects of TCE in both human and animal exposure studies. What is clear is that the magnitude of the hazard is directly proportional to the concentration of TCE in the drinking water and the duration of time that people may have been exposed to the contaminated water. After evaluating the human and animal studies, ATSDR concludes that individuals who used TCE-contaminated well water above 300 ppb may have experienced an increased cancer risk, and individuals exposed to levels above 500 ppb also may have had an increased risk for various non-cancerous effects.

No conclusions can be made about the causal association between any individual's disease and contamination found in the private wells affected by the Conrail site. Some reasons for this limitation include the fact that the levels of exposure doses over time are either not known or not well characterized, the uncertainty about our knowledge of chemical toxicity, and the presence of many other risk factors that may also be associated with any particular disease.

The concentration of 300 ppb is not intended to be a threshold level that defines a safe level, but rather a level that could be associated with an increased risk of developing some health effects. According to the well sampling records available since the mid-1980s, nine wells, serving an estimated 36 people, were contaminated with TCE at 300 ppb or higher. It is possible that a larger number of wells could have been affected but were either not sampled at any time or were sampled after the peak levels had passed through the groundwater well field.

Table 9: Summary of Health Effects Associated with Specific Levels of Exposure to TCE and Corresponding Concentrations of TCE in Water

TCE Exposure Conc. (ppb)	Number of Wells	Chronic Exposure Dose (mg/kg-day)	Possible Health Effects from Chronic TCE Exposure				Acute Inhalation Exposure (ppm)	Possible Health Effects from Acute TCE Exposure		
			Human Studies		Animal Studies			Human studies	Animal studies	
			Cancer	Other effects	Cancer	Other effects				
>30,000	None	500			Renal and kidney tumors	liver, kidney, neurological, reproductive, developmental	4128			
		250				liver, kidney, neurological, reproductive, developmental	2064			
		100					830			
		10					83			neurological, eye
		3.27					27			
>10,000		1.09								
>3,000	2	0.34								
>1,000	5	0.11								
>300	9	0.03	Woburn exposure group: increased acute lymphocytic leukemias	Woburn exposure group: cardiac, respiratory, immune, dermal	no information					
>100	30	0.01	increased risk of leukemia and non-Hodgkins lymphoma in drinking water study (23-67 µg/L; Cohn et al., 1994)	no demonstrated effect	no information			no demonstrated effect	no demonstrated effect	
>30	76	0.0033								
>5	100	0.0005	no demonstrated effect		no information					
<5										

Table 10A: Estimation of Total Absorbed TCE Dose from Ingestion, Dermal, and Inhalation Exposure to Water

					Comparison to MRL		Other comparisons to total absorbed dose		
					Developmental and neurological effects		Liver effects ¹	Developmental-cardiac effects ²	Kidney effects ³
TCE Conc. in Water (ug/L) (lower end of range)	Ingestion Dose (mg/kg-day)	Showering Dermal Dose (mg/kg-day)	Showering Inhalation Dose (mg/kg-day)	Total Absorbed Dose (mg/kg-day)	Acute MRL (mg/kg-day)	Acute Hazard Quotient*	Acute LOAEL (mg/kg-day)	Intermediate LOAEL (mg/kg-day)	Chronic LOAEL (mg/kg-day)
30,000	0.86	1.4	1.0	3.3	0.2	16.6	100	0.05	50
10,000	0.29	0.5	0.3	1.1	0.2	5.5	100	0.05	50
3,000	0.09	0.1	0.1	0.33	0.2	1.7	100	0.05	50
1,000	0.03	0.05	0.03	0.11	0.2	0.6	100	0.05	50
500	0.01	0.02	0.02	0.06	0.2	0.3	100	0.05	50
300	0.009	0.01	0.010	0.03	0.2	0.2	100	0.05	50
100	0.003	0.005	0.003	0.01	0.2	0.06	100	0.05	50
30	0.0009	0.001	0.0010	0.003	0.2	0.02	100	0.05	50
5	0.0001	0.0002	0.0002	0.0006	0.2	0.003	100	0.05	50

Doses are in units of mg/kg-day (ingestion assumes 100% absorption, dermal dose is based on an absorption model)

MRL (Minimum Risk Level) represents the adverse health effect level for human exposure

LOAEL is the Lowest Observed Adverse Effect Level

Exposure durations: Acute (up to 14 days); Intermediate (14 days to 1 year); Chronic (longer than 1 year)

* Hazard Quotient represents the ratio of total absorbed dose to MRL

References:

- 1- Elcombe, 1985
- 2- Johnson et al., 2003
- 3- Berman et al., 1995

Table 10B: Estimation of Exposure Concentration for Inhalation of TCE Vapors from Water

	Comparisons for Acute Exposure Duration					Comparisons for Intermediate Exposure Duration			
		Neurological effects		Immune effects ¹	Respiratory effects ²		Neurological effects		Liver effects ³
TCE Conc. in water (ug/L) (lower end of range)	Showering Inhalation Concentration (ppm)	Acute Inhalation MRL (ppm)	Acute Hazard Quotient	Acute LOAEL (ppm)	Acute LOAEL (ppm)	Time-adjusted Showering Inhalation Concentration (ppm)	Intermediate Inhalation MRL (ppm)	Intermediate Hazard Quotient	Intermediate LOAEL (ppm)
30,000	27	2	13.4	10	100	0.6	0.1	5.6	75
10,000	9	2	4.5	10	100	0.2	0.1	1.9	75
3,000	3	2	1.3	10	100	0.1	0.1	0.6	75
1,000	0.9	2	0.4	10	100	0.02	0.1	0.2	75
300	0.3	2	0.1	10	100	0.01	0.1	0.1	75
100	0.09	2	0.04	10	100	0.002	0.1	0.02	75
30	0.03	2	0.01	10	100	0.001	0.1	0.01	75
5	0.004	2	0.002	10	100	0.0001	0.1	0.001	75

Air concentrations are estimated in units of ppm (parts-per-million)

MRL (Minimum Risk Level) represents the adverse health effect level for human exposure

LOAEL is the Lowest Observed Adverse Effect Level

Exposure durations: Acute (up to 14 days); Intermediate (14 days to 1 year); Chronic (longer than 1 year)

* Hazard Quotient represents the ratio of total absorbed dose to MRL

References:

1- Aranyi et al., 1986

2- Odum et al., 1992

3- Kjellstrand et al., 1983

Interpretation of Potential Health Impacts from CCl₄ Exposure

Comparison to Human Studies

The National Institutes of Health (NTP 2005) classified CCl₄ to be ‘reasonably anticipated to be a human carcinogen’; there was evidence of liver cancer in experimental animals when administered by ingestion. In evaluating the health impacts among residents who were exposed to CCl₄ in their drinking water, we also considered information from all three types of studies previously described. Table 11 summarizes the exposure doses of CCl₄ that are associated with specific health effects. This exposure dose is estimated for specific ranges of CCl₄ concentration in water, from less than 5 ppb (the federal drinking water standard) to greater than 30,000 ppb. Occupational studies are generally limited to high levels of exposure through inhalation of CCl₄, with reports of gastrointestinal, liver, and neurological effects. However, studies of the effects of human exposure to relatively low doses of CCl₄ are very limited. In fact, there is essentially only one study that has examined health effects in the range of exposures that are likely to have occurred in the communities affected by Conrail. An epidemiologic study was conducted using birth outcome and drinking water exposure databases from a four-county area in northern New Jersey (Bove, et al. 1992a, 1992b, 1995). Estimated carbon tetrachloride concentrations in the drinking water of greater than 1 part per billion were associated with a statistically significant finding of smaller babies (decrease in full-term birth weight) and an increased incidence of neural tube defects, with weaker associations with central nervous system defects and cleft-lip or cleft-palate. A limitation of this study is the lack of defined exposure levels and the possible complication of other contaminants in the drinking water. Therefore, the 1 ppb CCl₄ in drinking water cannot be used as a threshold for adverse effects.

Comparison to Animal Studies

As summarized in Table 11, animal studies have found liver effects at relatively high doses, compared to the estimated total exposure dose for drinking water use. At higher doses, effects on fetal weight gain, immune function, and neurological and kidney effects have been observed. Table 12A shows the total estimated exposure dose for ingestion, dermal, and inhalation routes for specific intervals of CCl₄ concentrations in water. These levels are then compared to several health-based criteria from studies of CCl₄ ingestion, including the minimal risk level (MRL) and lowest observed adverse effect level (LOAEL) values for developmental (Narotsky et al. 1997), liver (Eschenbrenner and Miller, 1946), and kidney effects (Dcherty and Burgess, 1922). To include a comparison to studies that have evaluated the effects of CCl₄ inhalation, Table 12B shows the comparison of the estimated indoor air concentrations that would result from evaporation and accumulation of CCl₄ during bathing activities. These levels are then compared to several health-based criteria from studies of CCl₄ inhalation, including the MRL and LOAEL values for liver (Adams et al., 1952), kidney (Barnes and Jones, 1967; Japan Bioassay Research Center, 1998; Nagano et al., 1998) effects. The purpose of these comparisons is to better define the levels of exposure where there is confidence that no adverse health effects occur.

As with TCE, the HQ is a ratio of the exposure dose to the health-based guideline, MRL. The exposures to CCl₄ exceed the HQ of 1.0 at CCl₄ concentrations in water greater than 140 ppb, which indicates exposures were evaluated further. Also, as with TCE, ATSDR compared the estimated exposure doses to the levels that have been found to cause adverse health effects in various organ systems. The most sensitive effects of CCl₄ exposure are on liver function, but harmful effects might also occur to the respiratory, kidney, and neurological systems, and developmental effects might also occur. Levels of exposure to CCl₄ in water that are associated with liver toxicity may occur at concentrations greater than 300 ppb.

Conclusions about Potential Health Impacts for CCl₄ Exposure

This analysis is intended to characterize the magnitude of the risk that residents may have experienced as a result of their exposure to the contaminants found in their drinking water wells. After evaluating human and animal studies, ATSDR concludes that individuals who used CCl₄-contaminated well water at levels above 300 ppb may have experienced an increased risk of liver and kidney damage. That level is not considered to be a threshold for health effects, below which there is no concern. The magnitude of that risk is directly related to the duration of their use of water contaminated at that level. According to the well sampling records we examined for sampling conducted since the mid-1980s, 20 wells, serving an estimated 80 people, were contaminated with CCl₄ at that level or higher. It is possible that a larger number of wells could have been affected but were either not sampled or were sampled after the CCl₄ peak levels had passed through groundwater.

As mentioned in the discussion of TCE exposure, conclusions regarding the causal association between any individual's disease with contamination found in private wells affected by the Conrail site cannot be made because exposure doses over time are not known, there is uncertainty in estimating health effects for low levels of exposure, and the possible presence of other risk factors that may also be associated with causation of a disease.

Table 11: Summary of Health Effects Associated with Specific Levels of Exposure to CCl₄ and Corresponding Concentrations of CCl₄ in Water

CCl ₄ Conc.in Water (ppb)	Number of Wells	Total Chronic Exposure Dose (mg/kg-day)	Possible Health Effects from Chronic CCl ₄ Exposure				Acute Inhalation Exposure (ppm)	Possible Health Effects from Acute CCl ₄ Exposure	
			human studies		animal studies			Human studies	Animal studies
			Cancer	Other effects	Cancer	Other effects			
		1,200				Mild kidney effects			
		250		Neurological (acute); hepatic effects		Neurological effects (intermediate)	500	Developmental effects (body weight); hematologic effects	
		50		Nausea and vomiting (acute); serious hepatic effects (acute)	Heptatocellular carcinomas at 47 mg/kg-day	Reduced fetal weight gain for gestational days 6-8 (acute); decreased immune function (acute)	200	Serious respiratory, renal, hepatic effects	
		10	No information		Hepatoma at 20 mg/kg-day (intermediate)		100		
>30,000	0	3.27				Hepatic effects at 5 mg/kg-day	22.5		
>10,000	1	1.09		Developmental impacts at drinking water concentrations >1 ppb (low birth weight, CNS defects, neural tube defects, cleft-lip and cleft-palate (Bove, 1992))			7.5		
>3,000	6	0.34				10 ⁻² cancer risk at 0.1	No demonstrated effects	2.25	Hepatic effects (7 hr/day)
>1,000	14	0.11						0.8	
>300	20	0.03				10 ⁻³ cancer risk at 0.01		0.23	
>100	37	0.01						0.08	
>30	47	0.0033				10 ⁻⁴ cancer risk at 0.001		0.02	No demonstrated effects
>5	75	0.0005						0.004	
<5	88								

Table 12A Estimation of Total Absorbed CCl₄ Dose from Ingestion, Dermal, and Inhalation Exposure to Water

					Comparison to Chronic MRL		Comparisons for Acute and Intermediate exposure duration		
					Liver Effects		Develop. effects ¹	Kidney effects ²	Liver cancer ³
CCl ₄ Conc. in water (ug/L)	Ingestion Dose (mg/kg-day)	Showering Inhalation Dose (mg/kg-day)	Showering Dermal Dose (mg/kg-day)	Total Absorbed Dose (mg/kg-day)	CCl ₄ MRL (mg/kg-day)	Hazard Quotient	LOAEL (mg/kg-day) Acute	LOAEL (mg/kg-day) Acute	LOAEL (mg/kg-day) Intermediate
30,000	0.9	1.0	1.4	3.31	0.02	165.7	50	180	20
10,000	0.3	0.3	0.5	1.10	0.02	55.2	50	180	20
3,000	0.1	0.1	0.1	0.33	0.02	16.6	50	180	20
1,000	0.03	0.03	0.05	0.11	0.02	5.5	50	180	20
300	0.01	0.01	0.01	0.03	0.02	1.7	50	180	20
100	0.003	0.003	0.005	0.01	0.02	0.6	50	180	20
30	0.001	0.001	0.001	0.003	0.02	0.2	50	180	20
5	0.0001	0.0002	0.0002	0.0006	0.02	0.03	50	180	20

Doses are in units of mg/kg-day (ingestion assumes 100% absorption, dermal dose is based on an absorption model)

MRL (Minimum Risk Level) represents the adverse health effect level for human exposure

LOAEL is the Lowest Observed Adverse Effect Level

Exposure durations: Acute (up to 14 days); Intermediate (14 days to 1 year); Chronic (longer than 1 year)

* Hazard Quotient represents the ratio of total absorbed dose to MRL

References:

- 1- Narotsky et al., 1997
- 2- Docherty and Burgess, 1922
- 3- Eschenbrenner and Miller, 1946

	Comparisons for Acute Exposure			Comparisons for Intermediate Duration Exposure				
		Liver effects ¹	Kidney effects ²		Liver effects		Kidney effects ³	Hematologic effects ⁴
TCE Conc. in water (ug/L)	Showering Inhalation Concentration (ppm)	Acute LOAEL (ppm)	Acute LOAEL (ppm)	Time-adjusted Showering Inhalation Concentration (ppm)	Intermediate Inhalation MRL (ppm)	Intermediate Hazard Quotient	Chronic LOAEL (ppm)	Chronic LOAEL (ppm)
30,000	23	10	200	0.5	0.03	16	5	25
10,000	7.6	10	200	0.2	0.03	5	5	25
3,000	2.3	10	200	0.05	0.03	1.6	5	25
1,000	0.8	10	200	0.02	0.03	0.5	5	25
300	0.23	10	200	0.005	0.03	0.2	5	25
100	0.08	10	200	0.002	0.03	0.05	5	25
30	0.023	10	200	0.0005	0.03	0.016	5	25
5	0.004	10	200	0.0001	0.03	0.003	5	25

Air concentrations are estimated in units of ppm (parts-per-million)

MRL (Minimum Risk Level) represents the adverse health effect level for human exposure

LOAEL is the Lowest Observed Adverse Effect Level

Exposure durations: Acute (up to 14 days); Intermediate (14 days to 1 year); Chronic (longer than 1 year)

* Hazard Quotient represents the ratio of total absorbed dose to MRL

References:

1- Adams et al., 1952

2- Barnes and Jones, 1967

3- Japan Bioassay Research Center, 1998; Nagano et al., 1998

4- Japan Bioassay Research Center, 1998; Nagano et al., 1998

Exposure to a Mixture of TCE and CCl₄

Because some people were exposed to both TCE and CCl₄, ATSDR used its recently developed guidance for evaluating mixtures.⁴ For evaluating non-cancer health effects, the hazard quotient (HQ) is calculated for each chemical and for each route of exposure as previously described for the evaluation of TCE and CCl₄ exposures. With mixtures, the hazard quotients are added for each chemical to derive the hazard index (HI) for the mixture as follows:

$$\text{Oral HI}_{\text{mixture}} = \text{oral HQ}_{\text{TCE}} + \text{oral HQ}_{\text{CCl}_4}$$

$$\text{Inhalation HI}_{\text{mixture}} = \text{inhalation HQ}_{\text{TCE}} + \text{inhalation HQ}_{\text{CCl}_4}$$

Whenever a combined HI for a mixture of chemicals exceeds 1.0, ATSDR evaluates the exposure further to determine if a mixture's effect might be possible. Part of this additional evaluation requires that organ-specific endpoints be determined. The organ-specific HQs are referred to as target toxicity doses (TTD). For instance, when two chemicals both cause adverse effects to the lungs, a lung target toxicity dose is derived for each chemical, in this case for TCE and for CCl₄. As with calculating an MRL, the resulting TTD for chemical one and for chemical two are then used to develop a HI for just respiratory (lung) effects. Again, the HIs based on organ-specific target toxicity doses are calculated for each route of exposure as follows:

$$\text{Oral HI-TTD}_{\text{ingestion}} = \text{oral HQ}_{\text{ingestion-TCE}} + \text{oral HQ}_{\text{ingestion-CCl}_4}$$

$$\text{Inhalation HI-TTD}_{\text{respiratory}} = \text{inhalation HQ}_{\text{respiratory-TCE}} + \text{inhalation HQ}_{\text{respiratory-CCl}_4}$$

Similar to evaluating possible effects of single chemical exposure, when the HI-TTD for a specific organ exceeds 1.0, a comparison of the combined estimated exposure doses for the chemicals to no observed adverse effects levels (NOAELs) and to the lowest observed adverse effect levels (LOAELs) for both chemicals provides a better understanding of which exposures might pose a greater risk of resulting in adverse health effects. For the Conrail site, ATSDR calculated HI-TTDs for several target organs and specific health endpoints. Because of the levels of exposure, some of the values exceeded 1.0, requiring a final comparison of the estimated exposure dose to doses that are known to cause harmful effects in animals and humans.

In addition to the dose comparisons described previously, another important step to consider is the interactions that chemicals might have in causing toxicity. Chemicals can interact in the body resulting in effects that might be additive, greater than additive, or less than additive. If additive, the dose of each chemical would have an equal weight in its ability to cause harmful effects. In that case, the combined HI for the two chemicals is an indication of the degree to which possible harmful effects could occur in people. When the chemicals act in a greater than additive manner, which is known as synergism, one chemical is enhancing the effect of the other chemical. In that case, the combined HI for the two chemicals underestimates the potential

⁴The "Guidance Manual for the Assessment of Joint Toxic Action of Chemical Mixtures" (ATSDR 2004). ATSDR's Division of Health Assessment and Consultation, the division responsible for this consultation, worked with the Division of Toxicology, the division that developed the mixtures guidance, to evaluate exposures to TCE and CCl₄ from the Conrail site.

toxicity of the mixture of two chemicals. For chemicals that act in a less than additive manner, which is known as an antagonistic effect, the combined HI overestimates the potential toxicity of the mixture of two chemicals. In other words, one chemical might be thought of as protecting against adverse effects from the other chemical. In that case, the HI for exposure to that mixture is less than simply adding the individual HQs for each chemical.

To evaluate whether a mixture of chemicals could be acting additively, synergistically, or antagonistically, ATSDR developed an approach known as the binary weight of evidence analysis. The binary weight of evidence analysis consists of three parts:

- reviewing mechanistic information available for the chemicals about how two chemicals in a mixture might interact together,
- evaluating the toxicological significance of two chemicals interacting, and
- determining whether any information is available that might be used to modify their actions.

The results of this analysis provide qualitative information that helps interpret the HI score more accurately. In situations where exposure occurs to both TCE and CCl₄, TCE appears to enhance the effects of CCl₄. An important note is that additivity and interactions are specific to the route of exposure and target organ. For example, evidence that two chemicals interact at one target organ is not an indicator of how the chemicals would interact at a different target organ or endpoint. The following topics present information to support our finding regarding exposures to the mixture of TCE and CCl₄:

1. Scientific evidence for a mixture effects from simultaneous exposure to TCE and CCl₄
2. Sensitive groups
3. A brief review of the different pathways involving exposure to TCE and CCl₄
4. Possible health effects in residents at the Conrail site
5. Who is at risk at Conrail

Scientific Evidence for Greater than Additive Effects of TCE and CCl₄ Exposure

Several studies exist that show that TCE will enhance the toxic effects of CCl₄, particularly toxic effects to the liver. Thus, TCE acts in a greater than additive manner to enhance the toxic effects of CCl₄. Pessayre, et al., showed that a wide range of non-toxic TCE doses (injected into the body cavity of rats) potentiated the hepatotoxicity of chloroform (Pessayre 1982). The same study showed that CCl₄ did not increase the toxic effects of TCE. The Pessayre study showed that the threshold for toxic liver effects from CCl₄ was lowered, that is, in the presence of TCE, lower levels of CCl₄ can cause harmful effects to the liver. Because the Pessayre study exposed rats by injecting them with TCE and CCl₄, it is difficult to determine precisely how much TCE or CCl₄ in water would be needed to cause these synergistic effects. However, a study by another investigator showed that toxic effects to the liver from a mixture of TCE and CCl₄ were similar by either injection into the body cavity or by oral administration (Steup, et. al. 1991).

Steup, et al., showed a rather complex relationship between TCE dosing and CCl₄. Relatively low doses of CCl₄ (25 mg/kg) required higher doses of TCE (790 mg/kg) to cause liver damage while relatively high doses of CCl₄ (51 mg/kg) resulted in liver damage from lower doses of TCE (79 mg/kg). As you can see, the interplay between TCE and CCl₄ doses makes it difficult to pinpoint the lowest levels of each chemical that might interact to cause harmful effects to the liver. It is also important to remember that Steup's investigations evaluated very short periods of exposure (usually one day), making the doses he identified as critical not as applicable to longer exposure periods that are typical for residents at the Conrail site. Nevertheless, the principle is established that TCE at some level will synergistically increase the toxic effects to the liver from exposure to some levels of CCl₄.

Another study that administered TCE and CCl₄ orally to rats supports the findings from Steup (Borzelleca, et. al. 1990). Borzelleca exposed rats to relatively large amounts of CCl₄ and TCE (ranging from 100 milligrams chemical per kilogram body weight to 400 milligrams chemical per kilogram body weight (mg/kg)). The results clearly show that TCE synergistically increases the toxic effects of CCl₄.

Another series of studies reported the occurrence of hepatitis (inflammation of the liver) in people who sniffed solvents containing predominantly TCE and small amounts (7 to 20 percent) of CCl₄ (Conso, et. al., 1980a, Conso 1980b, Bouygues, et. al, 1980). Because these were human exposures, the concentration of TCE and CCl₄ in the air that these individuals breathed is not known. Therefore, it is not possible to know to what degree TCE enhanced the toxic liver effects of the small amounts of CCl₄ in the solvent. It is reasonable to assume, however, that TCE most likely enhanced the toxic effects of CCl₄ in the solvent.

Sensitive Groups

Studies in rodents have shown that other factors might increase the risk of harmful effects from exposure to CCl₄. Diet, diabetes, and stress have been shown to increase the harmful effects of CCl₄ in rodents (McLean and McLean 1966, Hanasono, et. al. 1975a, 1975b, Iwai, et. al. 1986). For instance, Iwai, et al., showed that non-toxic doses of CCl₄ caused liver damage when stress was induced in rats from shock treatment. Similarly, when diabetes was induced in rats by treating the animals with alloxan, previously non-toxic doses of CCl₄ caused liver damage in rats. As for diet, McLean, et. al., proposed that a low-protein diet might protect against the harmful effects of CCl₄. In addition, alcohol has been shown to potentiate (that is, increase) the harmful effects of CCl₄ in mice (Weber 2003). Therefore, it is reasonable to assume that people who drink alcohol might be at increased risk of harmful effects should their drinking water contain CCl₄.

Pathways of exposure to TCE and CCl₄

As described previously, about 608 people used private well water contaminated with TCE and CCl₄. Those people were exposed to both chemicals when they drank water from their private well and when they bathed in the water. Evaporation of TCE and CCl₄ from contaminated water while bathing and showering would result in exposure through inhalation of TCE and CCl₄ vapors. This inhalation exposure was most significant while showering and while remaining in

the bathroom shortly after the shower. Exposure to TCE and CCl₄ also occurred while bathing and showering because the TCE and CCl₄ that remained in the water came into contact with the skin. Some TCE and CCl₄ passed through the skin while showering or bathing, thus entering the body.

ATSDR estimated the amount of chemicals that people drank, the amount of chemicals that passed through the skin, and the amount of chemicals that evaporated into the bathroom air. Some uncertainty exists in these estimates because people drink different amounts of tap water each day. Uncertainty also exists in estimating the bathroom air concentrations that result from showering in contaminated water because it is not known precisely how much chemical will evaporate from the water, the water concentrations vary over time, and bathroom size varies from home to home. Even with these uncertainties, it is possible to get an idea of how much TCE and CCl₄ people might have contacted using assumed drinking water intakes, volatilization rates from water, and bathroom sizes.

Magnitude of Exposure to the Mixture TCE and CCl₄

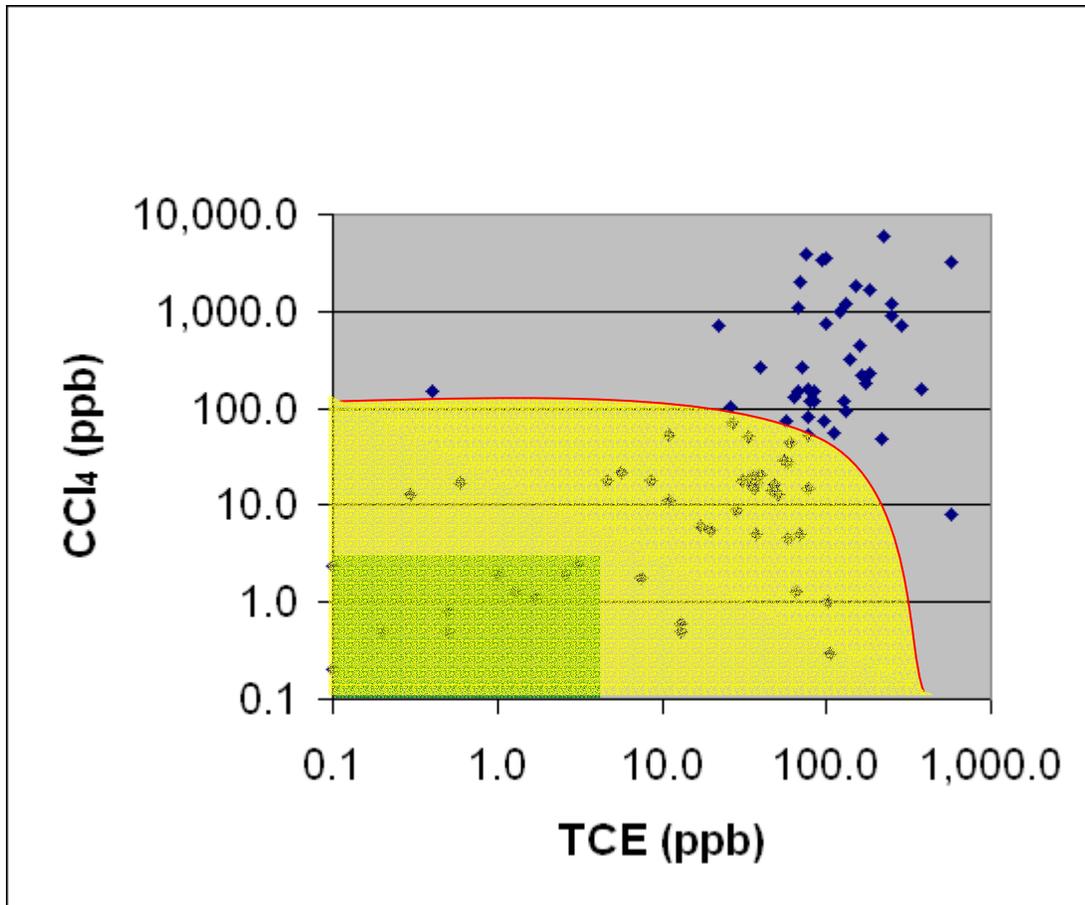
Of the 257 private wells that contained either TCE or CCl₄, 152 wells contained both chemicals.

- Seventy-eight of the 152 wells contained CCl₄ at or below the drinking water standard (5 ppb). Of those 78 wells with CCl₄ at or below 5 ppb, 12 wells had TCE levels ranging from 8 ppb to 105 ppb. The estimated 48 people using these wells were not at risk of harmful effects from the mixture of TCE and CCl₄. However, one well, had CCl₄ levels of 5 ppb and TCE levels of 2,500 ppb. While a risk of harmful effects existed from exposure to TCE alone at this level, in this case the additional risk from the low level of CCl₄ is not considered to be significant.
- For the remaining wells that contained CCl₄ ranging from 6 ppb to 27,000 ppb, ATSDR tried to determine if synergistic effects might have resulted from combination exposures to TCE and CCl₄.

Figure 11 shows the number of wells containing CCl₄ at levels above and below the drinking water standard of 5 ppb and the corresponding ranges of TCE present in the water.

- In the 72 wells, serving about 288 people, that contained CCl₄ levels above the drinking water standard,
 - 38 wells, serving about 152 people, contained CCl₄ levels above 100 ppb,
 - 34 wells, serving about 136 people, contained CCl₄ between 6 and 99 ppb.
- Although a wide range of TCE levels can be found for a corresponding CCl₄ level, in general, as the CCl₄ levels increase, the TCE levels tend to increase in most wells. The discussion of possible health effects from the synergistic effects of TCE on CCl₄ focuses on the 72 wells containing CCl₄ at levels greater than the drinking water standard of 5 ppb.

Figure 11. Display of the sampling results for individual wells containing both CCl₄ and TCE



◆ = individual wells

Green = Safe levels—little or no risk from use of water with these levels of TCE and CCl₄

Yellow = Some risk of health effects for people using water containing these levels of TCE and CCl₄

Blue = Greatest risk of health effects for people using water containing these levels of TCE and CCl₄

Possible Health Effects from Exposure to the Mixture TCE and CCl₄

When private well water contains 5 ppb or less of TCE and CCl₄ (the drinking water standard), no appreciable risk is apparent from exposure to a mixture of the two chemicals (shown in green in Figure 11). As TCE and CCl₄ levels increase above the drinking water standard, the risk of harmful effects increases (shown in yellow in Figure 11). While it is difficult to be precise in determining the specific levels where harmful effects might begin for someone who was exposed to a mixture containing CCl₄ and TCE, the risk is greater for people whose private wells had CCl₄ levels greater than 100 ppb and TCE levels greater than 500 ppb (shown in blue in Figure

11). Table 13 shows a variety of possible harmful effects for people who were exposed to the higher levels of CCl₄ and TCE.

Table 13. Organ Systems and Possible Health Endpoints Resulting from Simultaneous Exposure to CCl₄ and TCE	
Organ System	Possible Harmful Effects
Liver	Mild to severe damage to liver cells; changes in enzyme levels indicating injury, cirrhosis or harmful scarring of liver tissue,
Neurological	Sleepiness, depression
Respiratory	Fluid in the lungs
Developmental	Lower fetal weight (small babies), decrease in fetal weight gain (small babies), maternal weight loss, decrease length in fetuses,
Kidney	Decreased urine output, altered kidney function indicating injury; protein in the urine

Health Issues

The community has voiced many health concerns related to the Conrail site. For some of the health concerns, such as the occurrence of cancer or birth defects in members of the community, databases are available that enable health professionals to evaluate whether these diseases and birth defects in the Conrail area occurred at rates greater than for the state. For other health concerns, such as liver problems, kidney problems, heart problems, and fibromyalgia, there are no databases available for analyses. There is some medical literature that addresses exposure-related factors for these health concerns. The community has also expressed interest in the findings of the ATSDR TCE Subregistry for Conrail registrants. Although health issues specific to the Conrail registrants cannot be provided from the registry, information about health effects reported by all registrants can be provided. These health issues are addressed in this section.

The following information summarizes ATSDR's findings. To better understand how we did the analyses and, importantly, the limitations of the information, please read the discussions of each evaluation.

- For the birth certificate data examined, no difference was found in babies born within the two zip codes examined and with those born in the rest of the state. However, two types of birth defects, both of which are classified as neural tube defects, were found at a number we refer to as suggestive. We do not know if the mothers in these cases were exposed to TCE during pregnancy or had other risk factors for birth defects. We do know that TCE exposure in some toxicity studies might be associated with similar effects.
- For 1990–1999, new cases of cancer are consistent with the number and kinds we see in the state.
- More people died from all cancers combined and from lung and anal-rectal cancers from 1992–2001 in zip code 46516 than expected when compared to state data. The analyses for zip code 46561 did not show an excess number of cancer deaths for all cancers or for specific types of cancer. For these analyses, information about risk factors for cancer was not available. Some studies suggest exposure to TCE may be associated with some types of cancer, primarily leukemia and non-Hodgkins lymphoma, but, based on the Indiana Cancer Registry data, those cancers were not elevated.
- Some of the health effects reported in the TCE subregistry coincide with some of the health effects that people have asked us to evaluate. The health effects reported in the TCE subregistry are intended to help focus where more research is needed rather than to associate exposure with the effects.
- Both TCE and CCl₄ can cause damage to the liver, but the liver can repair much of the damage once exposure stops. CCl₄ can also damage the kidney; however, the kidney can heal if the damage is not too severe. There are no liver or kidney disease registries to use for comparison to determine whether there is excess liver or kidney disease in the Conrail area. Exposure to the mixture of CCl₄ and TCE might also have effects on the respiratory system. The effects of CCl₄ exposure are enhanced by simultaneous exposure to TCE. People exposed to these chemicals from the Conrail site may have been at risk for experiencing some effects on the liver, kidney, and possibly the lungs.
- Exposure to very high levels of TCE and CCl₄ has been associated with a specific type of heart problem (arrhythmias), and some animal studies have linked exposure during pregnancy to a congenital heart defect in the offspring.
- No one knows what causes fibromyalgia. There may be a link between the disease and injury or infection, but exposure to toxic chemicals has not been ruled out as a possible contributor to the condition.
- Exposure to TCE has been associated with effects on facial nerves, but neither TCE nor CCl₄ has been associated with damage to nerves in the limbs.

Health and Disease Outcomes

Health and disease outcome data are existing data that are gathered to help make determinations about potential health effects. This information comes from existing data sources such as disease registries, vital statistics, and hospital discharge data. While this information will not establish "cause and effect," it does provide information that characterizes the health status of a population. In this case, the health and disease outcome data assists in determining potential health effects from TCE and CCl₄ exposure from the Conrail site and other sources.

Health and disease outcome data include the following strengths:

- They provide means to assess whether there is a higher rate of disease in an area
- They provide specific information on the health status of a community, for a specified time period, geographic area, and disease
- They make use of established, accepted statistical methods.

Health and disease outcome data include the following limitations:

- Data are not collected for all diseases and for all geographic areas of interest
- "Cause and effect" will not be established
- Information on additional risk factors, occupational exposures, and length of residence that could be associated with the disease are unknown
- Truly exposed and truly unexposed persons are likely to be included, thus accuracy of results is questionable
- The small number of cases that would be found in a community the size of the Conrail area results in unstable⁵ estimates.

The Indiana State Department of Health (ISDH) maintains several health outcome databases that can be used to generate area-specific disease data. These data bases include a cancer registry, vital records (birth and death certificates), and hospital discharge information. In response to citizen concerns, ATSDR and ISDH have evaluated birth outcome data, cancer incidence data, and cancer mortality data for the area near the Conrail Rail Yard site.

Review of ISDH Birth Certificates (1990-1999)

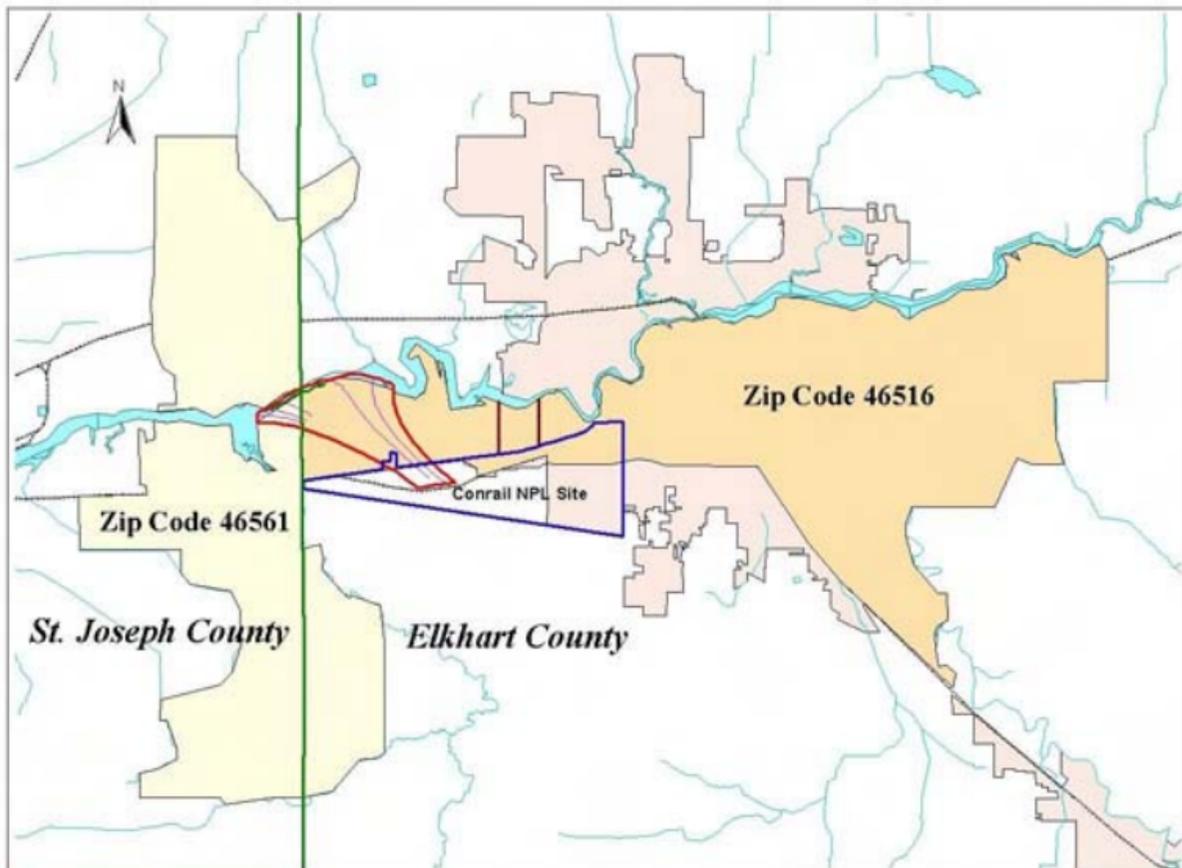
For exploratory purposes and because of an available database, ATSDR's Division of Health Studies, in cooperation with ISDH, examined birth certificate data to evaluate preterm birth, small for gestational age (SGA), and several birth defects. Citizens from the neighborhood around Conrail had expressed concerns over the number of children with birth defects in their community. Data were available for zip codes 46516 and 46561 in Elkhart (Elkhart County) and Osceola (Saint Joseph County), Indiana, for the 10-year period 1990 through 1999. Those years were selected because the data were readily available electronically and were considered more accurate than earlier data. The prevalence of preterm birth, SGA, and birth defects for these two zip codes combined were compared to the prevalence for the rest of the state. See Figure 11.

Over the combined 10-year period, the prevalence of preterm birth, SGA, and most of the birth defects in the two zip codes were similar to the prevalence in the rest of the state. After taking into account socioeconomic factors such as mother's age, education, race/ethnicity, and information from the birth certificate on maternal smoking, these prevalence rates remained similar (Appendix 7).

⁵ The term "unstable" refers to the difficulty in determining whether the number of cases found in an analysis is a result of a common factor such as exposure to a chemical or whether the cases just happened to be in a particular area. For instance, chances are just as great that two people with liver cancer live on the same block as they are that the two people live 10 miles apart. We would not be able to say with any certainty that the two people developed the cancer as a result of living on the same block. If 10 people on the same block develop the same type of liver cancer, then the chance of the cancer resulting from the same cause is much greater.

For the combined 10-year period, two central nervous system birth defects, anencephaly (defective development of the brain) and spina bifida (defect in the spinal column), were elevated in the two zip codes that include the Conrail site when compared with the rest of the state. These two central nervous system birth defects are often grouped together as "neural tube defects" or NTDs. Eleven children were identified as having been born with a neural tube defect.

A serious limitation of these analyses was the use of zip codes to define the exposed population. Because of the way the birth certificate data are reported to ISDH, we could not analyze data at a smaller geographic level other than the zip code. If some of the mothers residing in the two zip codes were not exposed to the Conrail drinking water contaminants during their pregnancies, then the risk of adverse birth outcomes from exposures to the contaminated drinking water in the study area may be underestimated. Further evaluation of these adverse birth outcomes will require a more precise definition of the exposed population. In addition, in order to evaluate neural tube defects, it will be necessary to identify a suitable unexposed comparison population, and it must be feasible to achieve complete ascertainment of neural tube defects in both the exposed and unexposed populations using multiple sources of information, including the review of hospital records.



Legend

- County Line
- Conrail NPL Site
- County Road 1 Plume
- Larue St. Plume
- County Rd. 1 Flow Direction
- TCE Discharge Area
- Zip Code Boundaries
 - 46516
 - 46561
- St. Joseph River
- Creeks and Streams
- Railroads
- City of Elkhart

Zip Code Boundaries
 Conrail Railyard Site
 Elkhart, Indiana



In the United States, one of every 33 babies (3%) is born with a birth defect. The mother's age at childbirth, her nutritional status, obesity before pregnancy, her alcohol, cigarette, and certain medication use during pregnancy, genetic factors, viruses, and some environmental exposures (including exposure to TCE and CCl₄) are associated with the occurrence of birth defects or other adverse pregnancy outcomes. With the exception of the mother's age and smoking status, the birth certificate data used in these analyses do not provide information on other risk factors. If more mothers residing in the two zip codes had these risk factors than those in the rest of the state, then the risk of adverse birth outcomes in the study area may be overestimated.

In summary, over the 10-year period 1990–1999, the prevalence of preterm birth, small for gestational age, and low birth weight among term births in the two zip codes were similar to the prevalence in the rest of the state. The findings for neural tube defects are suggestive and may warrant further evaluation. This analysis is exploratory and does not allow for conclusions to be made for any relationship between adverse birth outcomes and drinking contaminated water.

Review of Indiana Cancer Registry Data (1990–1999)

In response to community concerns about the occurrence of several types of cancers in the area adjacent to Conrail, ISDH conducted analyses of available cancer data from the Indiana Cancer Registry. This registry records all new cases of cancer diagnosed in residents of Indiana. ISDH evaluated total cancer, 21 specific types of cancer in children and adults, and all child cancer combined between 1990 and 1999. The types of cancer evaluated were selected based on concerns from citizens and suspected or plausible scientific associations from the medical literature between these cancers and TCE and CCl₄ exposure.

All new cases of cancer diagnosed among residents of the Conrail area for the most recent 10 years of complete data, 1990 through 1999, were identified. For this analysis, therefore, the geographic unit analyzed coincided with the described Conrail area based on the groundwater plume. Because the population around Conrail was predominantly white, the comparison population used was the white population of the state of Indiana. The comparison population would be expected to be similar to the study area population, with the exception of the exposure.

For this analysis, once the new cases of cancer were identified, standardized incidence ratios (SIRs) were calculated. The SIR is a ratio of the observed cases of cancer identified in the study area divided by the expected number of cases for the study area. The expected number is the calculated number of cases based on the rates from the comparison population. SIRs were determined for the 21 types of cancer and for the two groupings (all cancers and cancers in children).

None of the analyses indicated there were a significant excess number of cancers of any type or grouping in the population around the Conrail site (Appendix 8). For all cancers combined, the incidence of cancer among residents in the Conrail area was 125 cases observed, with 272 expected, as calculated from the comparison population; the SIR was 0.46. For the combined grouping of cancers occurring in children aged 0–19 years, the observed number of cases was two; the statewide trend predicted three cases. No new cases of primary liver cancer, chronic

lymphocytic leukemia (CLL), or Hodgkin's lymphoma were recorded for the Conrail area for the 10-year period.

An analysis of new cases of cancer should be considered exploratory and a way to evaluate if more rigorous studies are warranted. Information on other risk factors for developing cancer, other than proximity to the Conrail site, is not available. Cancer is a common disease; there is a lifetime risk of one in three of getting cancer. There are many causes of cancer, and the leading preventable cause of cancer is cigarette smoking. Exposure to carcinogenic chemicals and other industrial chemicals account for less than 5% of human cases.

From the ISDH cancer registry, it is not possible to determine how long an individual may have resided in a community (a surrogate of exposure for drinking the contaminated private well water). For residents of Elkhart and other counties, it was not possible to determine and adjust for how long an individual may have resided in a TCE- or CCl₄-contaminated neighborhood and/or drank water containing those compounds. Cancers, other than leukemia, usually have long latency times between exposure and onset of clinically recognized disease. Latency periods can be more than 10 years; therefore, new cancers diagnosed in the 1990s may have started in the 1970s or 1980s.

For many of the cancers, very few new cases were reported. A non-significant difference sometimes reflects the low number of cases rather than the absence of differences. In this analysis of newly diagnosed cancers, breast, lung, colon, and prostate cancers had the highest number of new cases registered. These four cancers are also the most commonly occurring cancers in men and women in the United States. In this analysis on the community around the Conrail site, for these four common types of cancer, the number of new cases observed was less than what was expected.

In summary, the incidence or new cases of cancer in the community around the Conrail site for 1990–1999 did not show an excess number for all cancers or specific types of cancer. This analysis does not allow for conclusions to be made for any causal relation between the occurrence of cancer and drinking contaminated water.

Review of ISDH Cancer Mortality Data (1992-2001)

To further address community concerns about cancer in the Conrail area, ISDH analyzed cancer mortality data. This information is collected from the death certificate and is available to the zip code level from 1992 to 2001. The period for this analysis differs slightly from the period used for the cancer incidence analysis; therefore, direct comparison of the findings is not advised. The types of cancer evaluated were selected based on suspected or plausible scientific associations found in the medical literature between these cancers and TCE and CCl₄ exposure and/or concerns from citizens.

The area for the analyses was defined as zip code areas 46516 and 46561 in Elkhart (Elkhart County) and Osceola (Saint Joseph County), Indiana. These two zip codes were considered because they overlie the groundwater plume from the Conrail site and other TCE plumes. The zip code areas analyzed are much larger than the Conrail area (Figure 11). All deaths from

cancer among the residents of the two zip codes during the period 1992–2001 were identified. Because the population in the Conrail area was predominantly white, the comparison population used was the white population of the state of Indiana.

For this analysis, once the deaths from cancer were identified, standardized mortality ratios (SMRs) were calculated. Similar to the SIR, an SMR is a ratio of the observed divided by the expected number of deaths for each zip code area. The expected number is a calculated number based on the comparison population. SMRs were calculated for the 18 types of cancer and for the three groupings (all leukemias, all cancers, and cancers in children).

The analyses for zip code 46516, which included Conrail neighborhoods and the city of Elkhart, did indicate that there were a significant excess number of cancer deaths for all cancers combined, for lung cancer, and for anal-rectal cancer (Appendix 9). For all cancers combined, the number of cancer deaths among the residents of zip code 46516 was 639 cancer deaths observed with 532 expected, based on the rates from the comparison population. The SMR was calculated as 1.20. This means there is a 20% increased risk of dying from cancer as compared to the state white population. For the combined grouping of all cancer deaths in children aged 0–19 years, there were four deaths observed with three expected. There were 205 deaths observed from lung cancer in zip code 46516 over the 10-year period, with 164 expected (SMR = 1.25). This means there was a 25% excess risk of dying from lung cancer compared to the state white population. For anal-rectal cancer, 17 deaths were observed whereas eight were expected (SMR = 2.17), an excess risk double that for the state population. Many other specific cancers had SMRs above 1.0; these were, however, not statistically significant.

None of the analyses for zip code 46561 (mainly the Mishawaka area including Penn Township) indicated that there were a significant excess number of cancers of any type or grouping (Appendix 9). For all cancers combined, the number of cancer deaths among the residents of zip code 46561 was 154 cancer deaths observed with 160 expected; the SMR was calculated as 0.96. For the combined grouping of all cancer deaths in children aged 0–19 years, there were no observed deaths. No deaths from chronic lymphocytic leukemia (CLL) or chronic myelogenous leukemia (CML) were recorded for zip code 46561 for the 10-year period. Nine cancers, liver, acute myelogenous leukemia (AML), Hodgkin's lymphoma, non-Hodgkin's lymphoma, kidney, brain, laryngeal, colon, and melanoma cancers, had SMRs above 1.0. However, none of these ratios were statistically significant.

Limitations for these analyses include the inherent absence in the mortality files of some persons with cancer who died from unrelated causes. Metastatic disease occurring in organs other than the primary site may be reported as the underlying cause of death when the primary site is unknown. In contrast to incidence data, mortality data are affected by the difference of survival across cancer sites and types. In addition, mortality data are susceptible to bias from differences in treatment and access to health care.

The geographic area used for the mortality analyses were two zip code areas that include the groundwater plume. This area is larger than the area potentially affected by the Conrail site. Mortality data were only available to the zip code level. Because of the inability to use a smaller geographic unit, the findings may not truly reflect the cancer mortality of those residents who

drank contaminated private well water near Conrail. These limitations need to be considered before drawing conclusions from this analysis.

In summary, the analysis of mortality data for 1992–2001 for zip code 46516 showed an excess of deaths from all cancers combined and from lung and anal-rectal cancers. The analyses for zip code 46561 did not show an excess number of cancer deaths for all cancers or for specific types of cancer. The study design does not permit conclusions to be made for any causal relation between cancer deaths and exposures from the Conrail site.

ATSDR Registry of People Exposed to TCE in Drinking Water

In 1988, ATSDR established the TCE Subregistry of the National Exposure Registry for tracking health conditions and diseases of people exposed to TCE in their drinking water. This long-term survey of self-reported adverse effects is conducted for nearly 3,000 registrants of 14 TCE sites nationwide, including 236 residents (127 male, 109 female) of the Conrail neighborhoods. After tracking the health of all registrants for the past 10 years, findings include elevated rates for the following health conditions (although not necessarily reported by Conrail area respondents):

- Anemia and other blood disorders
- Stroke
- Urinary tract disorder, particularly in females
- For females, liver and kidney problems
- Diabetes in females
- Skin problems and allergies

Findings of the National Exposure Registry are intended to help us focus on where more research is needed rather than to definitively associate an effect with exposure. For example, a baseline or first survey of all TCE Subregistry participants found that speech and hearing problems in children less than 10 years old were reported at significantly higher rates compared to U.S. averages (NHIS survey). Prompted by this finding, ATSDR funded a study of TCE exposure and child speech and hearing ability (oral motor, speech, and hearing function testing) in a subset of 116 children belonging to the registry. Approximately 100 children of the Conrail area were invited to participate in the study. Although anatomical/formation and other differences between the TCE-exposed and other children were found, they appear to have no impact on speech and hearing function. For children who were exposed to TCE in the womb, as a fetus, and were compared with children in later life, no differences in the tests results were observed (ATSDR 2004).

Specific Health Issues

Over the course of the public health assessment process, individuals in the community around Conrail have raised concerns about many health-related issues pertaining to exposure to trichloroethylene (TCE) and carbon tetrachloride (CCl₄). Concerns about cancer and birth defects were addressed in previous sections using available health outcome data. There is no public health reporting system for some health concerns, such as liver and kidney problems, heart

disease, fibromyalgia, or polyneuropathy. This section discusses these health concerns and any possible association between exposure to TCE or CCl₄ and these health outcomes.

Liver problems

The liver is the organ in the body that has a central role in regulating most chemical levels in the body. It performs hundreds of vital functions, so it is very important to maintaining good health. It stores vitamins, sugars and fats from food that you eat, builds chemicals needed by your body, and helps remove wastes from the blood. The liver is the primary organ in the body for breaking down harmful compounds that enter the bloodstream. After breakdown of these chemicals, the metabolic by-products are excreted into the blood or bile, and then eliminated from the body in the urine or feces. TCE and CCl₄ are metabolized in the liver; blood by-products are produced that are eliminated in the urine. For both TCE and CCl₄, the liver is considered the sensitive target organ. Although people in the communities affected by Conrail were exposed to lower doses of the individual compounds than those associated with exposure in the workplace or in animal studies, sensitive individuals, those exposed to high levels of both compounds, and those who also had occupational exposures could have experienced effects on the liver.

Damage to the liver will result in improper liver function. This damage can occur from viral infections, hereditary factors, alcohol use, certain medications, and toxic chemicals. Alcohol is the most common cause of toxic liver damage in the United States. Unstable toxic by-products can be produced that can injure the liver. When the liver metabolizes too large a quantity of a toxic chemical over a period of time, the liver cells may swell, scar, or die. These changes can result in liver problems ranging from an enlarged, fatty liver to cirrhosis (a chronic condition where damaged liver cells are replaced by scar tissue) and liver failure. Cirrhosis is the eighth highest cause of death in the United States.

The extent of liver damage will depend on the amount of toxic chemical and the period of exposure. Exposure to lesser amounts of a chemical over a longer period can be less damaging because the liver's capacity to detoxify may not be overburdened and there may be more opportunities for repair. Interaction with other chemicals that are processed by the liver can increase the toxicity of a chemical. For those with liver damage from any cause, it is important to avoid alcohol, medications, and chemicals that can increase the amount of damage. Consumption of alcohol has been shown to increase the toxic effects of CCl₄.

Fortunately, in most cases of chemical injury to the liver, improvement will occur after removal of the chemical. Even in the case of chronic liver disease, improvement can occur. The liver is the only organ in the body that can regenerate itself.

Kidney problems

There are two kidneys in the body; these organs filter the waste products from your blood. The waste products may come from the normal breakdown of active tissues and food. The kidneys will also filter the metabolites from liver detoxification of chemicals or break down by-products and allow these metabolites to be excreted in the urine. The kidneys can metabolize some chemicals, but this is a minor role compared to the liver. For both TCE and CCl₄, the kidneys filter the metabolites that are excreted in the urine and also are involved in some direct metabolism of these chemicals. Although people in the communities affected by Conrail were

exposed to lower doses of the individual compounds than those associated with exposure in the workplace or in animal studies, sensitive individuals, those exposed to high levels of both compounds, and those who also had occupational exposures could have experienced effects on the kidney.

Damage to the kidneys occurs when the filtering units inside the kidneys are injured or poisoned. About 20 million people in the United States have some degree of impaired kidney function. While two kidneys provide for excess capacity for processing blood, a person with less than 25% of their capacity will have serious health problems. High blood pressure and diabetes are the two leading causes of kidney damage. Hereditary and congenital diseases, trauma or injury, and certain poisons are other causes of kidney disease. Acute TCE poisonings have not caused appreciable effects on kidney function; some chronic studies on laboratory animals have shown some mild to moderate effects. Both the kidneys and liver are considered sensitive target organs for exposure to CCl₄. However, it takes a larger dose to affect the kidney than it does to affect the liver.

Minor damage to the kidneys can be repaired over time by the body to restore the working capacity. Some damage is too severe and will result in a permanent loss of kidney function. However, maintaining good blood pressure and diabetic control and avoiding chemicals that damage kidneys, such as over the counter pain medicine, some drugs, and toxic chemicals, may slow the progression or prevent additional damage to these organs. A few studies on nonfatal cases of CCl₄ ingestion have shown that renal function usually returns to normal.

Heart Disease

There are many diseases that affect the heart and circulatory system including high blood pressure, coronary artery disease, congestive heart failure, enlarged heart, arrhythmias, and valve defects. Some of the heart diseases are very common; over 50 million Americans have high blood pressure and some 7 million Americans have coronary artery disease. Risk factors for these diseases include age, heredity, race, smoking, physical inactivity, obesity, high cholesterol, and diabetes. At Conrail, the unborn child was at greatest risk of having heart problems from exposure to TCE, but other people, as previously described, might have experienced a specific type of heart problem as a result of exposure.

Exposure to certain chemicals can also affect the heart. Generally, there have not been many cardiovascular changes associated with exposure to TCE or CCl₄, especially when levels are below those which cause marked damage to the liver and kidneys. Arrhythmias, a change in the regular beating pattern of the heart, have been found in some cases with high acute inhalation or ingestion exposures to organic solvents such as TCE and CCl₄. Arrhythmia was seen in workers who inhaled TCE at levels greater than 15,000 parts per billion. Arrhythmia that resolved was seen with ingestion of 200 to 500 milliliters of TCE. The level of CCl₄ associated with arrhythmia is less clear, and may be dependent on whether there is already severe liver or kidney damage. Changes in blood pressure and dilation of the heart have sometimes been observed with high CCl₄ exposure, but this appears to be a secondary effect from kidney damage or central nervous system effects. Although there are no conclusive studies on humans, congenital heart defects were seen in animal studies on TCE exposure during pregnancy; this relationship to birth defects is discussed in more detail in Appendix 5.

Fibromyalgia

Fibromyalgia is a common rheumatoid disorder (not involving the joints) characterized by fatigue and achy pain, tenderness, and stiffness of muscles, ligaments and tendons. It is estimated that 3–8 million people in the United States are affected by this chronic condition. Some people with fibromyalgia have been found to have changes in some brain chemicals related to pain.

The cause of fibromyalgia is unclear but is probably due to contributions from several factors. Some of the triggers or leading events in the development of fibromyalgia include sleep disturbances, injury to the upper spinal region, viral or bacterial infection, psychological stress, and hormonal changes. Because of the crossover of symptoms between fibromyalgia and chronic fatigue syndrome, there has been some interest in the relationship of these disorders to exposure to environmental contaminants because environmental allergy is one proposed cause of chronic fatigue syndrome. So far, there is no evidence that supports a chemical cause of fibromyalgia. We cannot draw any conclusions about whether exposure to contaminants from Conrail contributed to development of fibromyalgia.

Polyneuropathy

Polyneuropathy refers to damage to multiple nerves that are outside of the brain or spinal cord. The damage can result in symptoms of weakness, sensory loss, and/or impaired reflexes. Polyneuropathies can occur from a variety of causes including hereditary factors, metabolic disorders, inflammatory responses, and adverse drug reactions. There are also some industrial chemicals that are found in occupational settings or in the environment that are linked to the development of toxic neuropathies. With chemical toxins, the severity of the neuropathy is usually related to the amount of chemical the person contacted. Unless the nerves have been severely damaged, usually there is gradual improvement after removal of the toxic agent.

Neither TCE nor CCl₄ are known to cause damage to peripheral limb nerves. Both TCE and CCl₄ have an anesthetic action, so they depress the central nervous system; ingestion may result in headache, weakness, lethargy, and confusion. TCE and its degradation products have been associated with trigeminal nerve neuropathy (the 5th cranial nerve) and, to a lesser extent, nerves that are involved in facial and eye muscle movement. The trigeminal nerve is involved in signaling sensations of touch, pain, pressure, and temperature from the face and in movement of chewing muscles. Some people exposed to TCE are found to have a decrease in blink reflex and eye closure time; however, whether these changes truly cause harm has not been determined. People exposed to TCE from Conrail might have experienced some of the eye effects, but the polyneuropathy was not likely from their exposure.

Child Health Considerations

Children who live near hazardous waste sites often have greater exposure and greater potential for health problems. For the Conrail site, children were considered the most sensitive population. We reviewed health studies for possible harmful effects for children exposed to CCl₄ and TCE; findings are noted in this public health assessment. ATSDR concludes that, in the past, children were likely exposed to those chemicals through contaminated well water used for drinking,

mixing formula, bathing, and by breathing the compounds as they volatilized from the water into the air. Some children may have slightly higher inhalation exposures if they also breathed vapors from the groundwater plume that entered their home. Children, including infants, were put at-risk for both serious and mild adverse health effects. Since the late 1980s, children supplied with city water or safe private well water are not at-risk for adverse effects. On the basis of available information, children are not currently exposed to harmful drinking water or indoor solvent vapors from the Conrail site.

We know from health studies that unborn babies and newborns exposed to these chemicals at the concentrations observed for the Conrail area have potential to experience adverse health effects. The possible health effects vary by type and severity and include non-life threatening or serious health effects. Examples of non-life threatening effects include slightly lower birth weight, skin rashes, mild liver effects, and mild respiratory problems. Serious effects include life threatening birth defects such as severe neural tube defects or certain heart defects. Disease tracking is not typically done for many adverse effects. We examined the available state disease data for the two zip codes containing Conrail neighborhoods. We found a small increase for some adverse birth outcomes that may or may not be related to mothers' exposures during pregnancy to Conrail-related contamination. Cancer incidence and mortality data, which include information on childhood cancers, were analyzed, and the results appear in Appendices 8 and 9. We did not have specific information on whether the mother or child was exposed to chemicals in the Conrail area and whether other cancer risk factors, such as infections or genetics, played a role in causing those cancers.

Because of exposure to CCl₄ and TCE, ATSDR is interested in discussing with state and local health officials and the community the feasibility of and interest in conducting a research study for child health effects. If done, this study would be a separate project and would possibly include children who were exposed to similar contamination from other local waste sites and water supply systems.

Conclusions

1. At present, no one is known to be exposed to contaminants in the area near the Conrail site at levels of health concern. Therefore, the site currently poses no public health hazard.
2. TCE and CCl₄ were detected in water from private drinking water wells at concentrations that exceeded EPA's drinking water standards by 1,000-fold or more. In the past, people were exposed to a wide range of levels of chemicals from the Conrail site. The following conclusions apply to those concentration ranges:
 - For people who were exposed to over 300 ppb of TCE or over 3,000 ppb of CCl₄, exposures posed a *public health hazard*. This conclusion is based on evidence that TCE exposure at these levels has been associated with specific birth defects. Although the data are inconclusive, there is a concern that women exposed to the highest levels of TCE during pregnancy were at risk of having children with developmental effects, particularly a type of heart defect. Women exposed to those

- levels of CCl₄ were at greater risk of having children with lower birth weights. Adults exposed to those levels were at greater risk of having liver damage. There is also evidence that long-term exposure to these TCE levels may have posed a greater risk of developing cancer, primarily lymphoma or leukemia.
- For people exposed to TCE and CCl₄ in drinking water at slightly lower levels (less than 300 ppb, but greater than 100 ppb), this exposure may have also posed a *public health hazard*. Although the potential for developing adverse health effects from exposure at this level was less than that for people exposed to the higher concentrations, long-term exposure at these levels of contamination could have resulted in similar effects, especially for some types of cancer.
 - For people exposed to TCE and CCl₄ in drinking water at levels from 30 to 100 ppb, the site posed an *indeterminate public health hazard* because of uncertainties in assessing the adverse health effects at these levels of exposure. This uncertainty is based on the limitations of existing studies evaluating the impact of exposure in this range of concentrations. There are no data evaluating health effects below 30 ppb.
 - For people exposed to both TCE and CCl₄, the risk of experiencing health effects was greater than for those people exposed to only one of the chemicals present in their drinking water. That is because TCE has been found to enhance the toxicity of CCl₄. The risk was greatest for people who had 1,000 ppb or more CCl₄ in their water. People with a combination of CCl₄ and TCE at levels at or below 5 ppb had little or no risk of experiencing health effects.
 - No health effects are likely to occur from exposure to levels of TCE or CCl₄ in drinking water below 5 ppb, which is the federal drinking water standard for each compound.
 - The additional exposure to CCl₄ in indoor air at detected levels did not add substantially to overall exposures for those people who also used contaminated drinking water. Those who breathed CCl₄ in their indoor air at levels greater than 3.0 ppb by volume, but were not exposed to contaminated drinking water, had a small increased risk of developing cancer as a result of their exposure. ATSDR stated in a health consultation that the 3.0 ppb by volume action level was appropriate for areas of buildings that were infrequently occupied, but not necessarily appropriate for living spaces. ATSDR also said that other buildings could be impacted in the future.

Conclusions are based on evaluation of exposure to TCE and CCl₄ found in drinking water supplies and indoor air in neighborhoods affected by Conrail. As described in our exposure assumptions, people who worked with those chemicals or who were exposed to those chemicals in other ways would need to evaluate their total exposure to determine whether they might be harmed.

3. The fact that the contamination that is already in the neighborhoods northwest and north of the site will remain until the contaminants degrade naturally has raised concerns about future exposures. Degradation of the contaminants could take several decades. Future exposures can be avoided through enacting the following measures:
 - Vapor extraction or mitigation systems can be installed in homes that are over the contaminated groundwater, and developers of new buildings can follow plat

restrictions regarding installation of these systems in new buildings. The systems have proven effective for preventing exposures through vapor intrusion.

- Safe, affordable water available to all people residing in the contaminated areas will minimize the likelihood that people will install wells that might produce contaminated drinking water. Enforcing deed restrictions on well drilling in the contaminated area will help discourage new well installations. Providing information to new residents about the contamination and how they can safely live in the community will also help prevent any future exposure.
4. Birth certificate data from zip codes 46516 and 46561 along with cancer mortality data from zip code 46516 suggest that adverse health outcomes might be slightly elevated. For this analysis, no conclusions can be made about exposure to Conrail site-related contaminants and the adverse health outcomes because we cannot distinguish between those exposed versus those not exposed. Other risk factors for people residing in zip code 46516 could be contributing to these slightly elevated rates. To determine whether the adverse health outcomes occurred more in the Conrail contaminant-exposed people than in the unexposed people residing in those zip codes would require time and resource intense data gathering, technical reviews, and analyses.

Recommendations

1. Ensure that future exposure is prevented by enforcing:
 - Deed restrictions that prohibit private well drilling within the contaminant plumes
 - Building codes that require new construction to have vapor mitigation systems installed.
2. Continue planned long-term monitoring to assess migration of vapors into indoor air. Provide vapor mitigation systems as needed and expand the investigation as needed.
3. Provide information to area residents, especially new residents, about ways to avoid or minimize exposures to area groundwater and soil gas contamination.
4. Determine the feasibility of conducting a health research study.

Public Health Action Plan

ATSDR develops public health action plans to give people information about who will implement recommendations and to provide time frames for when the actions will be taken. At Conrail, some public health actions have already been completed that were important to stop exposure to contaminants. The actions that were taken include providing safe water for those who had contaminated wells and installing vapor mitigation systems on buildings in the area that contained CCl₄ at levels over 3.0 parts per billion by volume. Additionally, many local health care providers and area residents have been provided information about the Conrail site and the exposures that have occurred as a result of contamination from the site.

Appendix 1 describes actions completed. Further recommendations have been made. Table 16 provides information on how the recommendations will be implemented.

Table 16: Public Health Actions to be Implemented

Public Health Action	Who Will Implement the Action	Time Frame for Implementation	Desired Outcome When Implemented	Public Health Impact
Enforce well drilling deed restrictions	Elkhart and St. Joseph County Zoning Commissions	Immediately	No private wells will be drilled in the contaminated areas for any purposes	No exposure to contaminated well water through ingestion, inhalation, or dermal contact. St. Joseph County has a program, and Elkhart County is now working on a new ordinance.
Enforce vapor mitigation systems installations on new construction	Elkhart County and St. Joseph County Building Inspectors	Immediately	All new buildings within the contaminated areas will be equipped with vapor mitigation systems	No exposure for occupants of new buildings to vapors from groundwater contaminant plumes. No exposure for occupants of new buildings to naturally occurring radon. Since our 8/3/04 public meeting, newer residents have made local builders aware of their concerns that systems have not been put in new buildings.
Provide vapor mitigation systems in buildings as monitoring indicates and expand area of investigation as needed	EPA with Norfolk Southern	Immediately upon discovery of indoor air CCl ₄ reaching the action level.	All existing structures within the contaminated areas will be equipped with vapor mitigation systems	No exposure for occupants of existing buildings to vapors from groundwater contaminant plumes at harmful levels. No exposure for occupants of existing buildings to naturally occurring radon.
Provide information to area residents, especially new residents, about how to safely live in the contaminated area	Elkhart County and St. Joseph Health Departments and ISDH with community volunteers	On-going	People have information necessary to keep their families safe from contaminants from Conrail	People avoid exposure by using safe water and by installing vapor mitigation systems. Since our 8/3/04 public meeting, newer homeowners have expressed greater awareness to developers and county officials. At least 2 additional real estate companies have requested information.
Explore and determine the level of interest and feasibility for conducting further public health activities	ATSDR with county and state health officials with input from area residents and hospitals	Begin discussions during the public comment period of this public health assessment	Decide on the level of interest and whether county and state health officials envision a role	County and state health officials assist in the design of any future health follow-up activity
Provide more information about exposure to both TCE and CCl ₄	ATSDR	Fall 2004	Determine whether exposures resulted in something other than additive risk. ATSDR's findings were that TCE enhances CCl ₄ toxicity.	Better answer the community's concern about health effects from exposure to both contaminants. ATSDR completed this evaluation and include the finding in this document.

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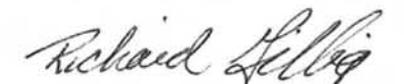
Clayton Koher, ATSDR Regional Representative, provided assistance with planning and logistics of the health care provider education efforts.

Certification

This Conrail Rail Yard (Elkhart) Public Health Assessment was prepared by the Agency for Toxic Substances and Disease Registry. The public health assessment is in accordance with guidelines and procedures present at the time the public health assessment was begun.


Technical Project Officer
DHAC

This public health assessment has been reviewed by the Division of Health Assessment and Consultation, ATSDR. ATSDR concurs with the findings in the public health assessment.


Chief, SPAB, DHAC, ATSDR

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Appendices

Appendix 1: Conrail Rail Yard Action Plan Developed with Community Members in 2000

Action	Agency Responsible	Goal/Objective(s)	Time Line	Date Completed	Impact
Gather birth certificate data for zip codes 46561 and 46516 (years 1967-1995)	ISDH	1. ID any obvious birth defects. 2. ID low birth weight babies (for gestational age). 3. ID address at time of birth.	Data to be pulled by 1/30/01. Date of report will be determined by amount of data needing evaluation	2002/ ATSDR completed an evaluation of the data in 2003	Provides exploratory information for possible adverse birth outcomes in the geographical area that includes the exposed population.
Determine whether site-specific information can be teased out of TCE subregistry data	ATSDR	1. ID any pattern of reported health effects specific to this community.	Request sent to Ginger Gist 11/22/00. Report on results by 1/30/01.	1/30/01 DHS reports that they cannot, because of confidentiality policy, do this.	Community request cannot be granted because of confidentiality policies. For those people who are included on the TCE subregistry, their privacy is safeguarded as promised.
Provide Health Education to local health care providers	ATSDR, ISDH, Elkhart County Health Department, St. Joseph County Health Department and CLEAN	1. Provide health care workers with information on taking case histories. 2. Provide health care workers with information on exposures and possible health effects. 3. Provide health care workers with information on tests that might be applicable.	ISDH Packages to be ready by 1/30/01.	Example package shown at 2/7/01 meeting. Education presentation completed in May 2002.	Health care providers will be better able to evaluate possible exposure-related health effects and monitor patients exposed to contaminants for plausible health outcomes.
Provide chemical and site-specific fact sheets to the community	ATSDR, ISDH, Elkhart County Health Department, St. Joseph County Health Department, and CLEAN	1. Provide site information to existing and new residents. 2. Provide chemical-specific information to existing and new residents.	ISDH Packages to be ready by 1/30/01.	Example package provided at 2/7/01 meeting. CLEAN and Elkhart County Health Department sent out periodic news letters. Elkhart and St. Joseph County Health Departments completed educational materials in 2002.	Community will be better aware of what is known about their exposure and how to discuss their exposure with their health care providers.
Conduct survey of impacted community	CLEAN with Elkhart County Health Department assistance.	1. Gather health outcome information in an organized manner to present to health agencies. 2. Provide information on exposure levels and dates of exposure. 3. Ensure all affected community members are represented and have an opportunity to express their concerns.	1. Meet with larger community to present survey option week of 1/15/01. 2. If community agrees, develop the survey by first week of Feb. 2001.	Met with larger community 2/7/01; those present agreed and contributed to draft survey.	Affected community members played an active role in participating in the public health assessment process and contributed valuable information to the process.
Gather private well data and plume map from EPA	ATSDR	1. Map the plume. 2. Identify levels of exposure and contaminated well locations.	12/30/00	EPA provided information in Dec. County has additional information. First map completed 2/03.	Provides exposure data and helps map location of exposed population for any possible health follow up.

ISDH = Indiana State Department of Health
 CLEAN = Conrail Rail Yard activist group
 TCE = trichloroethylene

Appendix 2

Conrail Superfund Site Community Education Project (CD ROM—see inside back cover)
Conrail Superfund Site, Elkhart County, Indiana (Community education pamphlet)
A Community Assessment of the Health Education Needs of the Community (Phases I and II)

Questions from residents of the Conrail Superfund site.

Is there a link between site contaminants and illness?
So far no direct link has been shown between exposure and illness. An informal health study was started in late 2000 but is not yet complete.

Do toxin problems ever skip a generation? What percentage of prenatal health issues can be attributed to exposure to these chemicals?

There is no current scientific information available to answer these questions in regard to exposure to TCE and carbon tetrachloride.

Will my children pass on health problems to their children living in the area that has been contaminated for so long? Long-term studies have not been conducted that would provide an answer to this question.

Is there a possibility of contamination build up in the household plumbing and if so, could this build up break away in small amounts and pose a health risk?

No evidence was found that the chemicals build up in pipes. The chemicals are volatile, so if the chemicals were not released directly in the water, they would have evaporated by now.

What is the quality of municipal water?

Very good. You may get current water quality information from your local public water utility company. Ask your utility company where you can review the information.

How is the air pollution (vapors) going to affect our lives in the future?

Public health actions that have been taken to reduce or prevent exposure, along with the venting systems installed in residences with higher vapor levels, should prevent residents from being exposed to harmful levels of these chemicals in the future. The human body metabolizes and rids itself of these solvent compounds rather quickly (typically in hours, not days), scientific literature indicates that any possible health effects would have happened soon after exposure, not years later.



Environmental Health Services Division

4230 Elkhart Rd
Goshen, IN 46526

Phone: (574) 875-3391
Fax: (574) 875-3376

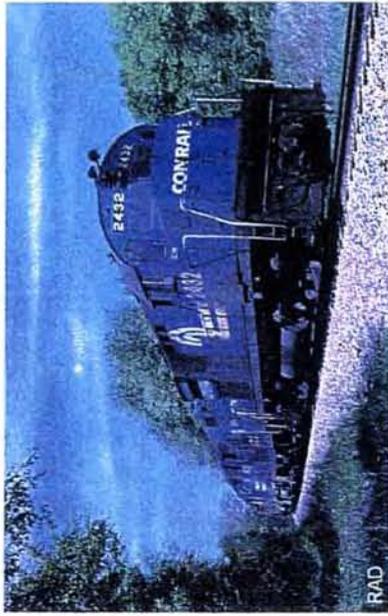
References and more information:

www.atsdr.cdc.gov
www.atsdr.cdc.gov/tfacts19.html
www.atsdr.cdc.gov/tfacts30.html
www.epa.gov/ebpages/cleasuperfund.html

City of Elkhart Public Works and Utilities
1201 S Nappanee Street
Elkhart, IN 46516
Phone: (574) 293-2572

Funding from the National Association of
County and City Health Officials

Conrail Superfund Site Elkhart County, Indiana



Location, Contaminants and Questions



The boundaries of the Conrail Superfund site include but are not limited to: Baugo Creek in St. Joseph County to State Road 19/Nappanee Street, Saint Joseph River South to Old US 33/Norfolk Southern rail yard.

What is a Superfund site?

In the past, some hazardous wastes were dumped on the ground, in rivers, or left out in the open. As a result, thousands of uncontrolled or abandoned hazardous waste sites were created. These sites pose threats to public health and our natural resources. The United States Environmental Protection Agency (USEPA) regulates these sites through a law known as Superfund. Superfund locates, investigates, and cleans up hazardous waste sites throughout the United States to protect people and the environment, and return the land to productive use.



How did this area become a Superfund site?

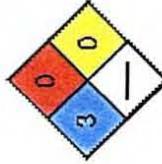
Numerous complaints were received between 1962 and 1986 regarding oily discharges from the railroad and spills of products such as diesel fuel, hydrochloric acid, caustic soda and a variety of petroleum-related substances. The complaints included reports that track cleaning substances and engine degreasers were used and disposed of at the rail yard. In June of 1988 the site was proposed for inclusion on the National Priorities List (NPL) after the identification of two well-defined groundwater contamination plumes: Trichloroethylene and Carbon Tetrachloride. The NPL scores sites based on the amount of contamination and risk to the population surrounding the site.

Trichloroethylene (TCE)



Trichloroethylene is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids and spot remover. It may be present in underground water sources as a result of the manufacture, use and disposal of the chemical. Breathing and/or drinking large amounts may damage the liver, kidneys and nervous system.

Carbon Tetrachloride



Carbon Tetrachloride is a manmade compound that does not occur naturally. It is a clear liquid with a sweet smell that can be detected at low levels. Exposure to Carbon Tetrachloride results mostly from breathing air, drinking water, or coming in contact with soil that is contaminated with it. This is most likely to occur around hazardous waste sites or in the workplace. In people, exposure to very high amounts of Carbon Tetrachloride can damage the liver, kidneys, and nervous system.

Past:



To eliminate the potential health threat of contaminated water, between September of 1994 and December of 1996 municipal water was extended to 1135 homes in the Superfund site. Thirty-five homes, for different reasons, refused to accept the city water supply. New homes built in the area are required to connect to municipal water thus eliminating exposure to contaminants.

Present:



Contamination in the Conrail area has been identified using monitoring wells for groundwater and soil gas vapors. The USEPA, Indiana Department of Environmental Management and consultants for Conrail continue to work on defining the best locations for systems to remove the contamination. Special emphasis is being placed on areas in the Conrail yard and the Osceola drag strip properties. Vapor extraction systems have been required for all new home construction in the affected areas as a safeguard against future health problems.

Future:



Installation of wells to remove contaminated groundwater and vapors moving through the soil into homes will proceed. This system will allow for the treatment of contamination in place. Areas which presently have minor amounts of contamination will be allowed to naturally heal. This process is called "natural attenuation" which means the bacteria in the soil and groundwater will breakdown the chemicals and make them harmless. It may take 20 or more years for the contamination to be removed or treated to more acceptable levels.

**A Community Assessment of the
Environmental Health Education Needs of the Community.**

**Conrail Superfund Site
Elkhart County, Indiana**

A Project funded by the Elkhart County Board of Health
and
The National Association of County and City Health Officials

Phase I, August 2001 – February 2002

Prepared by

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Kim Stackhouse, Community Representative

April 24, 2002

Abstract

The Conrail Railyard in Elkhart County was opened in 1956 as part of New York Central Railroad operations. It continued operations as a subsidiary of the Penn Central Transportation Company until 1976 when operations were transferred to Consolidated Rail Corporation (CONRAIL). Numerous complaints were received between 1962 and 1986 regarding oily discharges from the railroad and spills or releases of products such as oil, diesel fuel, hydrochloric acid, caustic soda and a variety of petroleum-related substances. The complaints included reports that track cleaning substances and engine degreasers were used and disposed of at the railyard.

Investigations at the site indicated a large area of Trichloroethylene (TCE) contamination. Later, high concentrations of Carbon Tetrachloride (CCl₄) were also documented. Bottled water and carbon filters were provided to residents in the late 80's after TCE concentrations as high as 5850 parts per billion (ppb) were identified in the drinking water. Concentrations of CCl₄ were subsequently observed as high as 117 ppb.

In June of 1988 the site was proposed for inclusion on the National Priorities List (NPL) after the identification of two well-defined contamination plumes. Between September of 1994 and December of 1996 municipal water was extended to 1135 homes in the area. Thirty-five homes, for different reasons, refused to accept the municipal water supply. Gradually these homes, either due to a change of owner or change of heart by the landlord, are being connected to the municipal supply.

A citizens group, known as the "Citizens League for Environmental Action Now" (CLEAN) has kept community interest in the site alive. CLEAN requested and received several Technical Assistance Grants (TAG) from the EPA to monitor the process and to keep residents informed. Through CLEAN, many anecdotal reports of unusually high numbers of illness and disease were reported to both the Agency for Toxic Disease and Substances Registry and the Elkhart County Health Department. These reports ultimately facilitated, with the help of CLEAN and the residents, a preliminary health assessment in the site. Through that assessment, 751 questionnaires were received from a total population of approximately 1200 homes. The initial review of the basic data received from the surveys indicates some potential for a higher incident of chronic disease than one might expect in a small population. That data is still under review and no conclusions have been reached to date.

The residents primary concern is that the lessons of this site continue to be shared with current residents. They are also concerned that the medical community be kept abreast of the survey findings as they may relate to their personal health care. A third concern is that new residents of the area be given the facts about the site and the knowledge to protect their families.

Support from the Agency for Toxic Substances and Disease Registry (ATSDR) and the NACCHO grant have allowed us to begin these efforts. The Environmental Health and Medical Health needs of this site will continue to unfold as more is learned about the site and the health effects of the contamination. This will require a long-term commitment to residents of the site if we are to be successful in meeting the citizens' request.

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List of Attachments:

1. NACCHO Forms I, III, and V
2. List of businesses in the defined area.
3. List of Day Care Businesses
- 4 Clean News Letter
5. Project Newsletter
6. Preliminary Health Assessment Tool
7. Letter to Parents of Baugo Community School Children.
8. Preliminary Results of the Health Assessment.

List of Figures

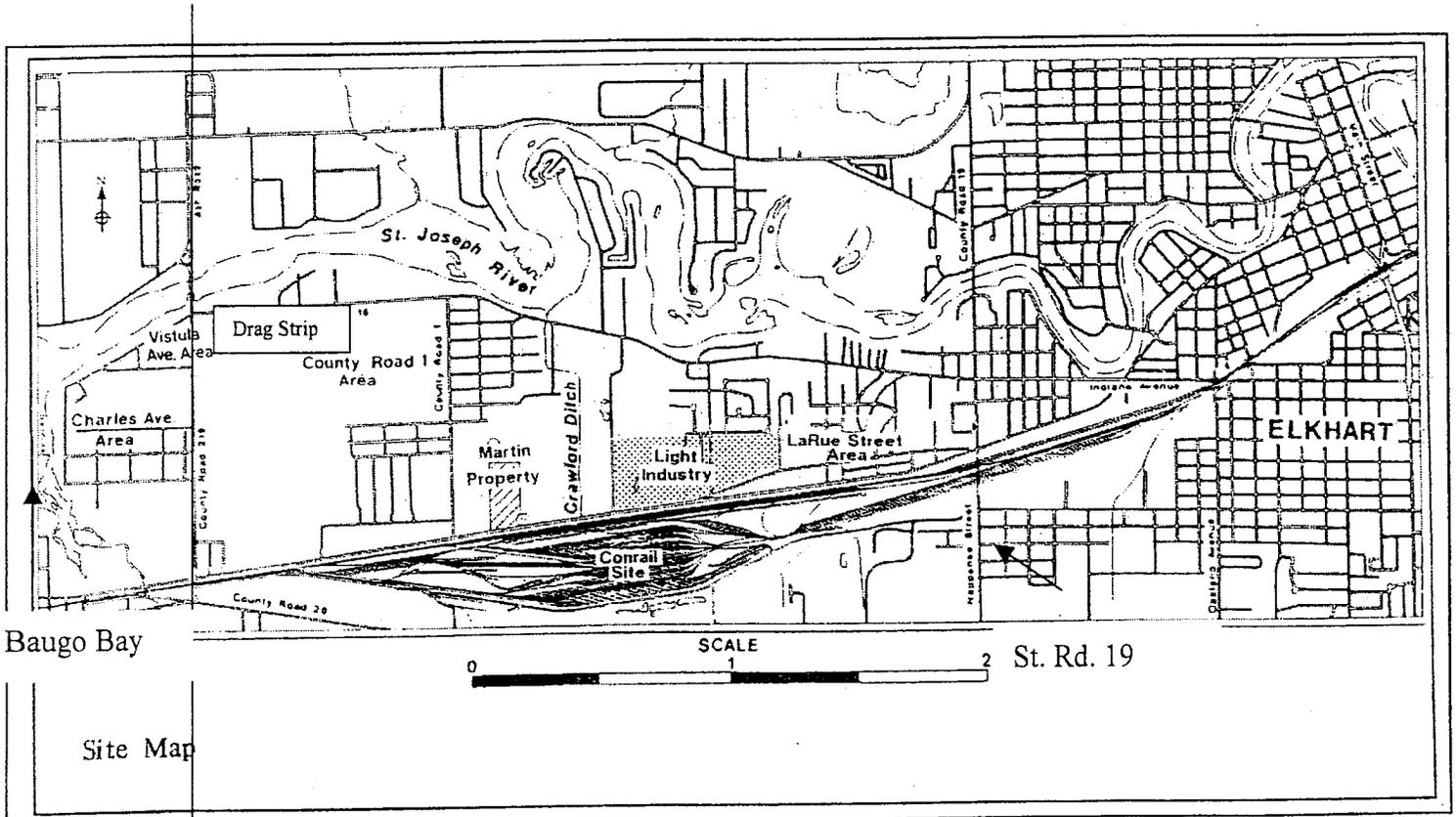
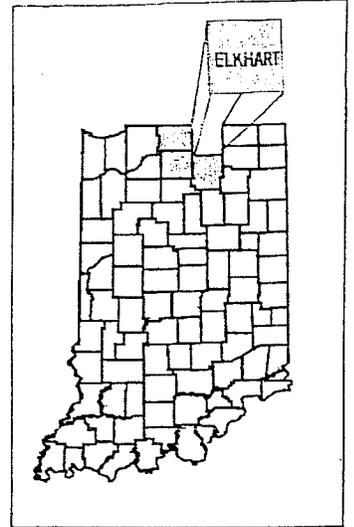
1. Location of Plumes
2. Proposed remedy

Site Location

Elkhart County, Indiana is located in North Central Indiana and adjoins the State of Michigan. The Conrail site is located directly west of the City of Elkhart and extends through Baugo Township into St. Joseph County to the West.

In area, the site covers approximately 2,500 acres in Elkhart and St. Joseph Counties. The site is bounded to the north by the St. Joseph River, to the West by the St. Joseph River and Baugo Bay, to the east by State route 19 (Nappanee Street) and to the south by the southern boundary of the Conrail railyard property.

The railyard occupies approximately 675 acres of the-declared site. The remainder is a mix of commercial, manufacturing, retail and residential properties. The residential properties exits primarily north of the US 33 commercial corridor.



Site Map

St. Joseph County

Elkhart County

Site History

The site became an active Railyard in 1956 as part of the New York Central Railroad and later operated as a subsidiary of the Penn Central Transportation Company until 1976. In 1976 operations were transferred to Consolidated Rail Corporation (Conrail) who operated the yards until June of 1999 when ownership changed to Norfolk and Southern Corporation.

The railyard has grown into one of the largest, in terms of volume, in the United States. From 1962 into 1968 numerous complaints regarding oil discharges from the railyard into the St. Joseph River via Crawford Ditch were filed. From 1976 to 1986 spills and releases of oil, diesel fuel, hydrochloric acid, caustic soda, and various petroleum-related substance occurred at the site. Reports also indicate that a track cleaning substance and engine degreasers were used and disposed of at the railyard.

The two primary contaminants, Trichloroethylene (TCE) and Carbon tetrachloride (CCl₄), and their source areas at the site are have been well documented. The TCE appears to be the result of an undocumented tank car releases. The exact nature of the CCl₄ release has not been clearly documented, although Environmental Protection Agency (EPA) records describe a release of approximately 16,000 gallons of CCl₄ from a damaged tanker car that may have occurred in the late 1960's.

A third site, a drag strip, is under investigation but at this time there is no available documentation in regard to the nature or volume of releases at that site.

After detecting TCE in a residential well in 1986, at the corner of CR1 and Tower Road, the U.S. EPA became involved and began providing bottled water to affected residents. Whole house filters were then provide and remained in place until 1994 when municipal water was extended to a portion of the site as directed by the interim Record of Decision and later in the final Record of Decision.

The U. S. EPA placed the site on the National Priorities List (NPL) on August 30, 1990. A remedial action/feasibility study was started by the EPA in 1988 and continued in three phases through 1994. Conrail was required to conduct soil gas studies and subsurface investigation to aid in determining the location and extent of the contamination. In total, 69 monitoring wells and 143 soil borings were drilled between 1988 and 1994.

In 1991 the EPA and involved parties achieved a 1991 Interim Record of Decision, in July of 1992 an administrative order, in April of 1994 a draft Final Record of Decision, and in September of 1994 a Final Record of Decision that included the following:

1. Extension of municipal water to all residents within the Site;
2. Additional source investigations and remediation;
3. Soil vapor extraction of TCE vapors in the south-central source area and air sparging in the saturated zone in the CCl₄ source area;
4. Ground water extraction and treatment to achieve ground water standards through- out the plumes, by emphasizing remediation of "hot spots".

Between 1994 and 1997 municipal water was extended to the entire site and effectively removed the drinking water route of exposure.

On November 11, 1997 American Premier Underwriters (APU) and Conrail entered into a Consent Decree with the EPA. The affect of the Consent Decree was to allow APU and Conrail to apply for a technical impracticability waiver that would allow for the natural attenuation or natural flushing within the aqueous portion of the plumes identified in the Record of Decision. The consent degree also provides that if EPA allows the technical waiver that APU and Conrail will investigate the potential for an additional source at the Drag Strip and undertake a response action at the Drag Strip.

In 1998 soil-gas monitoring and monitoring wells were completed in the Drag Strip location. No Dense Non-Aqueous Phase Liquids were located but tests seem to confirm, from CCl₄ concentrations in the monitoring wells, that a potential source for the CCl₄ may be on the Drag Strip property.

At the request of the residents, several phases of Vapor Monitoring for the presence of TCE and CCl₄ were conducted in local structures, both residential and commercial. The results of the study showed CCl₄ vapors in structures in the Vistula Avenue area situated down gradient (northwest) of the Drag Strip and between the Conrail Yard and the St. Joseph River. Vapor extraction systems were installed in each of the six impacted structures.

The residents and the St. Joseph River Basin Commission both expressed concerns for the aquatic environment of the St. Joseph River due to the impact of the contaminant plume intersecting the river (Figure 1). A Benthic Macroinvertebrate Study of the River was conducted in two phases. The first confirmed that TCE is discharging to the River from a location just east of the Ash Road Bridge to a location about 0.5 miles downstream (west) of the bridge. Carbon tetrachloride and chloroform, a CCl₄ breakdown product, are discharging to the river in a much narrower area completely contained within the TCE discharge area.

The second phase of the study (1999) was to determine what, if any, impact the chemicals were having on the Benthic Macroinvertebrates. The result of that work did not show an appreciable impact on the Benthic environment. Within the St. Joseph River community those findings are somewhat controversial and APU and Conrail will perform follow-up studies.

In 2001 installation of the barrier-treatment well tests were started to determine the potential for success of the proposed final remedy under the technical waiver (figure 2). Those tests have continued into 2002 and it is projected that a system of barrier-treatment wells will be installed, to stop the flow of contaminants out of the railyard, by years' end. A system of monitoring is proposed in the waiver to determine the success of natural attenuation in the plume areas down gradient of the Conrail yard.

Residents in the site continue to be concerned that they have been forgotten, that the EPA and the PRP's are in a foot-dragging mode and that even though municipal water has been provided the problem of the contamination and its discharge to the river continues. They also have a

secondary concern that their health is being impacted by the air contamination caused by diesel smoke from the locomotives.

Community

Elkhart County is a mix of agriculture, commercial, manufacturing, and assembly industries. The area is perhaps best known for three things, Miles Labs, now Bayer, which manufactures “One a Day Vitamins” and “Alka-Seltzer” among several other products, the recreational vehicle manufacturing industry, and the manufacture of musical instruments. These are three of the largest employers outside of Government. The county has a strong agricultural background, with many farms now owned by fourth and fifth generation families. Over 65 percent of the land is actively farmed and Elkhart County maintains the distinction of being the largest dairy producer in the state. The County also has a growing Amish culture. The Amish culture, when combined with the musical instruments and recreational vehicles, creates another thriving industry in the county, tourism.

The Conrail Site reflects each of these traits with the exception of the Amish. There are no Amish living within the designated boundaries of the site. There is, however, a mix of commercial, industrial, manufacturing and residential uses in the site. Vacant agricultural land is rapidly disappearing from the site as developers are pressuring to build within the site as a result of the extension of municipal water.

The Site population is characteristic of the rest of the rural portions of the county with a low percentage of cultural and racial diversity. There is however a very diverse mix of economic levels with upscale housing constructed at and near the St. Joseph River Banks and more moderate to lower priced housing closer to the Conrail Yard. Most of the commercial and manufacturing is located on U.S. 33, adjacent to the Rail Yard.

Demographics

The site consists of approximately 1200 homes. This number is now growing with two new subdivisions recently approved by the Elkhart County Planning Commission and a third being proposed. The demographic breakdown is as follows:

Racial Mix	94.4 % White	Age Distribution	
	2.2 % Black – non Hispanic	0 to 5 years	6.4 %
	2.2 % Hispanic	6 to 13 years	16.4 %
	0.21% Native American	14 to 18 years	7.5 %
	0.7 % Asian	19 to 24 Years	4.6 %
Gender is		25 to 44 years	28.1 %
	50.3 % Female	45 to 64 years	24.1 %
	49.7 % Male	65 and Older	12.9 %

Socioeconomic

45 % of the sites population earns less than \$34,000 and 55 % earn greater than \$34,000

Population Density is approximately 2 homes per acre.

Assessment

The community assessment for the Conrail Superfund site has two phases. The first phase was instigated by the CLEAN organization with help from the Elkhart County Health Department, the adjoining St. Joseph County Health Department, and ATSDR. Historically, the residents have been concerned that not much progress has been made toward the resolution or any form of clean up of the contamination that has existed for over 20 years. Perhaps given that it has been 20 years and we are only now looking at a partial remediation of the problem, the residents concerns are well founded.

In September of 2000 the CLEAN organization met with the Health Departments and ATSDR to discuss what could be done to bring some conclusion to the residents concern for the Health Affects of exposure to TCE and CCl₄ and what, if any, impact exposure may be causing in the future. Anecdotally, many of the residents have stories about the cancers and chronic illness that seem unusually high in such a small population.

By late October a preliminary questionnaire was being developed with the help of CLEAN and a team of local residents. On January 13th of 2001 a news release announced the project to the public and sought their assistance and commitment to make this project work. On January 30th the CLEAN organization, with help from the Health Departments, hand-delivered a newsletter to each of the approximately 1200 homes in the impacted area. On February 7th a public meeting was held at the Harley Holben Elementary School, which sits near the edge of the major plume. Representatives of ATSDR, the Board of Health, CLEAN, and CLEAN's technical advisor all made presentations on what a health assessment could and could not do for the community. Community commitment to the project was also gauged and a list of volunteers who would act as block captains, to oversee the door-to-door survey in their neighborhood, was started. It was made clear at the meeting that our goal was not to find a smoking gun but to begin to answer the questions residents have had for a long time.



Gale Godfrey of ATSDR making a point with residents

Health survey moving along

Too soon for any conclusions from Superfund site

By ALYSSA EMORY
Truth Staff

JIMTOWN — Progress has been made on the health survey conducted earlier this year within the Conrail Superfund site, according to a newsletter produced by the Elkhart County Health Department.

But it's far too soon to draw any conclusions about the preliminary statistics, said Bob Watkins, manager of Environmental Health Services at the Elkhart County Health Department.

The survey, a collaborative project resulting from the now-defunct Citizens League for Environmental Action Now, involved the Elkhart and Saint Joseph county health departments as well as the Indiana State Department of Health and the Na-

GROUP FORMED

A community advisory group that will work with local health departments on a health education plan for residents in the Conrail Superfund site is being formed.

All residents living within the site are invited to attend a meeting at 7 p.m. tonight at Harley Holben School, 30046 C.R. 16.

tional Agency for Toxic Substances and Disease Registry, an arm of the Center for Disease Control.

ATSDR analyzed information from 751 community health surveys. The information from those surveys had been entered into a database by the end of July.

The information in the surveys helped identify:

- Households that used contaminated drinking water.

- Types of diseases experienced by individuals in households.

- Concerns about illnesses that might occur as a result of using contaminated drinking water or breathing contaminated air.

Residents were asked 18 open-ended questions that produced statistics that, according to Watkins, should not be used for drawing conclusions about the public health of the site at this point.

The average length of time a resident surveyed had lived in the area was 20 years. Some of the results are:

- 31 percent (92 households) that had their wells tested reported their well tested positive for contamination.

- Of the 92 households that tested positive for contamination, 26 percent reported TCE was found in their wells, three percent reported carbon tetrachloride was found and 21 percent reported both were found.

Chronic illness:

- 42 percent of the households reported someone in their residence had experienced a chronic illness.

- 84 percent all households that had experienced a chronic illness had lived in the study area for more than five years.

- 17 percent of those reporting a chronic illness also reported their well tested positive for contamination.

Birth defects:

- Seven percent of the households reported having a child with a birth defect.

- 90 percent of the households reporting a birth defect had lived in the study area for more than five years.

- 18 percent of those reporting birth defects also reported their well tested positive for contamination.

Deaths:

- 23 percent reported a family member had died in the time they

Please see SURVEY/A6

SURVEY

From Page A3

have lived in the study area.

- 94 percent of those reporting a death had lived in the study area for more than five years.

- 19 percent of those reporting a death also reported their well tested positive for contamination.

- The most frequent cause of death was cancer, followed by heart disease and heart attacks.

Watkins cautioned people not to make any conclusions or assumptions from the data.

"We can draw no conclusions. There can be no conclusions at this point in time. It's not even clear in some cases what we're referring to. This is very preliminary, very raw number data," he said.

Contact Alyssa Emory at ae-emory@elkhart-truth.com

A3

Wednesday,
September 19, 2001
jury.

The Truth
LOCA

Jimtown: Advisory group on Superfund site forming

JIMTOWN — The Elkhart County and St. Joseph County health departments and citizens living within the Conrail Superfund site will meet at 7 p.m. Thursday at Harley Holben Elementary School, 30046 C.R. 16.

The topic of discussion will be the formation of a Community Advisory Group. The health departments are asking residents of the site to work with the departments on a health education plan to help residents understand the site.

All residents living within the site, bordered by the Saint Joseph River on the north, the railyard on the south, Nappanee Street on the east and Baugo Bay on the west, are invited to attend this meeting.

Resident participation is critical to the project's success, according to Bob Watkins, environmental health supervisor at the Elkhart County Health Department.

JIMTOWN

Superfund health education wanted

By ALYSSA EMORY

Truth Staff

JIMTOWN — A group of citizens is committed to working with local and federal officials to create and implement a health education plan within the Conrail Superfund site.

Twenty residents living within the site that covers parts of Elkhart and St. Joseph counties met with health department officials and representatives from the U.S. Environmental Protection Agency and the Agency for Toxic Substances and Disease Registry Thursday night at Harley Holben Elementary School.

"I'm pleased we've got representation from both counties and that they want to continue with it," said Bob Watkins, manager of environmental health services for the Elkhart County Health Department.

The meeting went right up until 8 p.m. when the room fell silent to listen to President Bush speak on television about last week's terrorist attacks on New York and Washington, D.C.

Watkins, along with Elkhart resident Kim Stackhouse, St. Joseph county resident Louis Trost and Tony Mancuso of the St. Joseph County Health Department, attended a conference in August that was the impetus for creating a community advisory group to deal with health education.

Stackhouse told the residents the group received a \$12,000

HEALTH

From Page A3

grant to be used for educating the community about health issues created by the Superfund site and to dispel rumors and misinformation.

Watkins said one of the group's goals is to educate area physicians about the chemicals within the site so that they'll better be able to treat residents who have been exposed to the carbon tetrachloride and TCE in the site.

Other likely goals are to educate area children, particularly those at Harley Holben Elementary, about the history of the site and create a flier for new residents, Watkins said.

The group will meet again in about a month to create more specific goals, he said.

Contact Alyssa Emory at aemory@elkhart-truth.com.

Please see HEALTH/A6

On February 19, 2001 a meeting was held with the volunteers to train them and begin the distribution of the surveys. On Feb 27, 2001 another meeting was held for the public to begin completing the surveys, answer the questions of those that missed the first meeting introducing the project, and train additional volunteers.

The delivery of the survey tool (attachment 6) and the coordination of the volunteers were coordinated by the CLEAN president, Lorna Richard. A printed identification badge was provided to each volunteer that carried the surveys. The Elkhart City Utilities department developed a listing of all properties in the area from their billing records. Each team was then responsible for up to 100 surveys. The Elkhart County Environmental staff was able to do some of the clean-up work as we ended the survey period and were responsible for 125 surveys in the original survey round. On March 5, 2001 the volunteers began the door-to-door surveys. The St. Joseph County Health Department Nursing staff volunteered to carry the surveys to the 300 homes in their portion of the site.

Survey methods used were as follows:

Initial round: face to face surveys completed by the surveyor or
face to face surveys with the written portion completed by the resident.

Second round: Door tags were developed requesting that a representative be called to administer the survey.

Third round: phone surveys were collected with the resident answering the question and the environmentalist from the Health Department completing the written portion of the survey.

At each residence, where the name and address of a previous resident were known, the information was collected. When a name and complete address could be obtained a survey with complete direction for completion of the survey and a self-addressed envelope was forwarded to the individual. Of the 751 returned surveys approximately 35 were from previous residents who had moved from the site.

The pre-established dead line for completion of the survey was May 30, 2001. All surveys were forwarded to the Indiana State Department of Health on June 4, 2001. ATSDR and their contractors reviewed the surveys and submitted the attached raw data and a preliminary report to us on August 29, 2001. A complete analysis and public health assessment report is scheduled for late July or August 2002 (attachment 7).

Residents of the site were notified of the progress and the preliminary data by a newsletter that was hand carried by the CLEAN volunteers in September 2001 (attachment 5). This was the last official act of CLEAN, which was disbanded the next week.

The next step will be to schedule a public meeting for the residents. At this meeting we will share the results of the Public Health Assessment and hope to have a toxicologist on hand to answer health question and the Indiana State Department/ATSDR staff available to discuss how

the public health assessment was compiled. We anticipate this meeting in August or September of 2002.

A separate survey of Railyard workers was proposed and scheduled. The Rail Workers Chief Union representative met with us and helped to schedule two times that the workers could complete the surveys during their normal work shift. Unfortunately, of the hundreds of people who work on the Rail Road, only three filled out the survey. Due to the limited number who responded, the three Rail Road worker surveys were not tabulated.

The second phase of the environmental health assessment started with the September 2001 newsletter announcing the NACCHO project and seeking help and input from the impacted residents (attachment 5). Our first meeting on the Conrail Superfund Community Advisory Group (CAG) was scheduled for September 20, 2001 at the Holben Elementary School. This school has been, and continues to be, the hub for all activities related to the site. We owe a great deal of thanks to the principal and staff of the school for their time and continued support of our activities.

Our CAG membership consists of 11 regular members and up to 20 residents who attend occasionally. At the organizational meeting (September 20, 2001) we explained the project, the project goals, established time lines and began seeking input from the residents. We also made it clear that the project was theirs, that their input was very important and that all suggestions would be considered with all decisions made by consensus.

At our second meeting, on November 1, 2001, we began to collect and discuss suggestions for the Health Education Needs of the site. This was a difficult task for some members still angry about the site and seeking solutions to the contamination problem. Two members stopped coming to the CAG meetings when they found that we were not going to focus on the EPA, Conrail or the potential for law suits.

The third meeting was on December 6, 2001. At that meeting we shared the beginning of a Power Point presentation describing the history of the site. It was agreed that this would be a very useful tool for doing public presentations. We also prioritized and ranked each of the CAG suggestions for the Health Education project. The door was, however, left open for additional suggestions as they were presented. It was also determined that the questions could be divided into classes that would be answered as the project continues. Class I questions/tasks could be worked on now and would be a product for the NACCHO work. Class II questions/tasks could not be answered until the Health Assessment is completed, and Class III question/tasks probably were not appropriate and would not be addressed.

Our fourth meeting was scheduled for January 31, 2002. At that meeting we reviewed additions to the Power Point work and spent the remainder of the session working on demographics. Elkhart County Environmentalists Jennifer Tobey and Erin Hafner reviewed each section of the demographics information package with the CAG and sought their input on information that we either could not find or areas we felt should be reviewed by the residents for accuracy.

Our fifth meeting scheduled for February was cancelled due to an ice storm.

On April 4, 2002 our final CAG meeting of the assessment phase was used to share all of the materials developed to date and to give the residents one last opportunity to suggest additional educational efforts prior to our beginning the implementation phase. No additional meeting was scheduled with the understanding that we would contact the CAG as necessary.

The final CAG recommendations are as follows:

1. Plan to answer the Phase II questions when the Public Health Assessment is complete.
2. Conduct at least one Physicians awareness program to bring local doctors up to date on the site and what exposures have occurred. April 2002
3. Continue to develop the Power Point presentation.
 - a. Conduct at least one presentation for the Elkhart and the St. Joseph County Board of Realtors.
 - b. Conduct at least one presentation for the Elkhart and the St. Joseph County Builders association.
 - c. CD ROMs will then be burned for use, as requested, by the public and made available to all public libraries, government offices, the Board of Realtors and the Builders Associations.
 - d. Develop brochures, to be used by the public, that provide as a minimum the questions developed by the residents and the CAG.
 - e. Develop a second brochure in response to the findings of the Public Health Assessment

What has worked and what has not?

Our largest problem is apathy. As we have said this is a very old site and the residents have been through a lot. With out questions what has worked best is the network of volunteers that CLEAN had organized. Unfortunately that groups founder moved out of the area for health reasons and the organization collapsed after ten years of work. To date no one has stepped up to take on the leadership role.

Initially we seem to get a good response from the printed media articles. As the project move on the returns from that method dwindled. The residents suggested that we get written information into the community. We took their advice and created flyers and posted them at gas stations, restaurants, even in some workplaces, and at the Holben School. That seemed to draw some attention at first but then the response from that method too seemed to decline. Whenever anyone new came to a meeting we added them to our mailing list. In that way we could do a direct mailing to everyone that had shown interest. This seemed to be a good way to

communicate with the residents. We feel it gave them a sense of worth and a feeling that we actually cared about them and what they thought. We will continue to make these mailings as we go forward.

Another problem that leads to the apathy of the site is the time involved with doing anything. We had a great deal of interest in the Preliminary Public Health Assessment and that is born out in the tremendous response we had to our survey. But we finished the actual survey nearly one year ago and the residents think we have forgotten them again because nothing has happened. Even though we made the preliminary results available to them, many feel, that like the resolution of the contamination, we talk about things but nothing ever really happens.

These people have attended so many meetings over the last ten years, with little or no success that getting them to attend is very difficult. We learned early on that if we are to have a meeting we must be taking actions and involve them in the process or they will not come back.

Even though it is a major task, and our volunteer group has dwindled, we will use all of our resources, including the door to door personal contact, to assure we reach all of the community when we schedule the discussion of the Public Health Assessment and when we distribute our educational materials. If we do not then we will be talking to the same twenty or so citizens that somehow have maintained their commitment to get the problems of this site resolved.

Conclusions

This community is worn down. The fight has been going on for so long that some residents have died and most have lost interest. Those that helped with the Assessment project are truly heroes. Most have lost their concern for themselves and are relegated to the fact that they were exposed for several years and what happens, happens. They all have stories about friends who have died from cancer or other illness they attribute to the ongoing contamination, in some cases for 40 years. Designation as a Superfund Site gave them hope, but that has waned as year after year goes by and site cleanup continues to be delayed. Some now understand the difficulty in trying to clean up the site given the extent of the contamination plumes. They are hopeful that something will still be done but really are most concerned that no one else be exposed to the contaminants and that the community not forget that the site is contaminated.

Communication has been two-way for over 10 years. The CLEAN organization, perhaps due to their TAG, was able to gain more information about the site than the Health Department. As of this writing it is still very difficult for the Health Department to get current information on the site or the status of the remediation plans. Since the Assessments began, a free flow of information has continued. Most of our current discussions still revolve around health issues. Occasionally an individual will ask who is going to pay the medical bills and we have to explain that is not our purpose.

The process has given everyone in the Health Department and some community members a better understanding of the problems of the site and a deepened respect for the community leaders who have made it their mission to keep pressure on the EPA to resolve the problems of this site.

Recommendations

Perhaps the greatest mistake or unfortunate problem with regard to this site has been the lack of activity at the personal, educational, and physical level by all levels of government. We know that early on some assumptions were made, by the State and Federal Agencies, which caused the Public Health aspects of the site to basically be forgotten. It is not clear who made those decisions or why, but as a result nothing was done for years even though the residents, through CLEAN, continued to ask for a review of the health concerns of the citizens. To this day it is far too difficult for the local Health Department to gain information about the site or receive copies of reports or even notices of public meetings from the EPA. Given the extent of the contamination that exists these facts seem to be very unacceptable.

Granted, municipal water was extended to the site and removed a pathway for exposure to the residents. Unfortunately, that seems to have led to a lessening of the concern that the State and Federal Government should still have for this site. This is unfortunate because now we know, again only because of the diligence and concern of the residents, that vapors in the basements and homes of the residents are a concern in portions of the site. Unfortunately there is no guarantee this will not become a problem in the remainder of the site. Unfortunately none of us can look into our crystal ball and predict the future, but the seeming lack of concern and the complete dismissal of a second plume area because municipal water has been installed is unfortunate.

A recent change in the EPA's community resource personnel has helped, but this site has had at least five different community resource individuals in the last seven to 10 years. Whether this is a Region 5 problem or an attitude that permeates the EPA is unknown but the inability to gain quick response at this site has grown painfully obvious.

Our recommendation for the area is that both the Region 5 EPA and State of Indiana reassess the role of the community and the Local Health Department when working these sites. We also recommend that the concerns of residents be taken seriously at the beginning of a project by both the EPA and ATSDR and not years later. We also feel that the development of a method to encourage community development at these sites in the early stages would not only facilitate better relations with the community, but should encourage support of the EPA instead of criticism.

In our opinion, if were not for the interest and concern for the site displayed by ATSDR's Gail Godfrey along with others in the agency and their willingness to meet with the community, to discuss their concerns, and provide support for health and educational activities in the site those activities would still not be occurring.

Bibliography

Information for the portions of this report was taken from actual experiences, conversations with "CLEAN" members, the Conrail CAG, and works found in the Public Record by the following companies:

1. His GeoTrans Inc
6 Lancaster County Road
Harvard, M 01451
2. Dames and Moore
644 Linn Street, Suite 501
Cincinnati, OH 45203
3. Ecology and Environment, Inc.
111 West Jackson Blvd.
Chicago, Illinois 60604
4. Groundwater Technology, Inc.
486 Grable Drive
Carmel, Indiana 46032
5. US EPA Interim Record of Decision
- 6.
7. U.S. EPA Record of Decision
- 8.
9. U.S. EPA Consent Decree
10. SGS WRI Report
Thomas Imbirgiotta and Angel Martin
11. USGS WRI Report 97-4204
Leslie D. Arihood and David A. Cohen

** The HIS Geo Trans summary was used in some sections verbatim.

The Conrail/Norfolk-Southern Yard in Elkhart County, Indiana

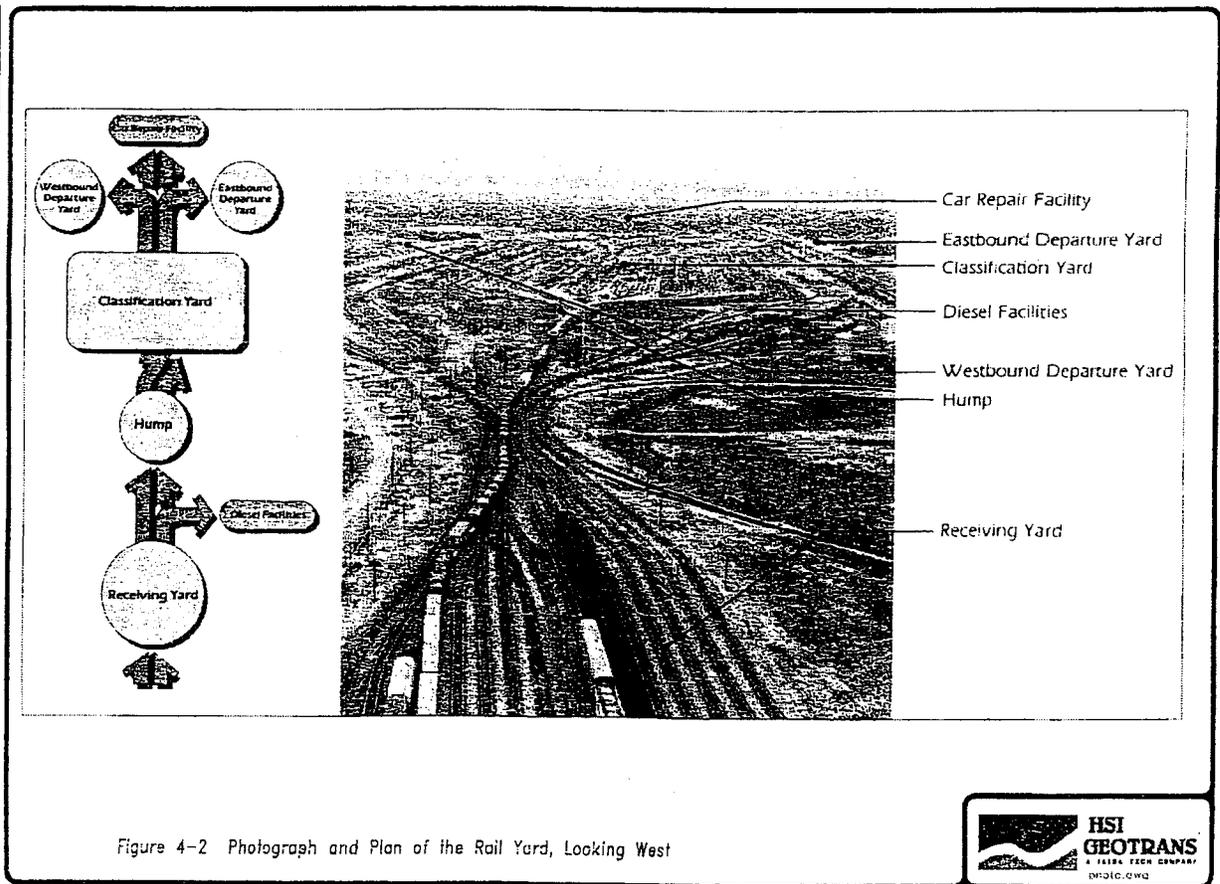
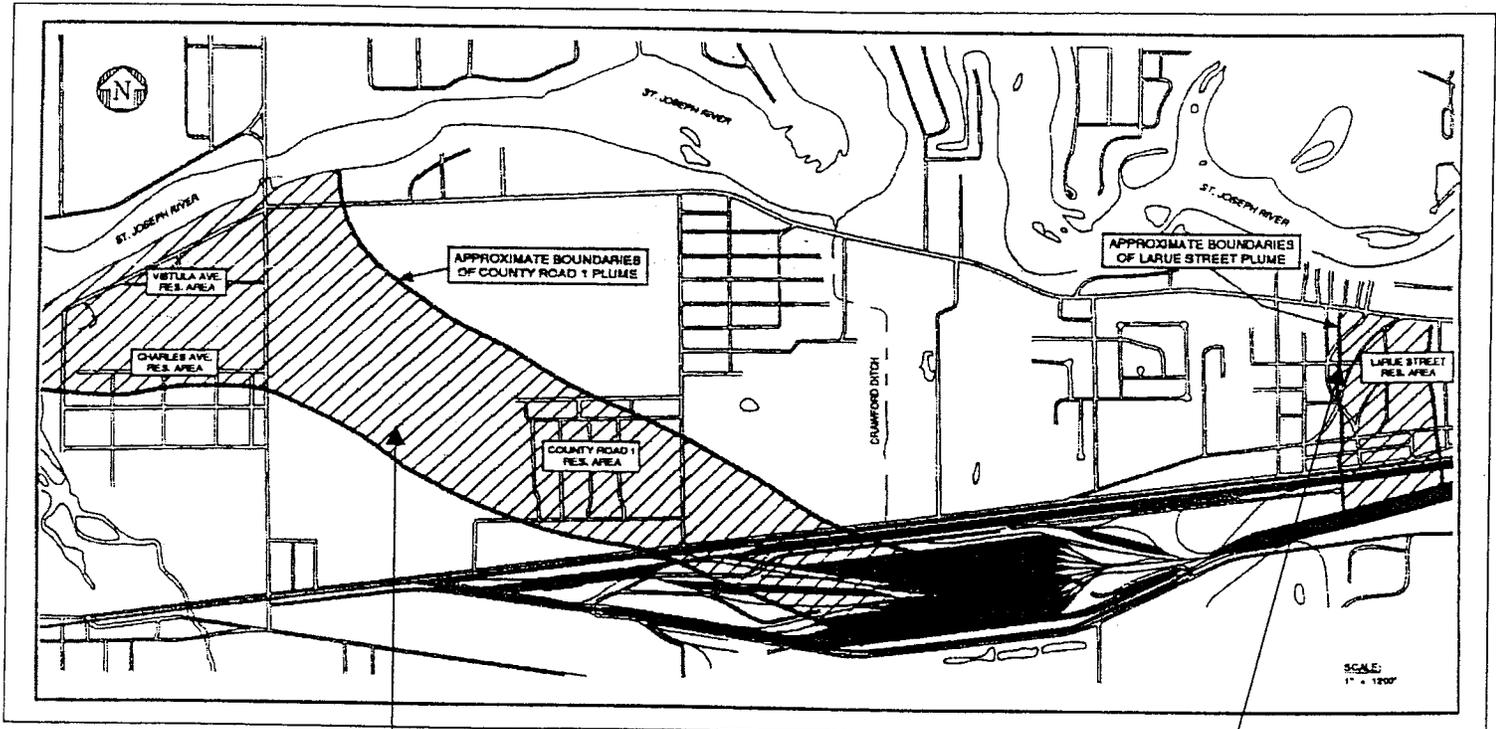


Figure 1. TCE and CCl₄ plumes



**County Road 1, Vistula Ave
Plume**

Larue Street Plume

Currently the Larue Street Plume is not being considered for any type of remediation due to the limited potential for exposure. This plume is potentially associated with at least one other contaminant plume in the area.

Figure 2. Proposed Remedy

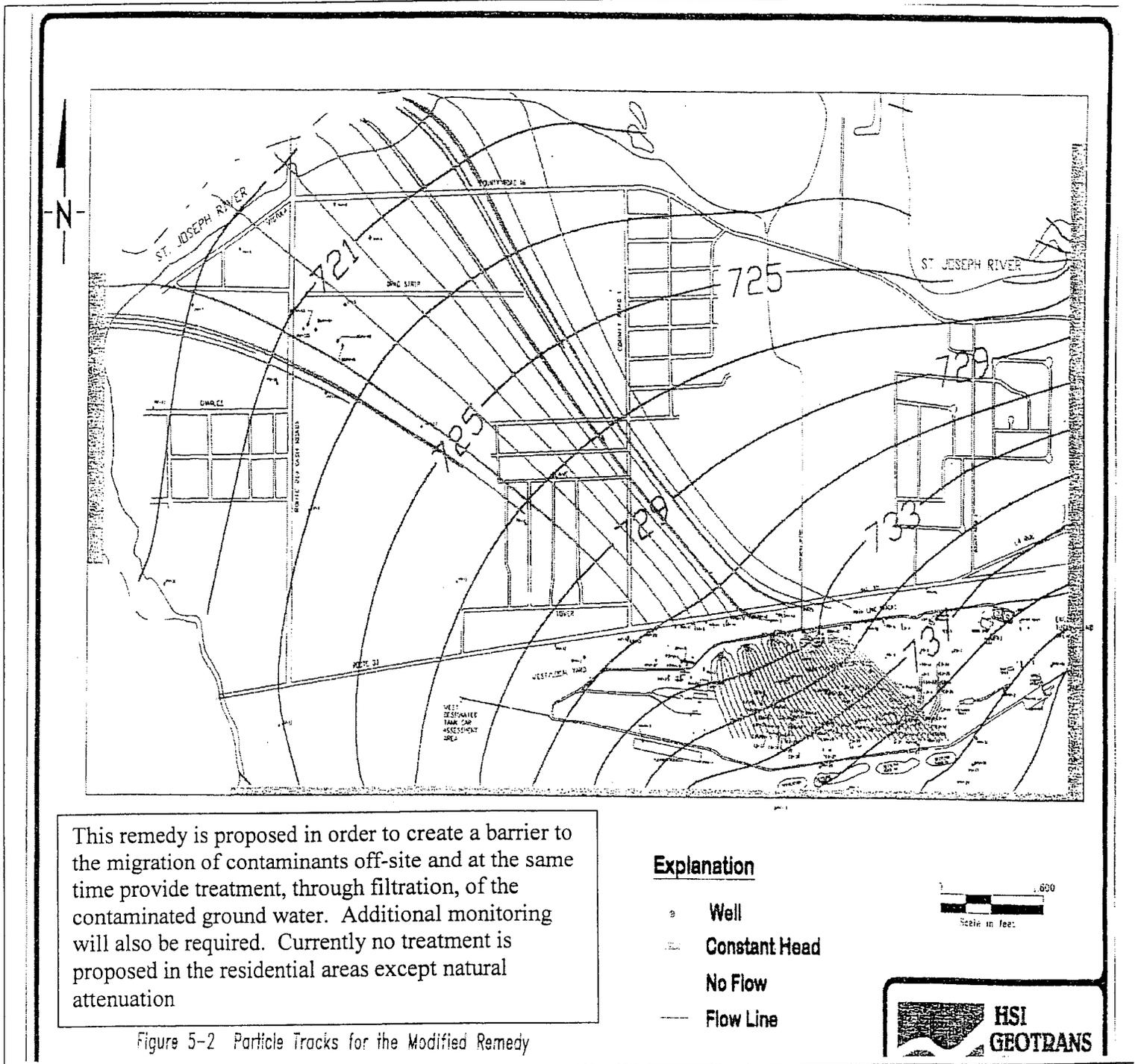


Figure 5-2 Particle Tracks for the Modified Remedy

Public Health Survey



Sorry we
missed you!

Please contact

at the Elkhart
County Health
Department
to complete a
household
survey.

875-3391

Expenditure Report

ENVIRONMENTAL HEALTH NEEDS ASSESSMENT PROJECT
*National Association of County and City Health Officials (NACCHO) and the
Agency for Toxic Substances and Disease Registry (ATSDR)*

This Expenditure Report form should be submitted by your local public health agency to NACCHO along with the final needs assessment report.

Public Health Agency Name: Elkhart County Health Department. 4230 Elkhart Rd., Goshen, Indiana 46526

Reimbursement agreement: NACCHO will reimburse your local public health agency up to a **grand total** of dollar amount specified in project contract for costs incurred on expenditures associated with community involvement and health education activities supporting the site. These include costs pertaining to phone service, facsimile service, postage and mail service, printing, supplies, professional contractor fees and travel.

Categories	Unit Cost	Total Expenditure
Personnel* Jen Tobey & Erin Hafner. After hours meetings 5 meetings 3 hours each x 2.		
a) Hourly salary	30 Hours @ \$32.07	\$962.10
b) Fringe Benefits	30 Hours @ \$10.30	\$309.00
Temporary help		
Phone/facsimile		
Postage/mail service Mailings to Physicians and prepaid returns	100 @ \$.34	\$34.00
Printing: 1400- 4 page newsletters hand delivered	5600 pages @ \$.25 / page 25 cents/pg. is our established county copy cost	\$1400.00
Supplies**		
Travel		
Professional Contractor		

Other‡	
Total Requested	\$2705.18

*Staff salary for work beyond the normal workweek, such as attending community meetings, conducting surveys, etc.

** Supplies do not include large office pieces, such as laptop computers, slide projectors, etc. Please limit each supply to \$200.00 or less. Supplies over \$200.00 are subject to approval.

‡ Please call NACCHO for authorization/clarification prior to using funds.

Certification: I certify that, to the best of my knowledge and belief, the data above are correct and that all outlays were made in accordance with the grant agreement and conditions, and that payment is due and is in accordance with District of Columbia guidelines.

Robert E. Watkins

4-27-02

Signature of Certifying Official

Date Request Submitted

Robert E. Watkins, Manager Environmental Health Services, Elkhart County

Typed/Printed Name and Title

Telephone 574-875-3391

Facsimile 574-875-3397

Part V Forms

1. Step One: *List all priority concerns/areas of interest cited by the community, LPHA and other agencies. Prioritize the top three or four and write them in the bold boxes.*

1.) Identifying health status of the community and what if any risks are associated with exposure TCE and CC₁₄, Public Health Assessment

2.) Concerned that medical community receive awareness training and be kept informed about the progress of health survey

3.) Concerned that residents be kept informed about progress in clean up on contamination and the residents, builders and realtor continue to receive accurate information about the site. Special concern exists for new residents moving to the area.

4.)

5.)

6.)

7.)

8.)

2. Step Two: *Based on the top areas of concerns/interest, develop an Action Plan by listing goals, objectives and action steps. The number of objectives and action steps do not need to be limited to the spaces provided.¹ (See sample Action Plans in the Assessment To Action workbook).*

Goal: Continue to monitor the activities of the EPA, RP, and Contractor.

Objective: *To continue to indicate a concern to the EPA and the RP that the environmental damage must be mediated and that all exposure to potential health affects removed:*

Action Step:

Timeline: from: ongoing to: Until treatment systems are in place

Resources Available: Existing Health Department Staff and community members.

Resources to Acquire:

Action Step:

Timeline: from: _____ to: _____

Resources Available:

Resources to Acquire:

¹ To create boxes for additional objectives and/or action steps, highlight the box you wish to copy and paste it anywhere in the document.

Goal: Complete the Preliminary Health Study/Assessment

Objective: To begin to answer the concerns of site residents regarding current and potential impacts of exposure to TCE, CCl₄, combinations and daughter products.

Action Step: conduct preliminary health study

Timeline: 741 surveys completed April 2001

Resources Available: Elkhart and St. Joseph County Health Department Staff, community members ATSDR and Indiana State Department of Health.

Resources to Acquire: None

Action Step: Compile survey results

Timeline: Preliminary Tabulation of surveys completed August 2001

Resources Available: ATSDR and ATSDR contractor

Resources to Acquire: None

Action Step: Complete a public health assessment using data provided

Timeline: from : August 2001, to: July 2002

Resources Available: Indiana State Department of Health and ATSDR

Resources to Acquire:

Action Step: Distribute findings to residents, arrange for toxicologist to explain results for public meetings and the media.

Timeline: July/ August 2002

Resources Available: Health Departments, Indiana State Department of Health and ATSDR

Resources to Acquire: Printing/duplicating expenses. Potential to need money to pay toxicologist.

Objective: Provide awareness training to local physicians

Action Step: Determine desire to receive training and determine best location for training

Timeline: from: March 1, 2002 to: March 15, 2002

Resources Available: Health Department funds for mailings and staff time to coordinate.

Resources to Acquire: Reimbursement from NACCHO

Action Step: Conduct Physicians Awareness Training Program

Timeline: April 24, 2002

Resources Available: Dr. Rachael Rubin, Chair, Department of Occupational and Environmental Medicine, Cook County Hospital, Chicago, Illinois funded through ATSDR

Resources to Acquire: None

Goal: Develop Educational Materials, including CD ROM of a Power Point Presentation to be used for discussions with realtors, builders and the public.

*Objective: Provide a reusable electronic presentation for informing the realtor and builder communities.
Secondary objective: to provide a narrated presentation for resident and others.*

Action Step: Compile data to be included in the presentation

Timeline: from: December 1991 to: June 2002

Resources Available: stff and community time

Resources to Acquire: Funds to reproduce approximately 250 CD-ROMS

Action Step: Provide at least one presentation to both the Elkhart County and St. Joseph County Board of Realtors and the Builders Associations

Timeline: from: December 2001 to: June 2002

Resources Available: Community partner and Health Department Staff

Resources to Acquire: Funds from NACCHO for materials

Action Step: Develop brochures answering, as a minimum, the questions of the residents.

Timeline: from: December 1991 to: June 2002

Resources Available:

Resources to Acquire: Funds to develop and reproduce brochures

Objective: Create brochure outlining findings and recommendations for the Completed Public Health Assessment

Action Step: Develop informational brochure once Health Assessment is complete

Timeline: from: August 2002 to: October 2002

Resources Available:

Resources to Acquire: Final Assessment Report and obtain funds to print brochure or other required educational materials.

Action Step:

Attachment 2

List of Businesses in the declared area

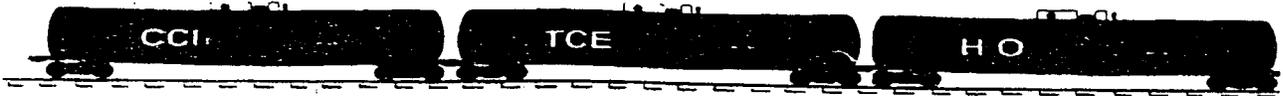
Type	Name	Address
	Smith's Food Mart	30949 US 33
	Creative Hair Styling	56528 Ash
	Precision Dental Lab	P.O. Box 92, Osceola
	Osceola Dragway	56328 Ash
	Escape Tanning	56310 Ash
	Auction Services	56314 Carolina
	Wolfords Tax Service	30015 Tower
	Rug Weaving	30397 Tower
	Gerard Model Home	56875 Meadow Glen
	Hoosier Siding & Construction	30471 US 33
	Town & Country Mobile Homes	57085 Tower
	Pickrell's Florists Inc	30803 US 33
	Kountry Island Auto	30841 US 33
	McClure's Auto Sales	30927 US 33
	S. & S.RV. (empty)	US 33
	Adams Cars	28100 US 33
	(empty)	28080 US 33
	Progressive Realty	28171 US 33
	MD Marine	28185 US 33
	Smith Tool/ Auto Glow	28235 US 33
	Gateway Enterprises	28261 US 33
	Surplus Salvage	28301 US 33
	(empty)	28373 US 33
	Yeoman Machinery Corp.	28423 US 33
	Money Medic	28445 US 33
	Central Hardware	28459 US 33
	Happy Cooker	28479 US 33
	(empty)	28501 US 33
	(new building)	56817 Shore
	James Madison Furniture	28591 US 33
	ABC Protatable Signs	28591 US 33
	Jingles Auto Sales	US 33
	Barber Auto Sale	28631 US 33
	Hull Lift Truck	28747 US 33
	Quality Paint Coatings	28822 US 33
	Elpaco	28867 US 33
	Global Glass	28967 US 33
	Beck	2870 LaRue
	Bob's Barber Shop	LaRue
	A-1 Upholstery	56787 Shore
	Sel-Rite	29031 US 33
	Uhaul	29057 US 33
	Warner & Sons	29099 US 33
	RJ Auto Sales	29173 US 33
	(empty)	US 33
	Schupan & Sons	29391 US 33
	Duncan Systems	29391 US 33
	Midway Truck & Coach	29391 US 33
	Hanover Commercial Vehicles	29391 US 33
	Continental Spacemaster	29391 US 33

	Palm Aire Inc	US 33
	Jones Motor	56960 Elk Park
	Jacobs Steel Services	56959 Elk Park
	Bowen	56897 Elk Park
	K.C. Machine	56850A Elk Park
	The Franklin Press	56850B Elk Park
	Global Glass	56807 Elk Park
	Hilliard Photographics	56800 Elk Park
	Ramco Engineering	56764 Elk Park
	American Fab	56741 Elk Park
	Pletcher Sales (empty)	56728 Elk Park
	Stone Construction	56700 Elk Park #4
	D & A Concrete	56700 Elk Park #3
	Chubb Steel Sales	56700 Elk Park #2
	Chubb Steel Sales	56700 Elk Park #1
	Peterson & Associates	56624 Elk Park
	Dynamic Metal	56644 Elk Park
	P & R Moulding Plant 1	56616 Elk Park
	Quality Engineered Products	56802 Elk Court
	AM Distributing	56854 Elk Court
	A. F. Ward	56883 Elk Court
	Hugus Photography	56900 Elk Court
	Paul's Seating	56912 Elk Court
	Alpha Omega	56935 Elk Court
	Lemacks Construction	56935 Elk Court
	Interstate Brands Corp.	56935 Elk Court #2
	Just Rite Engineering	56977 Elk Court
	Butternut	56935 Elk Court #1
	Vim Recycling	29861 US 33
	Fibertron Corp.	29877 US 33
	Elkhart Office Machines	30015 US 33
	Baugo Fire Station #2	US 33
	Residential	30085 US 33
	Jans Bar & Grill	30107 US 33
	D & M Auto Sales	30150 US 33
	Kelly's Auto Care	28235 US 33
	Bastion Builders	30367 US 33
	Bruno's	28046 CR 16
	7 11	58458 SR 19
	Video Game Exchange	28046 CR 16
	Jaxon Cleaners	1501 S. Nappanee St.
	Hair Care	1501 - 2&3 S. Nappanee St.
	Star Staffing	1501 - 4 S. Nappanee St.
	Color Time	1501 - 6 S. Nappanee St.
	Law Office	1515 S. Nappanee St.
	Quality Glass	1521 S. Nappanee St.
	City of Elkhart West Pumping Station	28522 CR 16

Attachment 3

Children's Day Care Centers/homes

Ann Morris, Lantz Av
Deanna Arnold, CR 3
Babette Czoch, Driftwood
Michelle Rhodes, Lantz
Nicole Proctor, Miller
Cindy Workman, Driftwood
Lori Lakes, Miller
Lucinda Guletty, Wolf



CLEAN WATER!

Conrail/C.R.1 Superfund Site Update

Published By:
CLEAN Inc.

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A Public Meeting Will Be Held by EPA May 3rd, 7:00 PM at Harley Holben School

Did You Hear the Doorbell?

Lorna Rickard/Editor

Yes, a group of dedicated people are ringing doorbells and knocking on Superfund resident's doors. CLEAN has pointed out and asked many times that a health survey be made to determine the extent and intensity of diseases in this Conrail Site. Please invite them in and fill out a questionnaire. We plan to complete this survey by the end of May. So far everyone who has answered the door has been willing to take the time to complete the questionnaire. However some of you have not been home and if you have not talked to someone wearing a "volunteer" pin please give us a call so we can bring the questionnaire to you. We can be reached at (219) 522-0184 or (219) 875-3391. CLEAN is also looking for new members. This Superfund Site still needs lots of monitoring and sometimes there is a need to suggest to the decision-making agencies other avenues to pursue to get the job done. LET US HEAR FROM YOU.

WANTED: Administrative Assistant

RESPONSIBILITIES:

Liaison between citizens and federal and state environmentalists

SALARY: \$ 0.00

STRESSFUL? REWARDING ?

FRUSTRATING? Yes!

Yes!! And Yes!!!

Bonnie Fitch/CLEAN Secretary

So, why this advertisement? Our current unpaid Administrative Assistant and Treasurer of CLEAN, Lorna Rickard, would like to retire.

This non-profit organization owes Lorna a chance to retire; she has given much time and effort in helping this neighborhood find its way through the maze of governmental (in)action and legalese. Also, because of illness or age, several board members would also like to retire.

Late 1986 it was discovered that harmful chemicals were in our drinking water. By the time 1988 rolled around, several citizens from this neighborhood stepped up to the plate to argue that having county officials (at that time period) pretending there was no problem was not the 'thing' to do. That was when Citizens League for Environmental Action Now was founded. Lorna was already in her retirement years when CLEAN was founded for two main reasons: 1) convince county officials that we really need a groundwater protection ordinance and 2) convince those same county officials and other officials that the county health department works best if top department heads are unbiased. CLEAN, with Lorna and others in the foreground, finally convinced the authorities

that it would help to have the groundwater protection ordinance. After several years of enforcement, the county received requests from county governments in other states for copies of this ordinance. They didn't have anything and heard this might be what they needed. Our county officials were busting their shirt buttons while swelling with pride over what 'good deeds we did with this ordinance'.

So, in almost 13 years, what has CLEAN accomplished?

- 1) groundwater protection ordinance which has been moderately successful
- 2) brought safer drinking water to this neighborhood via Elkhart City waterline
- 3) insisted on testing the vapors in (selected) homes in this neighborhood with surprising results
- 4) tried to get governmental officials to test the ditch more thoroughly, so far without success
- 5) tried to apply common sense to discussions about remedial groundwater cleanup
- 6) tried to explain to officials at CDC and ATSDR that there might be a pattern of illness in this neighborhood which reflects on past human deeds. This latest moment-in-time-spot-check with the health survey is the result.

Our annual meetings to select board members and officers (president, treasurer, secretary) have been in October, starting in 1988. We received our first Technical Assistance Grant in 1993. These grants are given out by the federal government with some of the following restrictions: 1) a three year time period 2) only one per 'Superfund' site 3) not to be used by any political party for election purposes 4) help community activists and officials as liaisons between federal and state government and private citizens.

We originally used this TAG to hire a consultant, John Wallace of John C. Wallace, Inc. Environmental Site Assessments. With John's expertise, we as a community have greatly benefited. When looking at the governmental documents for this site, John knew what questions to ask and to whom to ask for further assistance. Confronted with the same documents, those questions most likely would not have occurred to us. Some of the site officials have mentioned (some grudgingly) that if it was not for the TAG, most of the achievements we had discussed in meetings (public and director), then proposed and pushed for would not have happened. At this point in time, our Technical Assistance Grant has been extended an unheard of three times. I believe that because of the number of extensions, this may have increased the difficulty in the governmental handling of the paperwork from us. The officers of CLEAN may choose to allow the current TAG extension to end this year.

We have accomplished a lot. We hope it has all been good. In fact, the one major fear that I personally have had over these years, is that someone will blame us for the site problems instead of the actual responsible parties. Blaming someone else for something you did will not make you feel good about yourself; but taking responsibility for your actions will. An added bonus is the acceptance and amount of goodwill from others on hearing about the site problems. That is how you inspire others. That is how and why CLEAN was asked to contribute our story to the US-EPA's website.

As part of the community we should make our voices heard since that is another way (besides taxes) we will all be able to take part in our society. Reflecting on our Past, shows what we need to do in the Present, so our Future will be better.

THE FUTURE OF OUR SUPERFUND SITE

Michael Fitch, CLEAN President

We have obviously come a long way since the discovery of TCE and carbon tetrachloride pollution coming from the Robert Young Railyards. In 1985 there was no official acknowledgment of the problem in spite of rising suspicions.

Residents were drinking some heavily polluted water, but as the saying goes, 'who knew'? When the problem was brought to public attention in the summer of 1986, bottled water was at first provided by the EPA. Home filtration systems were next provided from Superfund resources.

The final solution to provide safe drinking water for our area was a waterline from the Elkhart City Water Department, brought out to residents, even into Osceola, with the understanding that water connection from the St. Joseph County side would eventually be made. Unprecedented cooperation between the EPA, Conrail and two County governments. The issue of possible harmful vapors from concentrations of polluted groundwater is still being addressed by IDEM, the state agency.

The Elkhart County Health Department with the help of CLEAN is conducting a preliminary health study to determine the health effects of pollution exposure. What lies ahead for the Superfund site will be a long-term effort to contain the pollution in the railyards and prevent its spread. The railroad has obtained a technical impracticability waiver stating that it is impossible by any means yet scientifically devised to treat the groundwater flowing out of the yards to complete drinking water standards. The railroad, now designated as Norfolk and Southern, is still legally obligated

to work on a system designed to contain its pollution and hopefully stop it in its tracks. This obligation is spelled out by the Record of Decision, sometimes abbreviated as the ROD, negotiated at the Federal level by the EPA and the railroad. The system is called pump and treat. Wells along US 33 are planned to extract the polluted groundwater, purify it and re-inject it to steadily dilute the remaining pollution source.

CLEAN has been involved with the Superfund site since it was designated, and we conclude after long consideration that this solution is the best that can be found. We believe that a combination of the City waterline, continued vapor testing and a pump-and-treat system installed and maintained by Norfolk and Southern is the best we can do to protect and preserve our little piece of this big, pollution-heavy planet.

The Catch-22 which worries CLEAN is the fact that these measures will only work if the railroad follows through with its anti-pollution efforts. As it now is projected, there is no set number of pump-and-treat wells specified.

Ideally, the effectiveness of the line of wells in the system will be carefully monitored by the test well system already in place in the Superfund site. If more pump-and-treat wells are needed, more will be added. The railroad must be held to this. At the start, just a single pump and treat well will be installed and monitored for effectiveness. We need to be sure that the location of this first well is in a place that can be easily tested. Assuming positive results, the rest of the system needs to be installed in a timely manner.

The railyards of the 'Penn-Central-Conrail' site will probably never be totally cleaned up. We can only hope that their pollution, past, present and future can be contained safely.

A Few Updates

John Wallace/TA

It always seems like a long time between newsletters, even though CLEAN has put one out every quarter since 1993. This time I thought there would not be a lot of new information, and for the most part that's true. However, there are some things happening that you should be aware of.

If you have driven down 33 lately, you probably noticed a drill rig and a white car with the letters URS on the door. They're back! Under a work plan prepared by the railroad's contractor (URS) and approved by EPA, there will be a subsurface investigation of the central portion of the site, which will also encompass the area in and around the Crawford Ditch. The drill rig and URS vehicle spotted on Route 33 were in close proximity to the ditch.

The lack of valuable information regarding the subsurface environment for this area has left a lot of speculation as to what happens to the contamination discovered at the rail yard, just up gradient from the position of the drill rig. CLEAN has argued in the past that this investigation take place.

This is only one item carried under the work plan. The document title is Remedial Design/Remedial Action Work Plan. And there is a lot of work described within its pages. So you can expect to see workers in this area, around the drag strip area, and if you work in the rail yard, they will be there too. May 3rd, at 7:00 p.m. there will be a meeting at Harley Holben School presented by the EPA. Project Manager Brad Bradley will be there to further explain the investigations and work efforts conducted within the site.

Toxicologist, Dr. Pat VanLeeuwen will also be in attendance regarding the ongoing health survey. And of course I will be there, and I trust you will too.

Special Item...

Lorna Rickard was given a Community Golden Apple Award at the Elkhart County Health Department's Annual Safety and Social Services Fair. I can't think of anyone more deserving of such an award.

If you own a computer and/or have access to the web, and would like to know more about the Technical Assistant Grant Program & CLEAN go to;

<http://www.epa.gov/oerrpage/superfund/tools/tag/testr5.htm>

You can mail donations or send for information on becoming a member of CLEAN to:

CLEAN Inc.,

P.O. Box 4754

Elkhart, IN 46514

Update



September 18, 2001

Residents of the Conrail Superfund Site. This newsletter is being provided to you in order to give an update on the Public Health Activities in the site. The alphabet soup above represents the State and Federal agencies involved. The intent of this letter is twofold. First to bring you up to date on the Health Study with out the need for another meeting and second to discuss what we have been doing locally. If you have any questions please feel free to contact me at 875-3391, Bob Watkins, Elkhart County Health Department.

Agency for Toxic Substances and Disease Registry (ATSDR) and Indiana State Department of Health (ISDH) Update on Activities at the Conrail Railyard Site

The Agency for Toxic Substances and Disease Registry (ATSDR) and the Indiana State Department of Health (ISDH) want to update residents living near the Conrail Railyard National Priorities List Site about our progress on the actions that are on going at the site. The actions include

- entering the information community members provided on a survey into a database to document illnesses and concerns about illnesses
- developing the public health assessment which evaluates ways that people in the community may have contacted contaminants is evaluated
- mapping the area of groundwater contamination and mapping information residents reported in the community-generated surveys
- providing information to both residents and health care providers about exposures people in the area have experienced.

Community Health Survey

ATSDR received 760 community health surveys. By the end of July, the information contained in the surveys was entered into a database. Residents provided information in the surveys that helped identify:

- households that used contaminated drinking water

- types of diseases household members experienced
- concerns about illnesses that might occur as a result of using contaminated drinking water or breathing contaminated air.

The survey findings support public health assessment activities. A summary of the survey findings is provided in this newsletter. However, the numbers presented are raw data only. It is still too early to begin drawing conclusions about the public health of the site. As more information is available and other parts of the review are completed we will either send another newsletter or have a public meeting with residents to discuss what the results might mean.

Public Health Assessment

ISDH and ATSDR are currently collecting and evaluating data for the public health assessment. Both historical and current environmental data are being collected to help evaluate all ways people came in contact with chemicals released from the Conrail Railyard Site and to determine whether people are currently coming in contact with chemicals from the site. The amount of data available is extensive and is taking much longer to collect and evaluate than first anticipated.

The public health assessment will identify any exposure interventions that might be needed and will provide guidance on what other public health actions might be needed. The document was first scheduled for public comment release in the fall of 2001, but because data are not in one central area and more data are available than first thought, the document will not be ready before spring of 2002. ISDH and ATSDR will meet with the community or provide an update on progress before release of the document.

Mapping Groundwater Contamination and Community Survey Information

A Geographic Information System (GIS) will be used to help analyze information we collect. GIS produces computer-generated maps of the area. We will use these maps to show places where contaminants were found and the levels of contaminants that were present in well water. We can also show information gathered from the health survey, although the information will be depicted in a way that maintains confidentiality. The map will help with the overall evaluation of community concerns about health effects and about the levels of contaminants present in well water.

Health Information for Residents and Health Care Providers

ISDH, with help from ATSDR, Elkhart County Health Department, and St. Joseph County Health Department, are preparing information for residents living near the Conrail Railyard Site and for health care providers in the area. A health education action plan is being developed with the two county health departments. Educational materials will include general chemical information and health effects that might result from contact with the chemicals.

Both Elkhart and St. Joseph County Health Departments have been awarded grants through the National Association of City and County Health Officials to conduct a community needs assessment and to implement the action plan currently under development. Health education activities will begin this fall.

Contact Information

If you have questions about the activities that are being conducted in your neighborhood, you may call, e-mail, or write to any of the following people.

Bob Watkins
Elkhart County Health Department
4230 Elkhart Road
Goshen, Indiana 46526
Ph. 219-875-3391 Fax 219-875-3376
elkenv@juno.com

Dr. Janice Carson or Tony Mancuso
St. Joseph County Health Department
227 West Jefferson Blvd., 9th Floor
South Bend, Indiana 46601
Ph. 219-235-9721 Fax 219-235-9497
rjkickbush@hotmail.com

Garry Mills or LaNetta Alexander
Indiana State Department of Health
Epidemiology Resource Center
2 North Meridian Street
Indianapolis, Indiana 46204
gmills@isdh.state.in.us or
317/233-7525 or
LaNetta Alexander at 317/233-7162
lalexand@isdh.state.in.us

Gail Godfrey
ATSDR
1600 Clifton Road, MS E32
Atlanta, Georgia 30333
ggodfrey@cdc.gov
1-888-422-8737, Ext. 0432

NACCHO GRANTS

Both the Elkhart County Health Dept. and the Saint Joseph County Health Departments have received small grants from the National Association of County and City Health Officials (NACCHO) to help the residents of the Conrail Site with their Environmental Health Education needs over the next eighteen months. The project has two phases. The first phase relies heavily on input from residents. Ideally a questionnaire is circulated seeking to know what the educational needs of an area are. Since we just completed the preliminary health survey we would like to avoid another door-to-door survey if possible. We still need to get your input and make sure we are addressing the resident's needs as much as possible.

The second phase of the project is implementation. We will begin to create and distribute the materials requested and address the priority concerns of the residents as possible.

One resident from each county attended the training and will help us with this project. In St. Joseph County the community representative is **Louis Trost**, 219-679-0128. In Elkhart County your representative is **Kim Stackhouse**, 219-262-4553 or 219-679-9499.

Kim and Louis are forming a "Community Advisory Group" or CAG to help us with the project. This advisory group will help us determine the needs of the residents, help establish goals and priorities and tell us the best methods for communicating with residents. **We need your help** if we are to be successful.

To date, several projects have been suggested including communicating with area doctors to bring them up to date on the site, exposures, symptoms etc.; Development of informational packages for builder and realtors working in the area; Informational packages for new residents, and a Sr. High School project to increase awareness in the new generation.

We would like 12 to 15 residents to help us with this effort. Please contact Kim or Louis if you are

interested. We will also be having a public meeting on September 20, 2001 at 7pm at Harley Holben to kick off the project, receive public input and to ask for volunteers. We look forward to seeing you there.

Summary Findings of the Community-Based Public Health Survey Conrail Rail yard Superfund Site

The Agency for Toxic Substances and Disease Registry (ATSDR), in conjunction with the Indiana State Department of Health (ISDH), has processed the community-developed, health surveys from residents living near the Conrail Railyard National Priorities List Site in Elkhart and St. Joseph Counties, Indiana. ISDH sent the completed surveys to ATSDR. Information contained in the surveys was entered into a database. This is a summary of the survey responses.

Elkhart and St. Joseph County Health Departments received a total of 769 volunteer-assisted or self-administered questionnaires and sent them to ISDH. Information from 18 surveys was not included in the analysis because significant information was missing. Therefore, a total of 751 questionnaires were analyzed.

In the questionnaires, residents were asked 18, open-ended questions, such as whether individuals in each household used contaminated drinking water, what types of diseases household members experienced, and whether households that experienced chronic illnesses or death from chronic illnesses also used contaminated drinking water.

The findings are presented in this summary in the Demographics, Contamination and Well Water Information, Chronic Illness, Birth Defects, and Deaths sections.

The information provided by community members helps ISDH and ATSDR better understand the medical conditions that are of concern to residents. The information is qualitative in nature. That means that the information cannot be used to draw definitive or absolute conclusions about whether a particular illness resulted from drinking

contaminated water. However, the information is important to our overall evaluation of site conditions.

Demographics

The median age of the survey participants is 40 years. About 23% of household members were children and approximately 10% of household members were elderly (> 70 years).

The survey population is approximately 51% male and 49% female. This information, however, is inexact because many households did not completely answer this question.

The average length of time that survey participants lived in the study area was about 20 years. 74% of participants have lived in the study area for more than 5 years, with 68% of households having lived at their current address for more than 5 years; 20% have lived in the study area for more than 1 year and up to 5 years; and 4% have lived in the study area for less than 1 year.

Contamination and Well Water Information:

69% of households reported they previously had their drinking water supplied by a private well, and 6% of households currently have their drinking water supplied by a private well.

40% of households reported they have had their well tested for contamination.

31%, or 92 households, that had their wells tested, reported their well water tested positive for contamination.

Of the 92 households whose wells tested positive for contamination, 26% reported trichloroethylene (TCE) was found in their well, 3% reported carbon tetrachloride, and 21% reported both TCE and carbon tetrachloride were found.

Chronic Illness:

42% of households reported someone in their residence had experienced a chronic illness. The

types of chronic illnesses reported were diverse, with cancer and diabetes the most frequently reported.

84% of households that had experienced a chronic illness had lived in the study area more than 5 years.

86% of those reporting they had experienced a chronic illness reported their drinking water was previously or is currently supplied by a private well, and 17% of those reporting a chronic illness also reported their well tested positive for contamination.

Birth Defects:

7% of households reported having a child with a birth defect.

90% of households reporting a birth defect lived in the study area for more than 5 years.

All of those reporting that a child in their residence experienced a birth defect also reported their drinking water had previously been or is currently supplied by a private well, and 18% of those reporting a birth defect also reported their well tested positive for contamination.

Deaths:

23% of households reported a family member(s) had died in the time they have lived in the study area. Less than 1% of the deaths were children. Of the 23 %:

94% reporting a death had lived in the study area for more than 5 years.

94% of households reporting a death also reported their drinking water had previously been supplied or is currently supplied by a private well, and 19% of those that reported a death also reported their well tested positive for contamination.

Each reported death was categorized into one of 16 causes of deaths. The most frequent cause of death was cancer, followed by heart disease or heart attack.

Preliminary Public Health Survey
Conrail Superfund Site, Elkhart, Indiana

A separate questionnaire must be completed for each home or business

Date: _____

1. Name(s) A. _____ B. _____
C. _____ D. _____

2. Street Address _____

A. How long have you lived at this address? _____

3. Have you lived at another address in the study area? YES NO

What is the address of the other residence(s)?

B. _____ Years at this address _____

C. _____ Years at this address _____

List family members who lived at each location. B _____

C. _____

4. What is your occupation? _____ Spouse's occupation? _____

Are you exposed to chemicals at work? YES NO Spouse YES NO

If yes, please list chemical names. _____

Have you ever been told that you are working with anything hazardous? YES NO

How long have you worked in your present job(s)? _____

Have you had any exposure to chemicals in a previous job(s)? YES NO

If yes, please list chemical names. _____

5. Is your drinking water currently provided by a private well? YES NO

If yes, how long have you been drinking it? _____

If no, do you use well water for any other purpose? _____

6. Was your drinking water previously supplied by a well? YES NO

If yes, how long? _____ At which residence(s)? A B C

List all family members who previously drank private well water at these locations. _____

7. Has your well water been tested for contamination? YES NO

Dates it was tested? _____

It was tested by: EPA IDEM PRIVATE LAB

Was contamination found in your well water? YES NO

List the name(s) and concentration of substance(s) found. _____

8. Did your house have a whole house water filter installed? YES NO
 When was it installed (month/year)? _____ Who maintained the filter? _____
 Do you know what the level of contamination was after the water was filtered? YES NO
 If yes, which contaminants came through? _____
 What were the concentrations of each chemical? _____
 Do you still have a whole house filter in use? YES NO
9. What are the Ages and Sex of family members? _____
10. How would you describe your family's health? _____
 Do family members miss work or school often due to illness? YES NO
 How often do you see a doctor? _____
 Have you or anyone in your residence experienced a chronic illness? YES NO
 List illnesses _____

 Did a physician confirm these illnesses? YES NO Physician's name _____
11. What are the symptoms? _____
 Do you or members of your family have any unexplained illnesses or symptoms? YES NO
 Explain _____
12. Are you being treated for any illness(es) now? YES NO
 Name of illness(es) _____
13. Have any children in the residence experienced a birth defect? YES NO
 Name of defect _____
14. Are you concerned about any health problems in area children or neighbors? YES NO
 Please describe your concern _____
15. Have any family members died in the time you have lived in the study area? YES NO
 Name _____ Relationship _____ Age at time of Death _____
 What was the cause of death? _____ Year of Death _____
 Who was the primary physician for the deceased? _____
16. Can you provide the name(s) of anyone who used to live in the study area but have relocated? YES NO
 (Complete supplemental sheet with name, address, phone, or contact person).
17. Do you know the name of anyone who used to live in the survey area but is now deceased? YES NO
 (Complete supplemental sheet with name, address, and phone of contact person).
18. Comments _____



Environmental Health Services

4230 Elkhart Road
U.S. 33 & C.R. 26
Goshen, Indiana 46526
(219) 875-3391
Fax: (219) 875-3376

Joseph S. Russo, D.O.
Health Officer

February 13, 2001

To Parents of Baugo Community School children and residents of the Conrail Superfund area;

If you presently live or previously lived in the area bounded by Nappanee Street on the east, the Conrail Yard on the south, Baugo Bay to the west and the St. Joseph River to the north we would like to talk to you. Who are we? We are the Elkhart County Health Department (ECHD), the Indiana State Department of Health and the Citizens League for Environmental Action Now (CLEAN).

Volunteers will be canvassing the Conrail Superfund area in the upcoming months to interview, distribute and collect a public health survey from residents. This survey is a follow up to real and potential well water contamination that occurred in the area over the past three decades. This survey will be used to determine if the numbers of illnesses is significantly higher in this area than in other parts of the city, county or state. Your response and answers to this survey will be used to establish a basic assessment for this area. This may lead to a larger more definitive study that would be completed by the federal government.

Why is this important to you? This work may lead to answers for unexplainable illnesses you or family members may be experiencing now or in the future. It will also better serve the medical community by letting them know more about exposures your family may have had while living in the area. Lastly it may bring positive results from something negative that happened long ago and we have had no control over. We could all make something good happen from a bad experience!

On February 27, 2001 volunteers will be at Harley Holben Elementary School at 30046 CR 16 from 6:00 pm to 8:00 pm. These volunteers will be conducting interviews of interested families who have lived in the Conrail Superfund area. Families or individuals, who wish, can be interviewed at that time. After that date volunteers canvassing the area will conduct all interviews. **Please participate!**

Further questions or concerns can be addressed by contacting Lorna Rickard of CLEAN at 522-0184 or Bob Watkins of the ECHD at 875-3391.

Attachment 8

Frank L. O'Bannon
Governor

Gregory A. Wilson, M.D.
State Health Commissioner



Indiana State Department of Health

An Equal Opportunity Employer

August 29, 2001

Robert Watkins
Manager
Elkhart Co. Health Department
4230 Elkhart Road
Goshen, IN 46526

Re: Health Survey Results-Conrail Superfund Site

Dear Mr. Watkins;

Enclosed please find the summary of findings for the health survey data provided by the community on the Conrail site. This information is provided in many formats, including a narrative summary, descriptive statistics and distribution figures.

If more information is needed regarding these results, please contact, Ms. Gail Godfrey, Technical Project Officer at the Agency for Toxic Substances and Disease Registry (ATSDR), 404/498-0432.

Sincerely,

LaNetta Alexander
Director
Environmental Epidemiology
317/233-7162

Enclosures

cc: Gail Godfrey, TPO, ATSDR
File-Conrail

**Summary Findings
of the Community-Based Public Health Survey
Conrail Railyard Superfund Site
Elkhart and St. Joseph Counties, Indiana**

Introduction:

The Agency for Toxic Substances and Disease Registry (ATSDR), in conjunction with the Indiana State Department of Health (ISDH), has processed the community-developed, health surveys from residents living near the Conrail Railyard National Priorities List Site in Elkhart and St. Joseph Counties, Indiana. ISDH sent the completed surveys to ATSDR. Information contained in the surveys was entered into a database. This is a summary of the survey responses.

The questionnaire was developed by community members with help from Elkhart and St. Joseph County Health Departments. Elkhart and St. Joseph County Health Departments received a total of 769 volunteer-assisted or self-administered questionnaires and sent them to ISDH. Once ATSDR received the surveys, answers to survey questions were entered into a Microsoft (MS) Access 2000 database. All 769 surveys were reviewed, and concerns listed on all surveys will be addressed in the forthcoming Public Health Assessment. Information from 18 surveys was not included in the analysis because significant information was missing. Therefore, a total of 751 questionnaires were analyzed.

In the questionnaires, residents were asked 18, open-ended questions, such as whether individuals in each household used contaminated drinking water, what types of diseases household members experienced, and whether households that experienced chronic illnesses or death from chronic illnesses also used contaminated drinking water. The findings are presented in this summary in the Demographics, Contamination and Well Water Information, Chronic Illness, Birth Defects, and Deaths sections.

The information that community members provided in the survey helps ISDH and ATSDR better understand the medical conditions that are of great concern and interest to residents. The information is qualitative in nature. That means that the information cannot be used to draw definitive or absolute conclusions about whether a particular illness resulted from drinking contaminated water. However, the information is important to our overall evaluation of site conditions.

Demographics

— The median age of the survey participants is 40 years. About 23% of household members were children and approximately 10% of household members were elderly (> 70 years).

- The survey population is approximately 51% male and 49% female. This information, however, is inexact because many households did not completely answer this question.
- The average length of time that survey participants lived in the study area was about 20 years. 74% of participants have lived in the study area for more than 5 years, with 68% of households having lived at their current address for more than 5 years; 20% have lived in the study area for more than 1 year and up to 5 years; and 4% have lived in the study area for less than 1 year.

Contamination and Well Water Information:

- 69% of households reported they previously had their drinking water supplied by a private well, and 6% of households currently have their drinking water supplied by a private well.
- 40% of households reported they have had their well tested for contamination.
- 31%, or 92 households, that had their wells tested, reported their well tested positive for contamination.
- Among the 92 households whose wells tested positive for contamination, 26% reported trichloroethylene (TCE) was found in their well, 3% reported carbon tetrachloride, and 21% reported both TCE and carbon tetrachloride were found.

Chronic Illness:

- 42% of households reported someone in their residence had experienced a chronic illness. The types of chronic illnesses reported were diverse, with cancer and diabetes the most frequently reported.
- 84% of households that had experienced a chronic illness had lived in the study area more than 5 years.
- 86% of those reporting they had experienced a chronic illness reported their drinking water was previously or is currently supplied by a private well, and 17% of those reporting a chronic illness also reported their well tested positive for contamination.

Birth Defects:

- 7% of households reported having a child with a birth defect.

- 90% of households reporting a birth defect lived in the study area for more than 5 years.
- All of those reporting that a child in their residence experienced a birth defect also reported their drinking water had previously been or is currently supplied by a private well, and 18% of those reporting a birth defect also reported their well tested positive for contamination.

Deaths:

- 23% of households reported a family member(s) had died in the time they have lived in the study area. Less than 1% of the deaths were children.
- 94% of households reporting a death had lived in the study area for more than 5 years.
- 94% of households reporting a death also reported their drinking water had previously been supplied or is currently supplied by a private well, and 19% of those that reported a death also reported their well tested positive for contamination.
- Each reported death was categorized into one of 16 causes of deaths. The most frequent cause of death was cancer, followed by heart disease or heart attack.

Attachments include a chart that depicts survey responses, a graph depicting the age distribution of residents as obtained from the surveys, a chart depicting residents' gender distribution as obtained from the surveys, a graph depicting the number of residents who reported having specific illnesses, and a graph depicting the number of people who were reported as having died from a specific illness.

Table 1. Descriptive Statistics for Well Water Information and Length of Residence in Study Area

			Percent of all Households:
Is your drinking water currently supplied by a private well?	Yes	41	6%
	No	701	93%
	Unanswered	9	1%
Was your drinking water previously supplied by a private well?	Yes	516	69%
	No	201	27%
	Unanswered	34	5%
Did your house have a whole water filter installed?	Yes	79	11%
	No	616	82%
	Unanswered	56	7%
How long have you lived at current address (yrs)?	<=1 yr	49	7%
	>1 to <=5 yrs	183	24%
	>5 yrs	511	68%
	Unanswered	8	1%
	Mean	16.6 yrs	
	Median	12 yrs	
	Range	1-65 yrs	
Have you lived at another address in the study area?	Yes	178	24%
	No	561	75%
	Unanswered	12	2%
How many years did you live at this address? <i>Among Households that Lived at Another Address:</i>	<=1 yr	6	3%
	>1 to <=5 yrs	39	22%
	>5 yrs	127	71%
	Unanswered	6	3%
	Mean	14.4 yrs	
	Median	13 yrs	
	Range	1 to 53	
Total Years Lived Previously or Currently in the 46561 or 46516 zip code area	<=1 yr	33	4%
	>1 to <=5 yrs	153	20%
	>5 yrs	559	74%
	Unanswered	6	1%
	Mean	19.9 yrs	
	Median	16 yrs	
	Range	1-65 yrs	

Table 2. Descriptive Statistics for Private Well Water Contamination

			Percent of all Households:
Has your well water been tested for contamination?	Yes	41	6%
	No	701	93%
	Unanswered	9	1%
The well water was tested by:			Among Households Tested:
	EPA	88	29%
	IDEM	32	11%
	Private Lab	95	32%
	Unknown/Other	26	9%
	Unanswered	59	20%
Was contamination found in your well water?	Yes	92	31%
	No	158	53%
	Unanswered	50	17%
Name of contaminant	TCE	24	26%
	Carbon Tet	3	3%
	Both	19	21%
	Unknown/ Other	16	17%
	Unanswered	30	33%

Table 3A. Descriptive Statistics for Self-Reported Chronic Illness

			Percent of all Households:
Have you or anyone in your residence experienced a chronic illness?	Yes	315	42%
	No	394	52%
	Unanswered	42	6%
Number of households that reported a chronic illness if they lived in the study area for:			Among those that reported a chronic illness:
	<=1 yr	6	2%
	>1 to <=5 yrs	42	13%
	>5 yrs	265	84%
	Unanswered	2	1%
Answered "yes" to chronic illness and did your house have a whole house water filter installed		35	11%
Answered "yes" to chronic illness and is your drinking water currently supplied by a private well		18	6%
Answered "yes" to chronic illness and was your drinking water previously supplied by a private well		252	80%
Answered "yes" to chronic illness and was contamination found in your well water		52	17%
Answered "yes" to chronic illness, previously drank well		52	17%

Table 3B. Chronic Illness Subset (includes only those that lived in 46516 or 46561 for >1 yr)

Have you or anyone in your residence experienced a chronic illness?	Yes	309	43%
	No	376	53%
Answered "yes" to chronic illness and did your house have a whole house water filter installed		35	11%
Answered "yes" to chronic illness and is your well water currently supplied by a well		18	6%
Answered "yes" to chronic illness and was your drinking water previously supplied by a well		252	82%
Answered "yes" to chronic illness and was contamination found in your well water		52	17%
Answered "yes" to chronic illness, previously drank well water, and contamination of well water		52	17%

Table 4. Descriptive Statistics for Self-Reported Birth Defects

			Percent of all Households
Have any children in the residence experienced a birth defect?	Yes	50	7%
	No	653	87%
	Unanswered	48	6%
Number of households with >1 birth defects		11	1%
Number of households that reported a birth defect if they lived in the study are for:	<=1 yr	0	0%
	>1 to <=5 yrs	4	8%
	>5 yrs	45	90%
	Unanswered	1	2%
Answered "yes" to birth defect and did your house have a whole house water filter installed		4	8%
Answered "yes" to birth defect and is your well water currently supplied by a private well		6	12%
Answered "yes" to birth defect and was your drinking water previously supplied by a well		44	88%
Answered "yes" to birth defect and was contamination found in your well water		9	18%
Answered "yes" to birth defect, previously drank well water, and contamination of well water		9	18%

Table 5. Descriptive Statistics for Self-Reported Deaths Among Family Members

Average age for all deaths (yrs)	Mean	65.1	
	Median	67.5	
	Range	1-100	
Have any family members died in the time you have lived in the study area?	Yes	171	Percent of all Households 23%
	No	550	73%
	Unanswered	30	4%
Children deaths (age at death <20)		6	1%
Number of households that reported a death if they lived in the 46516 or 46561 zip code area for:	<=1 yr	0	Among those that reported a death: 0%
	>1 to <=5 yrs	9	5%
	>5 yrs	160	94%
	Unanswered	2	1%
Answered "yes" to death and did your house have a whole house filter installed		18	11%
Answered "yes" to death and is your well water currently supplied by a private well		12	7%
Answered "yes" to death and was your drinking water previously supplied by a private well		149	87%
Answered "yes" to death and was contamination found in your well water		33	19%
Answered "yes" to death, previously drank well water, and contamination of well water		33	19%

Appendix 1. Comprehensive Listing of Self-Reported Chronic Illnesses

Disease/ Number of Self Reported Cases *		
Abdominal Aortic Aneurysm		Crones 4
Acid Reflux Disorder		Chronic Bronchitis 3
ADD		Chronic Fatigue Syndrome
Alcoholic		Chronic kidney infections
Allergies	18	Chronic migraines
ALS		Chronic pancreatitis
Alzheimer's		Chronic Spine Pain
Anemia		Cron's Disease
Anxiety	4	Cilia problems
Appendix		Circulation disease
Arthritis		Cirrhosis of the liver
Asthmatic Bronchitis	39	Colitis 2
Atrial Fibrillation		Colon 2
Back aches		Colon Cancer 4
Back problems		Congenital Scoliosis
Belle Paise		Congestive Heart Failure 6
Benign Cancer Cells		Congestive Heart problem
Bercitus		Contact Dermatitis
Bipolar		COPD 6
Bladder Cancer	2	Coronary Artery Disease
Bladder Infections	2	CP
Blistering Skin Disease		Damaged Nerves
Blocked Artery		Defective Vision
Blood pressure	2	Degenerative disk disease
Blood sugar		Depression 12
Boils		Detached Retina
Bone cancer		Diabetes 62
Bone Disease		Dysplasia
Bone marrow disorder		Ear aches
Bowel problems		Ear Infections 4
Brain aneurysm		Eczema 2
Brain Tumor		Eczema
Breast Cancer		Elevated Cranial Pressure
Breast Tumors	8	Emphysema 10
Bronchitis	22	Enlarged Prostate
Cancer	24	Enlarged prostate gland
Cancer Multiple Myloma		Epilepsy
Cancerous tumor in kidney		Erratic breathing
Characinoid syndrome		Esophagus Cancer
Cardiomyopathy		Eye problem
Carpal Tunnel Syndrome		Female Problems
Cataracts		Fibroid Breast Tumor
Cataract's- detached retina		Fibroid Buildup
Cervical cancer	6	Fibromyalgia 9
Cervical Ovarian Cancer		Fifth Disease
Charcot-Marie-Tooth disease		Flu
Chemical imbalance		Gall Bladder
Cholesterol		Gastritis 2

GERD		Lupus	3
Germinoma of Pituitary	2	Lymphoma Cancer	
Glaucoma		Macular degeneration	
Gout	2	Melanoma	
Headaches		Melanoma facial cancer	
Heart		Migraines	10
Heart Attack	11	Mini Strokes	2
Heart Condition	4	Mitrovalve Prolapse	
Heart disease	2	MRSA	2
Heart Failure	6	Multiple Sclerosis	5
Heart Flutter Valve		Multiple Sclerosis	
Heart murmur		Muscular dystrophy	
Heart Problems	2	Nervous Disorder	
Heart surgery	7	Nervous system disease	
Heart trouble	3	Neuropathic Pain Syndrome	
Hemophagocytic Lymphohistiocytosis		Nose bleeds	
Hepatitis		Open Heart Surgery	3
Hepatitis C		Open heart surgery	
High Blood Pressure	3	Open Heart Surgery	
High blood sugar	51	Osteoarthritis	2
High Cholesterol		Osteoporosis	3
Histoplasmosis	2	Ovarian Cancer	2
Hodgkin's disease	2	Ovarian Cyst	
Hyperactive thyroid		Pancreatitis	2
Hypothyroidism		Pancritis Infections	
Hysterectomy	3	Parkinson's	4
IBS		Peripheral Neopathy	
Immunodeficiency problems		Pneumonia	3
Infected stomach lining		Poor Circulation	2
Inner ear infection		Precancer cells on cervic	
Intestinal Illness		Prostate	
Irregular heart beat		Prostate Cancer	3
Jaw Cancer		Prostate stones	
Kidney		Psoriasis	
Kidney Cancer	3	Reynolds	
Kidney Disease		Reactive Airway Disease	
Kidney Failure		Reflux disease	
Kidney Infections	4	Reiter's syndrome	
Kidney problems	2	Renal disease	
Kidney Stones		Renal Failure	
Kidney transplant	3	Respiratory	2
Kidneys		Respiratory Illness	
Labial adhesion		Respiratory maladies	
Leukemia		Rheumatoid Arthritis	5
Liver	2	Sarcoidosis	
Liver Problems	2	Schizophrenia	
Liver trouble		Sciatic Nerve	
Low WBC count		Seizural disorder	
Lump in Breast		Seizure	
Lung cancer	4	Severe Rashes	
Lungs	2	Sinus and Lung	

Sinus disease	
Sinus Infection	3
Sinus Problems	2
Sinuses	5
Sinusitis	2
Sistic Mastes Disease	
Skin Cancer	3
Skin Irritation	
Skin rash	
Sleep Apnea	
Stomach	3
Stomach Cancer	
Stomach problems	2
Stroke	6
Tachicardiac	
Throat Cancer	3
Thromboend Arterectomy	
Thyroid disease	
Thyroid problems	
Thyroid	9
Thyroid Cancer	4
Thyroid problems	
TIA's	2
Tonsillitis	
Tourette's Syndrome	
Tumor on middle finger	
Tumors	2
Typhoid	
Unexplained	
Upper respiratory infection	
Uterian cancer	2
Viral meningitis	
Zollinger Ellison Syndrome	

*Empty Count=1 self-reported case

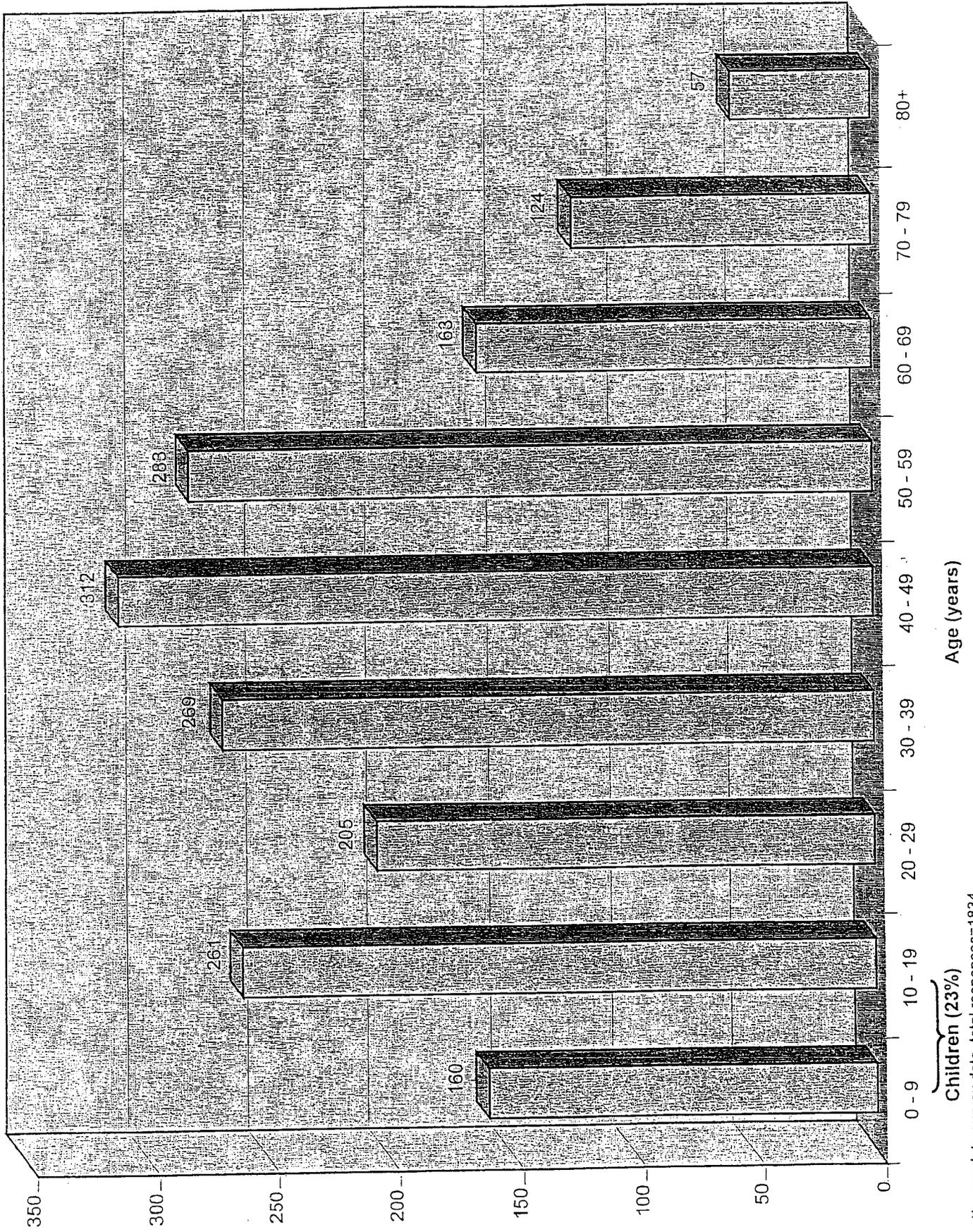
Appendix 2. Comprehensive Listing of Self-Reported Birth Defects

Disease/ Number of Self-Reported Cases*

Abnormal kidney reflux	
Asthma	
Blind	
Bone marrow disorder	
Born with hole in heart	
Breathing problems	
Cardio Myopathy	
Cerebral Palsy	3
Charcot-Marie-Tooth disease	
Club foot	2
Congenital scoliosis	
Down Syndrome	2
Eventration of diaphragm	
Eye defect	
Eye Problems	
Glaucoma	
Heart murmur	2
Hole in heart	
Irregular heart beat	
Lost heart beat during birth	
Miscarriage	3
Muscular dystrophy	
Open Spine and Water on Brain	
Premature	2
Prone to outbursts	
Pyloric Stenosis	2
Retardation	2
Severe vision problems	
Son born with one testicle	
Spina bifida	
Stillbirth	
Umbilical cord wrapped 3X around baby's head	
Underdeveloped respiratory system	
Valves not developed properly	
Ventricular septal defect	2
Vision Defect	
Williams Syndrome	

*Empty count= 1 self-reported case

Figure 1. Distribution of Age in Zip Codes 46516 and 46561*



*Incomplete survey data, total responses=1834

**A Community Assessment of the
Environmental Health Education Needs of the Community.**

**Conrail Superfund Site
Elkhart County, Indiana**

A Project funded by the Elkhart County Board of Health
and
The National Association of County and City Health Officials

Phase II, Implementation

April 2002 – December 31, 2002

Prepared by

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January 4, 2003

Abstract

The Conrail Rail Yard in Elkhart County was opened in 1956 as part of New York Central Railroad operations. It continued operations as a subsidiary of the Penn Central Transportation Company until 1976 when operations were transferred to Consolidated Rail Corporation (CONRAIL). Numerous complaints were received between 1962 and 1986 regarding oily discharges from the railroad and spills or releases of products such as oil, diesel fuel, hydrochloric acid, caustic soda and a variety of petroleum-related substances. The complaints included reports that track cleaning substances and engine degreasers were used and disposed of at the rail yard.

Investigations at the site indicated a large area of Trichloroethylene (TCE) contamination. Later, high concentrations of Carbon Tetrachloride (CCl₄) were also documented. Bottled water and carbon filters were provided to residents in the late 80's after TCE concentrations as high as 5850 parts per billion (ppb) were identified in the drinking water. Concentrations of CCl₄ were subsequently observed as high as 117 ppb.

In June of 1988 the site was proposed for inclusion on the National Priorities List (NPL) after the identification of two well-defined contamination plumes. Between September of 1994 and December of 1996 municipal water was extended to 1135 homes in the area. Thirty-five homes, for different reasons, refused to accept the municipal water supply. Gradually these homes, either due to a change of owner or change of heart by the landlord, are being connected to the municipal supply.

A citizens group, known as the "Citizens League for Environmental Action Now" (CLEAN) has kept community interest in the site alive. CLEAN requested and received several Technical Assistance Grants (TAG) from the EPA to monitor the process and to keep residents informed. Through CLEAN, many anecdotal reports of unusually high numbers of illness and disease were reported to both the Agency for Toxic Disease and Substances Registry and the Elkhart County Health Department. These reports ultimately facilitated, with the help of CLEAN and the residents, a preliminary health assessment in the site. Through that assessment, 751 questionnaires were received from a total population of approximately 1200 homes. The initial review of the basic data received from the surveys indicates some potential for a higher incident of chronic disease than one might expect in a small population. That data is still under review and no conclusions have yet been reached.

The residents primary concern is that the lessons of this site continue to be shared with current residents. They are also concerned that the medical community be kept abreast of the survey findings as they may relate to their personal health care. A third concern is that new residents of the area be given the facts about the site and the knowledge to protect their families.

Support from the Agency for Toxic Substances and Disease Registry (ATSDR) and the NACCHO grant have allowed us to begin these efforts. The Environmental Health and Medical Health needs of this site will continue to unfold as more is learned about the site and the health effects of the contamination. This will require a long-term commitment to residents of the site if we are to be successful in meeting the citizens' request.

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| 2. Preliminary List of Environmental Health Education Questions and the CAG Ranking | pg. 29 |
| 3. Brochure “Conrail Superfund Site – Location, Contaminants and Questions” | Rear Jacket |
| 4. Letter to Physicians | pg. 31 |
| 5. Power Point Presentation | Front Jacket |

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Site Location

Elkhart County, Indiana is located in North Central Indiana and adjoins the State of Michigan. The Conrail site is located directly west of the City of Elkhart and extends through Baugo Township into St. Joseph County to the West.

In area, the site covers approximately 2,500 acres in Elkhart and St. Joseph Counties. The site is bounded to the north by the St. Joseph River, to the West by the St. Joseph River and Baugo Bay, to the east by State route 19 (Nappanee Street) and to the south by the southern boundary of the Conrail railyard property.

The railyard occupies approximately 675 acres of the declared site. The remainder is a mix of commercial, manufacturing, retail and residential properties. The residential properties exits primarily north of the US 33 commercial corridor.

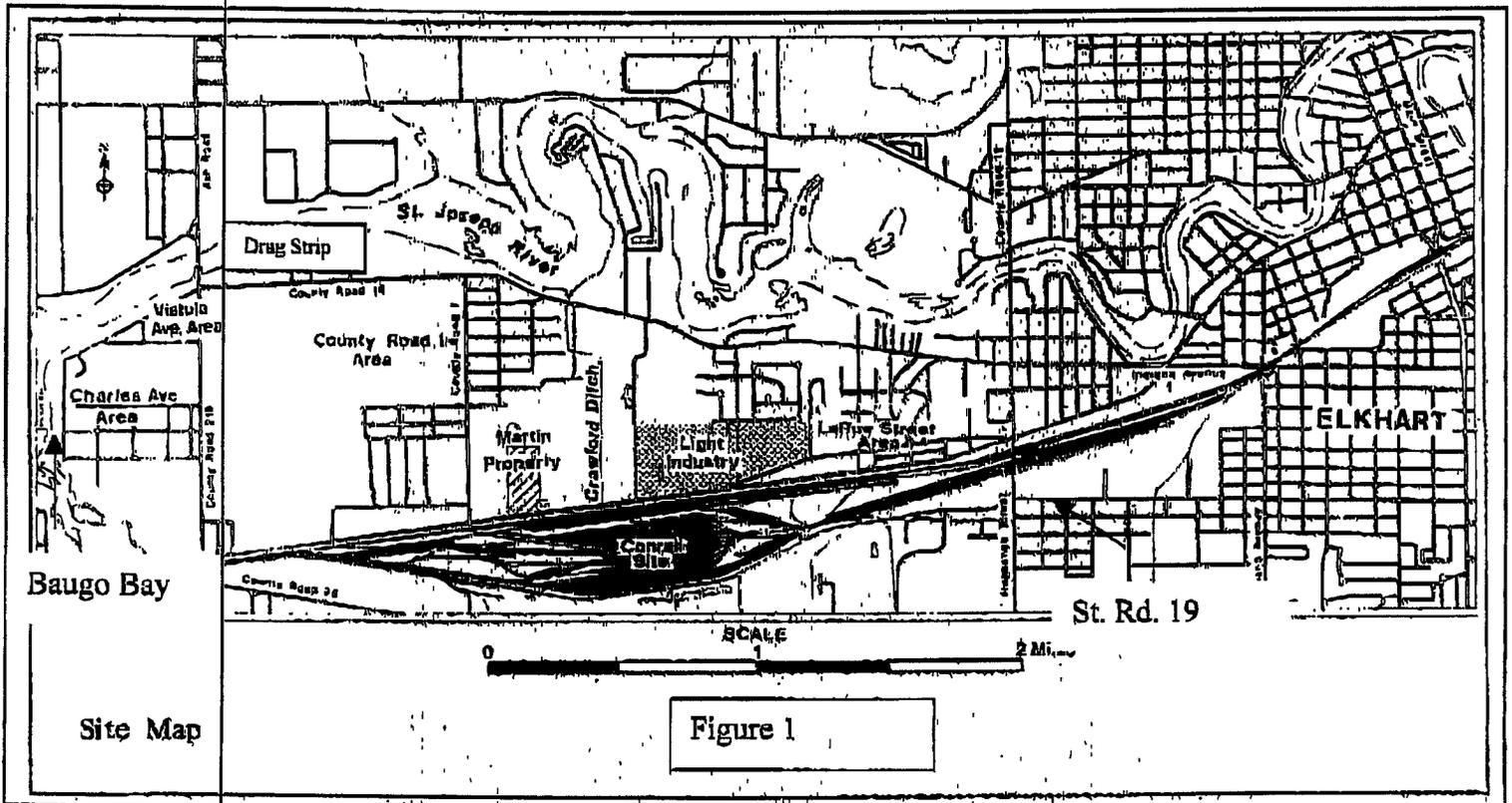
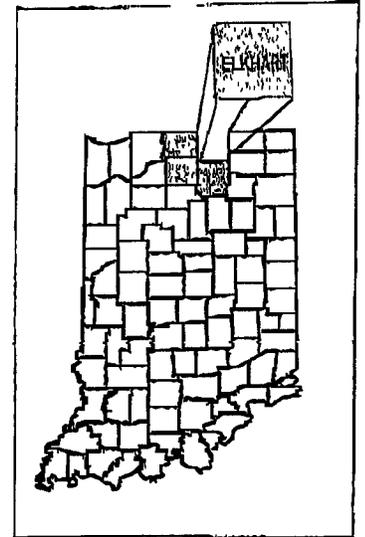


Figure 1

St. Joseph County ← —→ Elkhart County

Site History

The site became an active rail yard in 1956 as part of the New York Central Railroad and later operated as a subsidiary of the Penn Central Transportation Company until 1976. In 1976 operations were transferred to Consolidated Rail Corporation (Conrail) who operated the yards until June of 1999 when ownership changed to Norfolk and Southern Corporation.

The rail yard has grown into one of the largest, in terms of volume, in the United States. From 1962 into 1968 numerous complaints regarding oil discharges from the railyard into the St. Joseph River via Crawford Ditch were filed. From 1976 to 1986 spills and releases of oil, diesel fuel, hydrochloric acid, caustic soda, and various petroleum-related substance occurred at the site. Reports also indicate that a track cleaning substance and engine degreasers were used and disposed of at the rail yard.

The two primary contaminants, Trichloroethylene (TCE) and Carbon tetrachloride (CCl₄), and their source areas at the site are have been well documented. The TCE appears to be the result of an undocumented tank car release. The exact nature of the CCl₄ release has not been clearly documented, although Environmental Protection Agency (EPA) records describe a release of approximately 16,000 gallons of CCl₄ from a damaged tanker car that may have occurred in the late 1960's.

The third site, a drag strip, is under investigation but at this time there is no available documentation in regard to the nature or volume of releases at that site.

After detecting TCE in a residential well in 1986, at the corner of CR1 and Tower Road, the U.S. EPA became involved and began providing bottled water to affected residents. Whole house filters were then provided and remained in place until 1994 when municipal water was extended to a portion of the site as directed by the interim Record of Decision and later in the final Record of Decision.

The U. S. EPA placed the site on the National Priorities List (NPL) on August 30, 1990. A remedial action/feasibility study was started by the EPA in 1988 and continued in three phases through 1994. Conrail was required to conduct soil-gas studies and subsurface investigation to aid in determining the location and extent of the contamination. In total, 69 monitoring wells and 143 soil borings were drilled between 1988 and 1994.

In 1991 the EPA and involved parties achieved a 1991 Interim Record of Decision, in July of 1992 an administrative order, in April of 1994 a draft Final Record of Decision, and in September of 1994 a Final Record of Decision that included the following:

1. Extension of municipal water to all residents within the Site;
2. Additional source investigations and remediation;
3. Soil vapor extraction of TCE vapors in the south-central source area and air sparging in the saturated zone in the CCl₄ source area;
4. Ground water extraction and treatment to achieve ground water standards through out the plumes, by emphasizing remediation of "hot spots".

Between 1994 and 1997 municipal water was extended to the entire site and effectively removed the drinking water route of exposure.

On November 11, 1997 American Premier Underwriters (APU) and Conrail entered into a Consent Decree with the EPA. The affect of the Consent Decree was to allow APU and Conrail to apply for a technical impracticability waiver that would allow for the natural attenuation or natural flushing within the aqueous portion of the plumes identified in the Record of Decision. The consent degree also provides that if EPA allows the technical waiver that APU and Conrail will investigate the potential for an additional source at the Drag Strip and undertake a response action at the Drag Strip.

In 1998 soil-gas monitoring and monitoring wells were completed in the Drag Strip location. No Dense Non-Aqueous Phase Liquids were located but tests seem to confirm, from CCl₄ concentrations in the monitoring wells, that a potential source for the CCl₄ may be on the Drag Strip property.

At the request of the residents, several phases of Vapor Monitoring for the presence of TCE and CCl₄ were conducted in local structures, both residential and commercial. The results of the study showed CCl₄ vapors in structures in the Vistula Avenue area situated down gradient (northwest) of the Drag Strip and between the Conrail Yard and the St. Joseph River. Vapor extraction systems were installed in each of the six impacted structures.

The residents and the St. Joseph River Basin Commission both expressed concerns for the aquatic environment of the St. Joseph River due to the impact of the contaminant plume intersecting the river (Figure 3, pg. 21). A Benthic Macroinvertebrate Study of the River was conducted in two phases. The first confirmed that TCE is discharging to the River from a location just east of the Ash Road Bridge to a location about 0.5 miles downstream (west) of the bridge. Carbon tetrachloride and chloroform, a CCl₄ breakdown product, are discharging to the river in a much narrower area completely contained within the TCE discharge area.

The second phase of the study (1999) was to determine what, if any, impact the chemicals were having on the Benthic Macroinvertebrates. The result of that work did not show an appreciable impact on the Benthic environment. Within the St. Joseph River community those findings are somewhat controversial and APU and Conrail will perform follow-up studies.

In 2001 installation of the barrier-treatment well tests were started to determine the potential for success of the proposed final remedy under the technical waiver (figure 4, pg 22). Those tests have continued into 2002 and it is projected that a system of barrier-treatment wells will be installed to stop the flow of contaminants out of the rail yard by years' end. A system of monitoring is proposed in the waiver to determine the success of natural attenuation in the plume areas down gradient of the Conrail yard.

Residents in the site continue to be concerned that they have been forgotten. They feel that the EPA and the PRP's are in a foot-dragging mode and that even though municipal water has been provided, the problem of the contamination and its discharge to the river continues. They also

have a secondary concern that their health is being impacted by the air contamination caused by diesel smoke from the locomotives.

Community

Elkhart County is a mix of agriculture, commercial, manufacturing, and assembly industries. The area is perhaps best known for three things, Miles Labs, now Bayer, which manufactures "One a Day Vitamins" and "Alka-Seltzer" among several other pharmaceutical products, the recreational vehicle manufacturing industry, and the manufacture of musical instruments. These are three of the largest employers outside of Government. The county has a strong agricultural background, with many farms now owned by fourth and fifth-generation families. Over 65 percent of the land is actively farmed and Elkhart County maintains the distinction of being the largest dairy producer in the state. The County also has a growing Amish culture. The Amish culture, when combined with the musical instruments and recreational vehicles, creates another thriving industry in the county, tourism.

The Conrail Site reflects each of these traits with the exception of the Amish. There are no Amish living within the designated boundaries of the site. There is, however, a mix of commercial, industrial, manufacturing and residential uses in the site. Vacant agricultural land is rapidly disappearing from the site as developers are pressuring to build within the site as a result of the extension of municipal water.

The Site population is characteristic of the rest of the rural portions of the county with a low percentage of cultural and racial diversity. There is, however, a very diverse mix of economic levels with upscale housing constructed at and near the St. Joseph River Banks and more moderate to lower-priced housing closer to the Conrail Yard. Most of the commercial and manufacturing property is located on U.S. 33, adjacent to the Rail Yard.

Demographics

The site consists of approximately 1200 homes. This number is now growing with two new subdivisions recently approved by the Elkhart County Planning Commission and a third being proposed. The demographic breakdown is as follows:

Racial Mix	94.4 % White	Age Distribution	
	2.2 % Black – non Hispanic	0 to 5 years	6.4 %
	2.2 % Hispanic	6 to 13 years	16.4 %
	0.21% Native American	14 to 18 years	7.5 %
	0.7 % Asian	19 to 24 Years	4.6 %
Gender is		25 to 44 years	28.1 %
		45 to 64 years	24.1 %
	50.3 % Female	65 and Older	12.9 %
	49.7 % Male		

Socioeconomic

Forty-five percent of the sites population earns less than \$34,000 and 55 % earn greater than \$34,000. Population Density is approximately 2 homes per acre.

Preliminary Health Assessment

The community assessment for the Conrail Superfund site has two phases. The first phase was instigated by the CLEAN organization with help from the Elkhart County Health Department, the adjoining St. Joseph County Health Department, and ATSDR. Historically, the residents have been concerned that not much progress has been made toward the resolution or any form of clean up of the contamination that has existed for over 20 years. Perhaps given that it has been 20 years and we are only now looking at a partial remediation of the problem, the residents concerns are well founded.

In September of 2000 the CLEAN organization met with the Health Departments and ATSDR to discuss what could be done to bring some conclusion to the residents concern for the Health Affects of exposure to TCE and CCl₄ and what, if any, impact exposure may be causing in the future. Anecdotally, many of the residents have stories about the cancers and chronic illness that seem unusually high in such a small population.

By late October a preliminary questionnaire was being developed with the help of CLEAN and a team of local residents. On January 13th of 2001 a news release announced the project to the public and sought their assistance and commitment to make this project work. On January 30th the CLEAN organization, with help from the Health Departments, hand-delivered a newsletter to each of the approximately 1200 homes in the impacted area. On February 7th a public meeting was held at the Harley Holben Elementary School, which sits near the edge of the major plume. Representatives of ATSDR, the Elkhart County Board of Health, CLEAN, and CLEAN's technical advisor all made presentations on what a health assessment could and could not do for the community. Community commitment to the project was also gauged and a list of volunteers who would act as block captains, to oversee the door-to-door survey in their neighborhood, was started. It was made clear at the meeting that our goal was not to find a smoking gun but to begin to answer the questions residents have had for a long time.



Gale Godfrey of ATSDR making a point with residents

On February 19, 2001 a meeting was held with the volunteers to train them and begin the distribution of the surveys. On Feb 27, 2001 another meeting was held for the public to begin

completing the surveys, answer the questions of those that missed the first meeting introducing the project, and train additional volunteers.

The delivery of the survey tool and the coordination of the volunteers were coordinated by the CLEAN president, Lorna Richard. A printed identification badge was provided to each volunteer that carried the surveys. The Elkhart City Utilities department developed a listing of all properties in the area from their billing records. Each team was then responsible for up to 100 surveys. The Elkhart County Environmental staff was able to do some of the clean-up work as we ended the survey period and were responsible for 125 surveys in the original survey round. On March 5, 2001 the volunteers began the door-to-door surveys. The St. Joseph County Health Department Nursing staff volunteered to carry the surveys to the 300 homes in their portion of the site.

Survey methods used were as follows:

- Initial round:** face to face surveys completed by the surveyor or face to face surveys with the written portion completed by the resident.
- Second round:** Door tags were developed requesting that a representative be called to administer the survey.
- Third round:** phone surveys were collected with the resident answering the question and the environmentalist from the Health Department completing the written portion of the survey.

At each residence, where the name and address of a previous resident were known, the information was collected. When a name and complete address could be obtained, a survey with complete direction for completion of the survey and a self-addressed envelope was forwarded to the individual. Of the 751 returned surveys approximately 35 were from previous residents who had moved from the site.

The pre-established dead line for completion of the survey was May 30, 2001. All surveys were forwarded to the Indiana State Department of Health on June 4, 2001. ATSDR and their contractors reviewed the surveys and submitted the raw data and a preliminary report to us on August 29, 2001. A complete analysis and report on the public health assessment was scheduled for late July or August 2002.

Residents of the site were notified of the progress and the preliminary data by a newsletter that was hand-carried by the CLEAN volunteers in September 2001 (attachment 1, pg 23). This was the last official act of CLEAN, which was disbanded the next week.

The next step will be to schedule a public meeting for the residents when the Public Health Assessment is completed. At that meeting we will share the results of the assessment and hope to have a toxicologist on hand to answer health question and the Indiana State Department/ATSDR staff available to discuss how the public health assessment was compiled. We anticipated this meeting in August or September of 2002 but now that date has passed and we don't really have a sound idea of when the report will be finished.

A separate survey of rail yard workers was proposed and scheduled. The Rail Workers Chief Union representative met with us and helped to schedule two times that the workers could complete the surveys during their normal work shift. Unfortunately, of the hundreds of people who work on the rail road, only three filled out the survey. Due to the limited number who responded, the three rail road worker surveys were not tabulated.

The second phase of the environmental health assessment started with the September 2001 newsletter announcing the NACCHO project and seeking help and input from the impacted residents. Our first meeting on the Conrail Superfund Community Advisory Group (CAG) was scheduled for September 20, 2001 at the Holben Elementary School. This school has been, and continues to be, the hub for all activities related to the site. We owe a great deal of thanks to the principal and staff of the school for their time and continued support of our activities.

Our CAG membership consists of 11 regular members and up to 20 residents who attend occasionally. At the organizational meeting (September 20, 2001) we explained the project, the project goals, established time lines and began seeking input from the residents. We also made it clear that the project was theirs, that their input was very important and that all suggestions would be considered with all decisions made by consensus.

At our second meeting, on November 1, 2001, we began to collect and discuss suggestions for the Health Education Needs of the site. This was a difficult task for some members still angry about the site and seeking solutions to the contamination problem. Two members stopped coming to the CAG meetings when they found that we were not going to focus on the EPA, Conrail or the potential for law suits.

The third meeting was on December 6, 2001. At that meeting we shared the beginning of a Power Point presentation describing the history of the site. It was agreed that this would be a very useful tool for doing public presentations. We also prioritized and ranked each of the CAG suggestions for the Health Education project. The door was, however, left open for additional suggestions as they were presented. It was also determined that the questions could be divided into classes that would be answered as the project continues. Class I questions/tasks could be worked on now and would be a product for the NACCHO work. Class II questions/tasks could not be answered until the Health Assessment is completed, and Class III question/tasks probably were not appropriate and would not be addressed (attachment 2, pg 29)

Our fourth meeting was scheduled for January 31, 2002. At that meeting we reviewed additions to the Power Point work and spent the remainder of the session working on demographics. Elkhart County Environmentalists Jennifer Tobey and Erin Hafner reviewed each section of the demographics information package with the CAG and sought their input on information that we either could not find or areas we felt should be reviewed by the residents for accuracy.

Our fifth meeting scheduled for February was cancelled due to an ice storm.

On April 4, 2002 our final CAG meeting of the assessment phase was used to share all of the materials developed to date and to give the residents one last opportunity to suggest additional educational efforts prior to our beginning the implementation phase. No additional meeting was scheduled with the understanding that we would contact the CAG as necessary.

The final CAG recommendations are as follows:

1. Plan to answer the communities' questions in Phase II.
2. When the Public Health Assessment is complete schedule at least one public meeting to discuss the results. Attempt to have a toxicologist at that meeting.
3. Conduct at least one Physicians awareness program to bring local doctors up to date on the site and what exposures have occurred. April 2002
4. Continue to develop the Power Point presentation.
 - a. Conduct at least one presentation for the Elkhart and the St. Joseph County Board of Realtors.
 - b. Conduct at least one presentation for the Elkhart and the St. Joseph County Builders association.
 - c. CD ROMs will then be burned for use, as requested, by the public and made available to all public libraries, government offices, the Board of Realtors and the Builders Associations.
 - d. Develop brochures, to be used by the public, that provide as a minimum the questions developed by the residents and the CAG.
 - e. Develop a second brochure in response to the findings of the Public Health Assessment

Implementation

1. Preliminary Health Assessment

The Health Assessment project, as explained on pages nine and ten is ongoing. A final report on the preliminary surveys collected by the Health Departments and CLEAN has not yet been issued by ATSDR or the Indiana State Department of Health. The health impacts of the site continue to be a concern for the long time residents of the site. They no longer have a great concern for themselves but continue to desire additional health information for their children and for new residents of the site. Time continues to be an issue for the residents. It was projected that this report would be completed by July of 2002. We have not yet received the report and do not have a firm time line for receiving this crucial information.

As a part of this Environmental Health Education Project we will continue to monitor the progress on the report being formulated by ATSDR and anticipate a public meeting with residents to discuss the report. We anticipate that either the Indiana State Department of Health or ATSDR will provide a toxicologist to help residents understand, as much as possible, the results of the report.

2. Plan to answer the Phase II questions from residents.

The questions raised by the community advisory group are included as attachment 2 on page 29. Some questions were not appropriate to the project or had no answer. The CAG helped us to eliminate questions where appropriate and then to prioritize the questions into Categories I, II and III.

The Category I questions would be answered if possible. The Health Assessment being completed by the ATSDR may answer the Category II questions. Category III questions probably could not be answered as a part of the project. Due to space limitations in our presentation materials some category I questions were consolidated in an attempt to answer as many questions as possible.

Finding the answers to the residents' questions was not easy. Partially because no research exists to answer some of the medical questions asked. The ATSDR was very helpful in researching our final responses. The questions and responses are contained in Attachment 4; a brochure entitled "Conrail Superfund Site Elkhart County, Indiana - Location, Contaminants and Questions."

3. Conduct at least one Physicians awareness program.

Clayton Koher, of the Chicago office of ATSDR, and Jeniphor Bonnel of the Elkhart General Healthcare System, helped us to arrange a physicians training at Elkhart General Hospital. A letter announcing the effort is included as attachment 3 on page 31. With the letter we included a return mailer to reserve a space at the training and to begin a list of question the Doctors would like answered at the seminar. Jeniphor Bonnel was very helpful in obtaining continuing medical education credits for the program and thus making it more inviting to the Physicians.

Through the efforts of Mr. Koher we were able to have Dr. Rachael Rubin, Division Chairperson of Occupational and Environmental Medicine at Cook County Hospital in Illinois, as our speaker for the Physicians program. Interestingly the Physician questions reflected some of the same interests as the residents. A few examples of the Doctors questions are as follows:

- a. Is exposure continuing?
- b. Is there any post exposure treatment?
- c. What are the present statistics on Cancer effects if any?
- d. What symptoms or effects should I be looking for with TCE exposure?

Dr. Rubin arrived in Elkhart on April 23 and spent the afternoon touring the Conrail Site and a Second Superfund Site involving the Elkhart City Central Well Field. This provided a nice opportunity to meet the doctor and discuss the site with representatives of the Indiana Department of Health and ATSDR. On April 24, Dr Rubin spoke for a little over an hour and a half to twenty-one area doctors and others interested in the site. After some discussion about the two chemicals most prevalent at the site, Dr. Rubin dedicated most of her presentation to the significance of a complete exposure history where environmental factors are a medical concern. Dr Rubin and ATSDR provided a booklet and a plastic reference card for completing case studies in Environmental Medicine called, "Taking an Exposure History". The Doctors seemed very interested in the subject and seemed receptive to Dr. Rubin's' advice.

Extra copies of the materials presented by Dr. Rubin and ATSDR were provided to Elkhart General and Goshen General Hospital Medical Libraries.

4. Continue to develop the "Power Point" presentation.

A copy of the Power Point presentation called "Conrail Superfund, Environmental Health Education Project Report" is included with this report. The purpose of this presentation is two fold. First, due to the residents concern for newcomers to the community and their lack of knowledge of the site, we will be conducting a presentation to the Elkhart County Board of Realty in January. This was the earliest date we could schedule to make the presentation. Kim Stackhouse, our community representative and I will make the presentation. Our purpose is to inform the realtors about the site, what the concerns are, what has been done to reduce or eliminate those concerns, and in general inform the realtors what a Superfund site is all about. It continues to amaze us that this site has had documented problems for nearly 25 years, has routinely been in the media, and yet realtors and people who live in the site have no idea that it is a superfund site or what that means. This lack of knowledge includes some developers attempting to develop new subdivisions directly over the CR 1 plume.

We will also schedule a meeting with the Builders association of Elkhart County to do a similar presentation.

The second reason for the electronic presentation was to make it available to the public and to provide copies of the presentation available to all public libraries and the schools in the site. Several copies of the Power Point presentation, brochures and copies of this report will also be provided to the Board of Realtors and the Builders association in January.

Another goal, as time allows, will be to make a version of the presentation with a voice track and run time version of Power Point. We will be recording our presentations in January to determine what we say and what questions are asked. From those recordings we will prepare a transcript that we can use to record over the individual slides as appropriate. This will be a late winter project for Kim and I.

5. Develop brochures to be used by the public.

The Brochure entitled, "Conrail Superfund Site Elkhart, Indiana – Location Contaminants and Questions", is included with this report as attachment 3. The purpose of the brochure is to identify the site, the problems of the site and to try to answer some of the residents' questions. After several drafts of the brochure it was delivered to the health department on December 23, 2002. We considered this is an appropriate Christmas present.

Distribution of the brochure, the "Power Point" presentation on CD, and copies of this report to the CAG, the Schools, Libraries, Churches, Day Care Centers, Government offices and selected business will begin in January 2003. It is our intent to provide copies of this brochure to several of the title companies in the area for distribution with their title work on properties within the site. The township assessor, who is on our CAG, will also receive a supply. We will also distribute the brochure at our meeting to present the Health Assessment when it is finished. With the loss of the CLEAN organization and limited CAG membership it will not be feasible for us to distribute the brochure to individual homes. The local press has been very helpful with this project and will announce the availability of the brochure and the presentation CD for anyone who contacts the health department.

What has worked and what has not?

Our largest problem continues to be apathy. As we have said this is a very old site and the residents have been through a lot. Without question, what has worked best is the network of volunteers that CLEAN had organized. Unfortunately that group's founder moved out of the area for health reasons and the organization collapsed after ten years of work. To date no one has stepped up to take on the leadership role.

Even though we had a good turn out for the Physicians training, 21 doctors and others is a very small percentage of the total medical community. I was pleased that the Chief of Staff from Elkhart General and one of the more senior doctors from Goshen Hospital attended. Hopefully they shared the word. Except for the St. Joseph County Health Officer who is an M.D., no other physicians from St Joseph County expressed any interest in the seminar. We were able to do a second presentation at the Family Residency Program sponsored by South Bend Memorial, so at least the Doctors from that program had some awareness training.

Initially we seemed to get a good response from the printed media articles. As the project moved on, the returns from that method dwindled. The residents suggested that we get written information into the community. We took their advice and created flyers and posted them at gas stations, restaurants, even in some workplaces, and at the Holben School. That seemed to draw some attention at first but then the response from that method too seemed to decline. Whenever anyone new came to a meeting we added them to our mailing list. In that way we could do a

direct mailing to everyone that had shown interest. This seemed to be a good way to communicate with the residents. We feel it gave them a sense of worth and a feeling that we actually cared about them and what they thought. Another problem that leads to the apathy of the site is the time involved with doing anything. We had a great deal of interest in the Preliminary Public Health Assessment and that was born out in the tremendous response we had to our survey. But we finished the actual survey over one and a half years ago and the residents think we have forgotten them again because nothing has happened. Even though we made the preliminary results available to them, many feel, that like the resolution of the contamination, we talk about things but nothing really ever happens. Again this is reinforced in that the remediation for the site that was to have been tested and installed in the first quarter of 2002 and is still not installed as of January 3, 2003. It seem that the action plan has been chiseled on, almost continuously, since it was approved and it seems really doubtful that any further work will be done on this site unless another public health threat is identified. Unfortunately if identification of another problem does occur it will more than likely be as a result of residents again being exposed to hazardous materials.

These people have attended so many meeting over the last ten years, with little or no success that getting them to attend is very difficult. We learned early on that if we are to have a meeting we must be taking actions and involve them in the process or they will not come back. The CAG started strong and we had the support of about 20 people through out the project. They will all be glad to see this portion of the work done. It is a small success but only because they made it happen.

Even though it is a major task, and our volunteer group has dwindled, we will use all of our resources in an attempt to reach all of the community when we schedule the discussion of the Public Health Assessment and when we distribute our educational materials. If we do not, then we will be talking to the same twenty or so citizens that somehow have maintained their commitment to get the problems of this site resolved and their fears will be realized as new people move into the site and no one explains what it is all about.

Conclusions

This community is worn down. The fight has been going on for so long that some residents have died and most have lost interest. Those that helped with the Assessment project are truly heroes. Most have lost their concern for themselves and are relegated to the fact that they were exposed for several years and what happens, happens. They all have stories about friends who have died from cancer or other illness they attribute to the ongoing contamination, in some cases for 40 years. Designation as a Superfund Site gave them hope, but that has waned as year after year goes by and site cleanup continues to be delayed. Some now understand the difficulty in trying to clean up the site given the extent of the contamination plumes but wish something would be done. They are hopeful that something will still be done but really are most concerned that no one else be exposed to the contaminants and that the community not forget that the site is contaminated.

Communication has been difficult for over 10 years. The CLEAN organization, perhaps due to their TAG, was able to gain more information about the site than the Health Department. As of

this writing it is still very difficult for the Health Department to get current information on the site or the status of the remediation plans. Most of our current discussions still revolve around health issues. Occasionally an individual will ask who is going to pay the medical bills and we have to explain that is not our purpose.

The process has given everyone in the Health Department and some community members a better understanding of the problems of the site and a deepened respect for the community leaders who have made it their mission to keep pressure on the EPA to resolve the problems of this site. Our CAG and community representative Kim Stackhouse have all been great. The Conrail community owes each of them a very large thank you.

From the Health Department perspective we could not have done this project without our community partner. Although we have not yet addressed all of her suggestions we very much appreciate her insight and thoughts about what should be done and how we could best do it. Thank you very much Kim Stackhouse.

Recommendations

Perhaps the greatest mistake or unfortunate problem with regard to this site has been the lack of activity at the personal, educational, and physical level by all levels of government. We know that early on some assumptions were made by the State and Federal Agencies, which caused the Public Health aspects of the site to basically be forgotten. It is not clear who made those decisions or why, but as a result nothing was done for years even though the residents, through CLEAN, continued to ask for a review of the health concerns of the citizens. To this day it is far too difficult for the local Health Department to gain information about the site or receive copies of reports or even notices of public meetings from the EPA. Given the extent of the contamination that exists these facts are very unacceptable.

Granted, municipal water was extended to the site and removed a pathway for exposure to the residents. Unfortunately, that seems to have led to a lessening of the concern that the State and Federal Government should still have for this site. This is unfortunate because now we know, again only because of the diligence and concern of the residents, that vapors in the basements and homes of the residents are a concern in portions of the site. Unfortunately there is no guarantee this will not become a problem in the remainder of the site. Unfortunately none of us can look into our crystal ball and predict the future, but the seeming lack of concern and the complete dismissal of a second plume area because municipal water has been installed is unfortunate.

When we began this project a recent change in the EPA's community resource personnel had been made and that helped for a while. But he too has been moved to other duties and this site now has had at least six different community resource individuals in the last seven to 10 years. Whether this is a Region 5 problem or an attitude that permeates the EPA is unknown, but the inability to gain quick response at this site has grown painfully obvious and the lack of any form

of continuity from the EPA community resource personnel has certainly hindered the residents' knowledge of the site and the problems of remediation.

Our recommendation for the area is that both the Region 5 EPA and State of Indiana reassess the role of the community and the Local Health Department when working these sites. We also recommend that the concerns of residents be taken seriously at the beginning of a project by both the EPA and ATSDR and not years later. We also feel that the development of a method to encourage community development at these sites in the early stages would not only facilitate better relations with the community, but should encourage support of the EPA instead of criticism.

In our opinion, if it were not for the interest and concern for the site displayed by ATSDR's Gail Godfrey and Clayton Koher along with others in the agency and their willingness to meet with the community, to discuss their concerns, and provide support for health and educational activities in the site those activities would still not be occurring.

While I feel that this project was very worthwhile and wish to express my very strong appreciation for acceptance into the NACCHO project it has not been without frustration but it has been an excellent exercise in public health and perhaps brought us closer to the community.

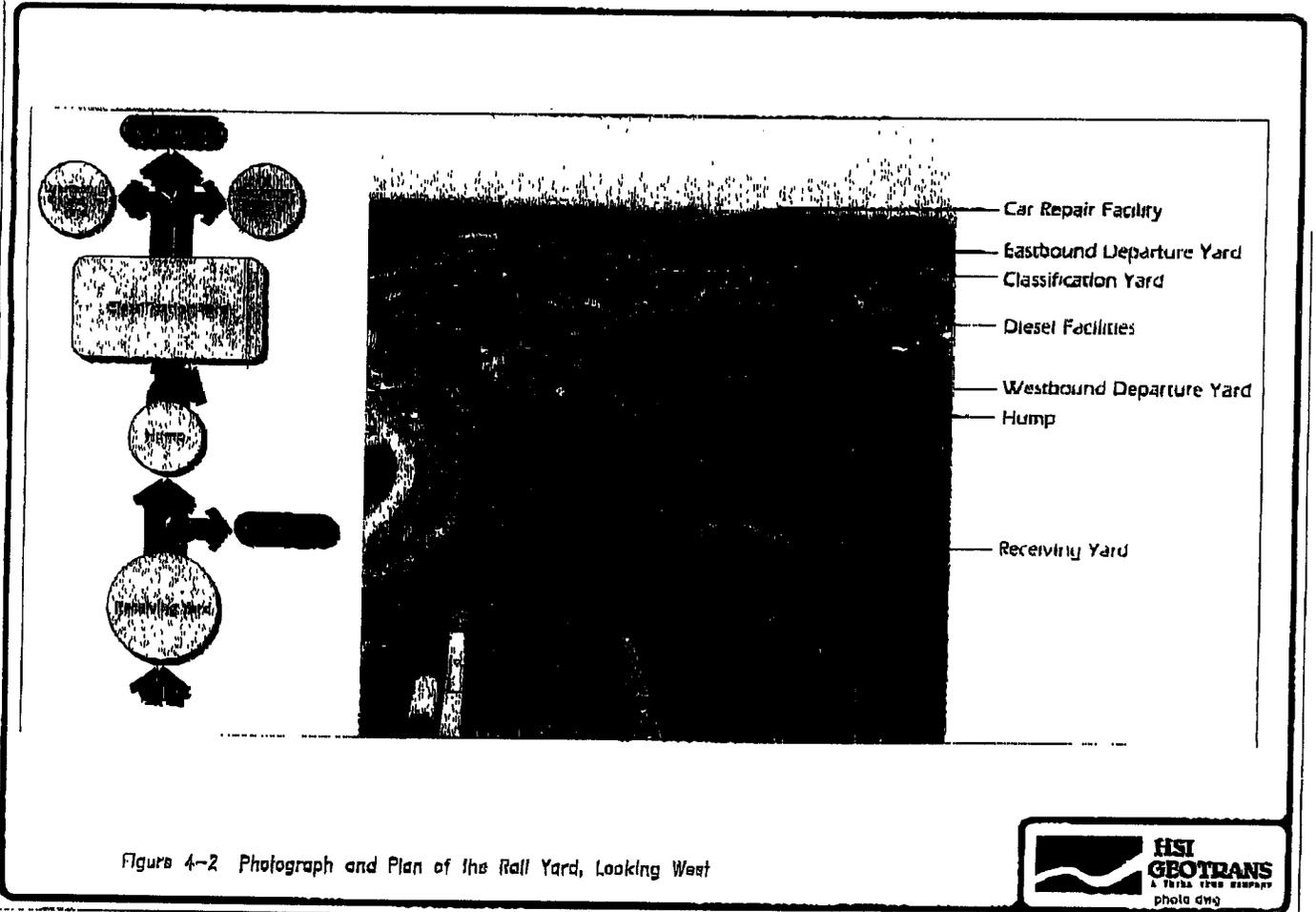
Bibliography

Information for the portions of this report was taken from actual experiences, conversations with "CLEAN" members, the Conrail CAG, and works found in the Public Record by the following companies:

1. His GeoTrans Inc
6 Lancaster County Road
Harvard, M 01451
 2. Dames and Moore
644 Linn Street, Suite 501
Cincinnati, OH 45203
 3. Ecology and Environment, Inc.
111 West Jackson Blvd.
Chicago, Illinois 60604
 4. Groundwater Technology, Inc.
486 Grable Drive
Carmel, Indiana 46032
 5. US EPA Interim Record of Decision
 6. U.S. EPA Record of Decision
 7. U.S. EPA Consent Decree
 8. SGS WRI Report
Thomas Imbirgiotta and Angel Martin
 9. USGS WRI Report 97-4204
Leslie D. Arihood and David A. Cohen
 10. USGS WRI Report 97-4204
Leslie D. Arihood and David A. Cohen
- ** The HIS Geo Trans summary was used in some sections verbatim.

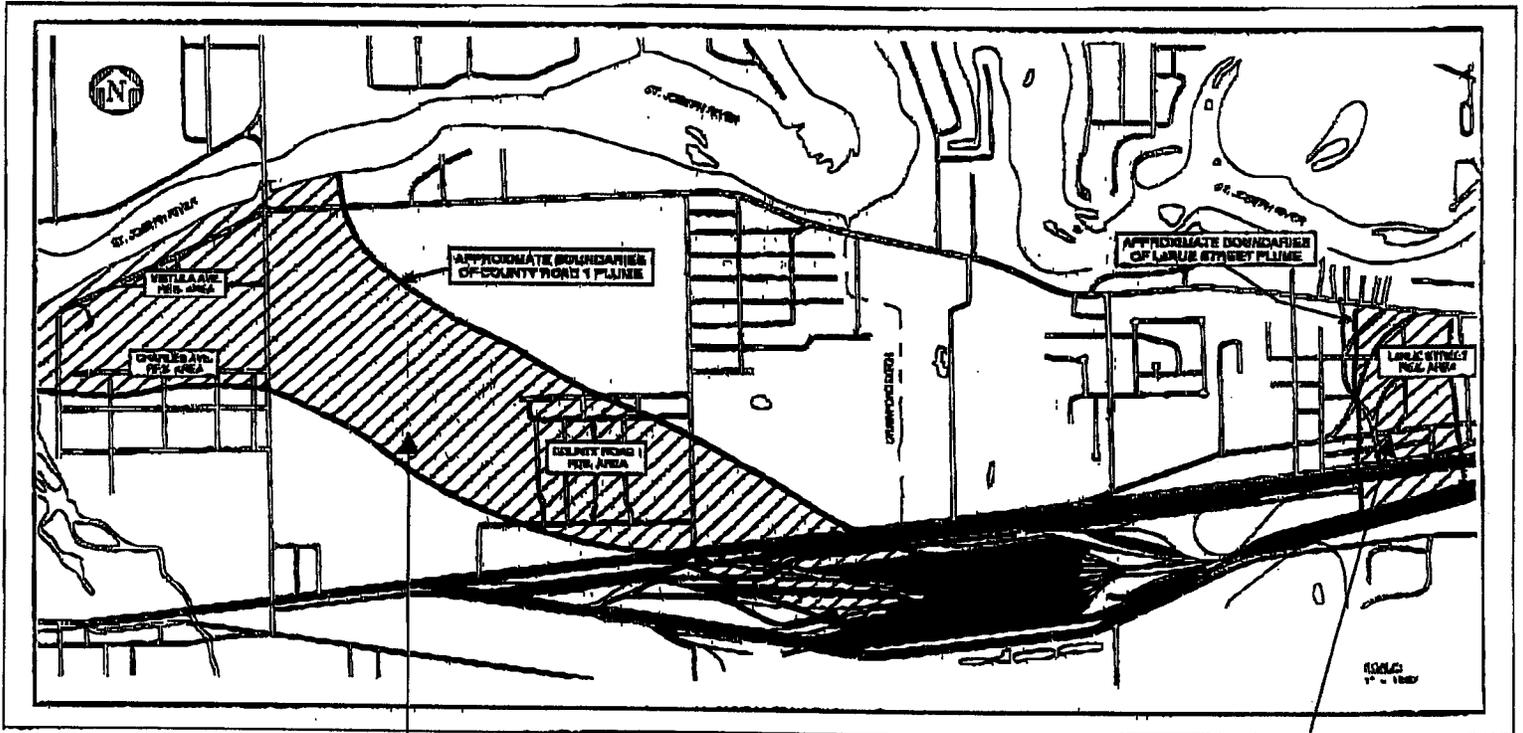
Figure 2

The Conrail/Norfolk-Southern Yard in Elkhart County, Indiana



Figurs 4-2 Photograph and Plan of the Rail Yard, Looking West

Figure 3 TCE and CCl₄ plumes

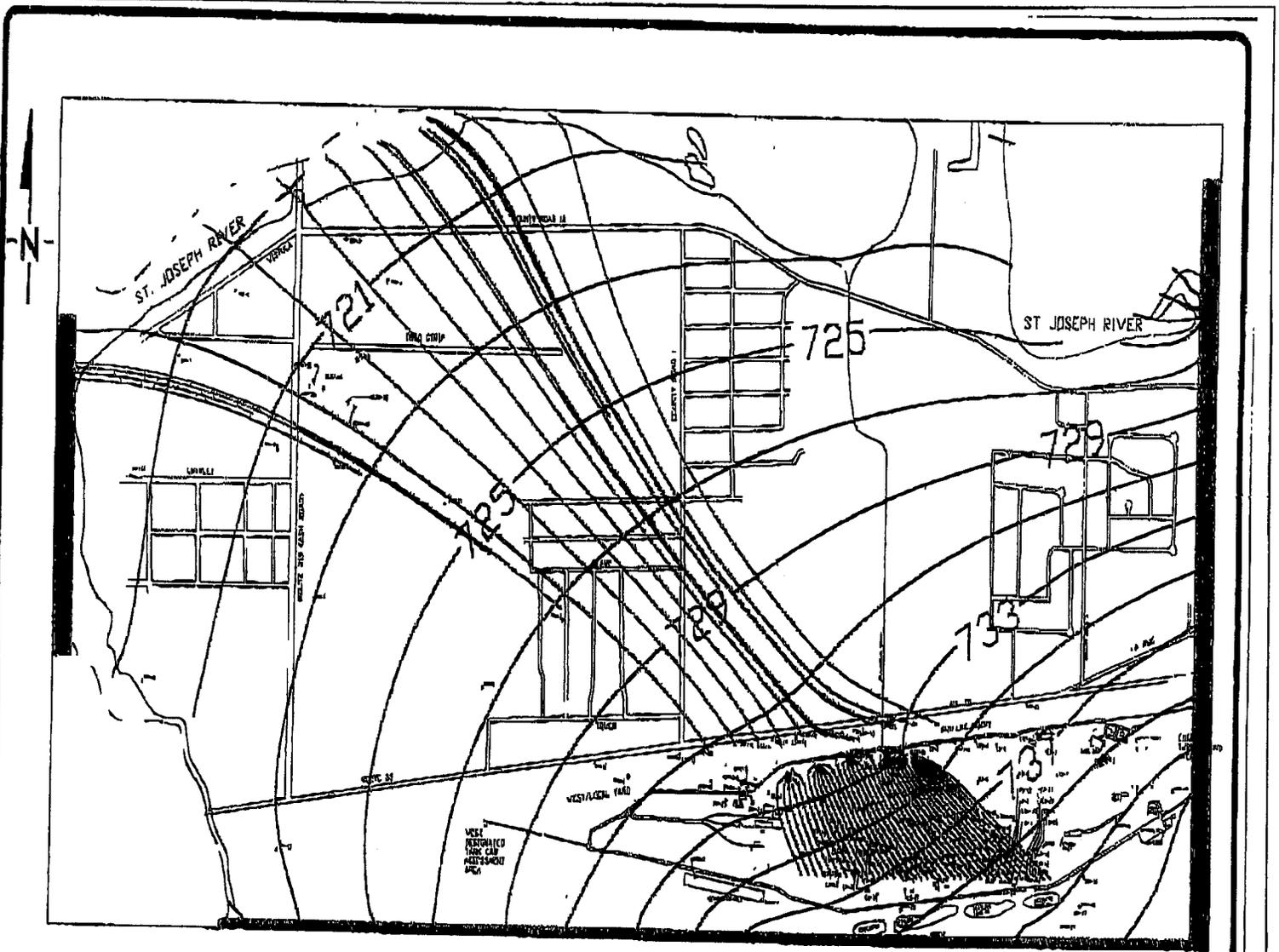


**County Road 1,
Vistula Ave Plume**

Larue Street Plume

**Currently the Larue Street Plume is not being considered for any type of remediation due to the limited potential for exposure. This plume is potentially associated with at least one other contaminant plume in the area.

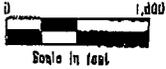
Figure 4 Proposed Remedy



This remedy is proposed in order to create a barrier to the migration of contaminants off-site and at the same time provide treatment, through filtration, of the contaminated ground water. Additional monitoring will also be required. Currently no treatment is proposed in the residential areas except natural attenuation

Explanation

- Well
- Constant Head
- No Flow
- Flow Line



Attachment 1

Update

?
ATSDR CAG
ISDH? NACCHO

September 18, 2001

Residents of the Conrail Superfund Site. This newsletter is being provided to you to in order to give an update on the Public Health Activities in the site. The alphabet soup above represents the State and Federal agencies involved. The intent of this letter is twofold. First to bring you up to date on the Health Study with out the need for another meeting and second to discuss what we have been doing locally. If you have any questions please feel free to contact me at 875-3391, Bob Watkins, Elkhart County Health Department.

Agency for Toxic Substances and Disease Registry (ATSDR) and Indiana State Department of Health (ISDH) Update on Activities at the Conrail rail yard site

The Agency for Toxic Substances and Disease Registry (ATSDR) and the Indiana State Department of Health (ISDH) want to update residents living near the Conrail rail yard National Priorities List Site about our progress on the actions that are on going at the site. The actions include

- entering the information community members provided on a survey into a database to document illnesses and concerns about illnesses
- developing the public health assessment which evaluates ways that people in the community may have contacted contaminants is evaluated
- mapping the area of groundwater contamination and mapping information residents reported in the community-generated surveys
- providing information to both residents and health care providers about exposures people in the area have experienced.

Community Health Survey

ATSDR received 760 community health surveys. By the end of July, the information contained in the surveys was entered into a database. Residents provided information in the surveys that helped identify:

- households that used contaminated drinking water
- types of diseases household members experienced
- concerns about illnesses that might occur as a result of using contaminated drinking water or breathing contaminated air.

The survey findings support public health assessment activities. A summary of the survey findings is provided in this newsletter. However, the numbers presented are raw data only. It is still too early to begin drawing conclusions about the public health of the site. As more information is available and other parts of the review are completed we will either send another newsletter or have a public

meeting with residents to discuss what the results might mean.

Public Health Assessment

ISDH and ATSDR are currently collecting and evaluating data for the public health assessment. Both historical and current environmental data are being collected to help evaluate all ways people came in contact with chemicals released from the Conrail rail yard Site and to determine whether people are currently coming in contact with chemicals from the site. The amount of data available is extensive and is taking much longer to collect and evaluate than first anticipated.

The public health assessment will identify any exposure interventions that might be needed and will provide guidance on what other public health actions might be needed. The document was first scheduled for public comment release in the fall of 2001, but because data are not in one central area and more data are available than first thought, the document will not be ready before spring of 2002. ISDH and ATSDR will meet with the community or provide an update on progress before release of the document.

Mapping Groundwater Contamination and Community Survey Information

A Geographic Information System (GIS) will be used to help analyze information we collect. GIS produces computer-generated maps of the area. We will use these maps to show places where contaminants were found and the levels of contaminants that were present in well water. We can also show information gathered from the health survey, although the information will be depicted in

a way that maintains confidentiality. The map will help with the overall evaluation of community concerns about health effects and about the levels of contaminants present in well water.

Health Information for Residents and Health Care Providers

ISDH, with help from ATSDR, Elkhart County Health Department, and St. Joseph County Health Department, are preparing information for residents living near the Conrail rail yard Site and for health care providers in the area. A health education action plan is being developed with the two county health departments. Educational materials will include general chemical information and health effects that might result from contact with the chemicals.

Both Elkhart and St. Joseph County Health Departments have been awarded grants through the National Association of City and County Health Officials to conduct a community needs assessment and to implement the action plan currently under development. Health education activities will begin this fall.

Contact Information

If you have questions about the activities that are being conducted in your neighborhood, you may call, e-mail, or write to any of the following people.

Bob Watkins
Elkhart County Health Department
4230 Elkhart Road
Goshen, Indiana 46526
Ph. 219-875-3391 Fax 219-875-3376
elkenv@juno.com

Dr. Janice Carson or Tony Mancuso
St. Joseph County Health Department
227 West Jefferson Blvd., 9th Floor
South Bend, Indiana 46601
Ph. 219-235-9721 Fax 219-235-9497
rjkickbush@hotmail.com

Garry Mills or LaNetta Alexander
Indiana State Department of Health
Epidemiology Resource Center
2 North Meridian Street
Indianapolis, Indiana 46204
gmills@isdh.state.in.us or
317/233-7525 or
LaNetta Alexander at 317/233-7162
lalexand@isdh.state.in.us

Gail Godfrey
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Atlanta, Georgia 30333
ggodfrey@cdc.gov
1-888-422-8737, Ext. 0432

Appendix 3

County and Township Demographics

GEOGRAPHICAL AREA	1970		1980		1990		2000	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
United States	203,302,031		226,542,189		248,709,873		281,421,906	
State of Indiana								
Total Population	5,193,669	100.0%	5,490,224	100.0%	5,544,159	100.0%	6,080,485	100.0%
White	4,820,324	92.8%	5,004,394	91.2%	5,020,700	90.6%	5,320,022	87.5%
African American	357,464	6.9%	414,785	7.6%	432,092	7.8%	510,034	8.4%
American Indian and Alaska Native	3,887	0.1%	7,836	0.1%	12,720	0.2%	15,815	0.3%
Asian and Pacific Islander	6,892	0.1%	20,557	0.4%	37,617	0.7%	61,131	1.0%
Other	5,102	0.1%	42,652	0.8%	41,030	0.7%	173,483	2.9%
Hispanic Origin	67,188	1.3%	87,047	1.6%	98,788	1.8%	214,536	3.5%
Median age	27.2		29.2		32.8	0	35.2	
Under age 5 years	455,676	8.8%	418,764	7.6%	398,656	7.2%	423,215	7.0%
Ages 5–9 years	529,024	10.2%	433,053	7.9%	410,463	7.4%	443,273	7.3%
Under age 10 years	984,700	19.0%	851,817	15.5%	809,119	14.6%	866,488	14.3%
Ages 15–44 years	2,138,834	41.2%	2,536,280	46.2%	2,579,484	46.5%	2,671,041	43.9%
Male	1,049,594	20.2%	1,257,070	22.9%	1,282,498	23.1%	1,347,036	22.2%
Female	1,089,240	21.0%	1,279,210	23.3%	1,296,986	23.4%	1,324,005	21.8%
Ages 65+	493,809	9.5%	585,384	10.7%	696,196	12.6%	752,831	12.4%
Households	1,609,494		1,927,050		2,065,355		2,336,306	
Median Household Income	\$8,921		\$17,582		\$28,797		\$41,567	
Families	1,321,674		1,461,645		1,480,351		1,611,045	
Median Family Income	\$9,970		\$20,535		\$34,802		\$50,261	
Families below poverty	97,545	7.4%	107,415	7.3%	118,225	8.0%	107,789	6.7%
Families with children <18 in poverty	57,582	7.4%	81,031	10.4%	91,923	11.9%	84,392	10.2%
Families with children <5 in poverty					47,124	15.3%	45,173	13.7%
Educational Attainment (pop 25 years+)	2,746,414		3,135,772		3,489,470		3,893,278	
Less than High School	1,292,237	47.1%	1,054,286	33.6%	850,014	24.4%	695,540	17.9%
High School or higher	1,454,177	52.9%	2,081,486	66.4%	2,639,456	75.6%	3,197,739	82.1%
Elkhart County								
Total Population	126,529	100.0%	137,330	100.0%	156,198	100.0%	182,791	100.0%
White	121,725	96.2%	129,971	94.6%	146,505	93.8%	157,931	86.4%
African American	4,395	3.5%	5,761	4.2%	7,106	4.5%	9,551	5.2%
American Indian and Alaska Native	na	na	256	0.2%	453	0.3%	495	0.3%

Asian and Pacific Islander	na	na	491	0.4%	997	0.6%	1,759	1.0%
Other	409	0.3%	851	0.6%	1,137	0.7%	13,055	7.1%
Hispanic Origin	1,181	0.9%	1,719	1.3%	2,932	1.9%	16,300	8.9%
Median age in years	26.7		29.0		31.8		33.0	
Under age 5 years	11,982	9.5%	11,350	8.3%	13,277	8.5%	14,800	8.1%
Ages 5–9 years	12,925	10.2%	11,465	8.3%	12,538	8.0%	14,799	8.1%
Under age 10 years	24,907	19.7%	22,815	16.6%	25,815	16.5%	29,599	16.2%
Ages 15-44	53,299	42.1%	63,704	46.4%	72,534	46.4%	80,157	43.9%
Male	25,771	20.4%	31,418	22.9%	36,217	23.2%	41,090	22.5%
Female	27,528	21.8%	32,286	23.5%	36,317	23.3%	39,067	21.4%
Ages 65 years+	11,066	8.7%	13,209	9.6%	17,497	11.2%	19,841	10.9%
Households	39,319		48,148		56,713		66,154	
Median Household Income			\$17,593		\$30,973		\$44,478	
Families	32,968		37,077		41,751		48,038	
Median Family Income	\$11,043		\$19,872		\$35,152		\$50,438	
Families below poverty	1,661	5.0%	2,153	5.8%	2,213	5.3%	2,793	5.8%
Families with children <18 in poverty	1,068				1,750	7.7%	2,302	8.8%
Families with children <5 in poverty					948	9.7%	1,315	12.3%
Educational Attainment (pop 25 years+)	66,281		78,491		96,003		112,908	
Less than High School	31,001	46.8%	26,994	34.4%	26,107	27.2%	27,391	24.3%
High School or higher	35,280	53.2%	51,497	65.6%	69,896	72.8%	85,517	75.7%
Baugo Township (Elkhart Co)								
Total Population	5,982	100.0%	6,097	100.0%	6,640	100.0%	7,646	100.0%
White	5,772	96.5%	5,915	97.0%	6,418	96.7%	7,217	94.4%
African American	195	3.3%	135	2.2%	146	2.2%	172	2.2%
American Indian and Alaska Native	na	na		0.0%	25	0.4%	15	0.2%
Asian & Pacific Islander	na	na		0.0%	31	0.5%	33	0.4%
Other	15	0.3%		0.0%	20	0.3%	209	2.7%
Hispanic Origin	63		41	0.7%	59	0.9%	171	2.2%
Median age in years	24.4		29.1		33.9		36.9	
Under age 5 years	572	9.6%	496	8.1%	462	7.0%	490	6.4%
Ages 5–9 years	668	11.2%	489	8.0%	549	8.3%	596	7.8%
Under age 10 years	1,240	20.7%	985	16.2%	1,011	15.2%	1,086	14.2%
Ages 15–44 years	2,663	44.5%	2,787	45.7%	2,989	45.0%	3,077	40.2%
Male	1,290	21.6%	1,358	22.3%	1,488	22.4%	1,535	20.1%
Female	1,373	23.0%	1,429	23.4%	1,501	22.6%	1,542	20.2%

Ages 65 years+	352	5.7%	427	7.0%	691	10.4%	985	12.9%
Households	1,726		2,011		2,248		2,810	
Median Household Income			\$20,249		\$32,903		\$45,632	
Families			1,709		1,837		2,175	
Median Family Income					\$34,439		\$49,989	
Families below poverty					103	5.6%	55	2.5%
Families with children <18 in poverty	29				62	6.2%	39	3.4%
Families with children <5 in poverty					24	6.8%	31	8.5%
Educational Attainment (pop 25 years+)					4,196		4,879	
Less than High School					1,329	31.7%	1,106	22.7%
High School or higher					2,867	68.3%	3,773	77.3%
St. Joseph County								
Total Population	245,045	100.0%	241,617	100.0%	247,052	100.0%	265,559	100.0%
White	225,382	92.0%	216,070	89.4%	216,984	87.8%	218,706	82.4%
African American	18,587	7.6%	21,604	8.9%	24,190	9.8%	30,422	11.5%
American Indian and Alaska Native	na	na	512	0.2%	846	0.3%	938	0.4%
Asian and Pacific Islander	na	na	1,178	0.5%	2,507	1.0%	3,690	1.4%
Other	1,076	0.4%	2,253	0.9%	2,525	1.0%	11,803	4.4%
Hispanic Origin	na	na	3,663	1.5%	5,201	2.1%	12,557	4.7%
Median age in years	27.9		29.9				34.4	
Under age 5 years	20,215	8.2%	17,115	7.1%	17,958	7.3%	18,673	7.0%
Ages 5–9 years	22,974	9.4%	17,391	7.2%	17,704	7.2%	19,291	7.3%
Under age 10 years	43,189	17.6%	34,506	14.3%	35,662	14.4%	37,964	14.3%
Ages 15–44 years	100,673	41.1%	109,325	45.2%	115,232	46.6%	116,990	44.1%
Male	50,371	20.6%	54,738	22.7%	57,440	23.3%	57,925	21.8%
Female	50,302	20.5%	54,587	22.6%	57,792	23.4%	59,065	22.2%
Ages 65+	24,147	9.9%	29,126	12.1%	34,879	14.1%	36,101	13.6%
Households	75,666		86,204		92,365		100,743	
Median Household Income	\$10,389		\$17,570		\$28,235		\$40,420	
Families	61,842		63,726		63,629		67,027	
Median Family Income	\$10,389		\$20,628		\$34,206		\$49,653	
Families below poverty	3,521	5.7%	4,280	6.7%	4,532	7.1%	5,087	7.6%
Families with children <18 in poverty	2,227				3,697	11.5%	4,317	12.3%
Families with children <5 in poverty					2,046	15.2%	2,404	16.9%
Educational Attainment (pop 25 years+)	131,099		140,911		154,443		166,060	
Less than High School	60,275	46.0%	45,707	32.4%	36,969	23.9%	29,235	17.6%

High School or higher	70,824	54.0%	95,204	67.6%	117,474	76.1%	136,825	82.4%
Penn Township (St. Joseph Co.)								
Total Population	53,494	100.0%	56,471	100.0%	59,879	100.0%	64,322	100.0%
White	53,218	99.5%	55,593	98.4%	58,548	97.8%	60,718	94.4%
African American	132	0.2%	386	0.7%	629	1.1%	1,384	2.2%
American Indian and Alaska Native	na	na	na	na	186	0.3%	221	0.3%
Asian and Pacific Islander	na	na	na	na	353	0.6%	609	0.9%
Other	144	0.3%	492	0.9%	163	0.3%	1,390	2.2%
Hispanic Origin	na	na	327	0.6%	514	0.9%	1,275	2.0%
Median age in years	27.8		30.4		33.2		35.7	
Under age 5 years	4,853	9.1%	4,029	7.1%	4,264	7.1%	4,388	6.8%
Ages 5–9 years	5,018	9.4%	4,329	7.7%	4,302	7.2%	4,459	6.9%
Under age 10 years	9,871	18.5%	8,358	14.8%	8,566	14.3%	8,847	13.8%
Ages 15–44 years	22,073	41.3%	25,377	44.9%	27,910	46.6%	27,876	43.3%
Male	10,610	19.8%	12,282	21.7%	13,676	22.8%	13,830	21.5%
Female	10,463	19.6%	13,095	23.2%	14,234	23.8%	14,046	21.8%
Ages 65 years+	5,168	9.7%	6,414	11.4%	7,992	13.3%	8,977	14.0%
Households	17,159		21,159		23,859		26,033	
Median Household Income			\$17,244		\$27,928		\$39,316	
Families			15,530		16,094		16,909	
Median Family Income			\$20,371		\$33,913		\$48,711	
Families below poverty					826	5.1%	908	5.4%
Families with children <18 in poverty	482				682	8.3%	772	8.6%
Families with children <5 in poverty					355	11.2%	377	11.4%
Educational Attainment (pop 25 years+)					38,490		41,858	
Less than High School					9,694	25.2%	7,390	17.7%
High School or higher					28,796	74.8%	34,468	82.3%

Appendix 4

Questionnaire and Summary of the Community Surveys Submitted to the Indiana State Department of Health and to the Agency for Toxic Substances and Disease Registry.

**Preliminary Public Health Study
Conrail Superfund Site, Elkhart, Indiana**

A separate questionnaire must be completed for each individual in the home or business

Date: _____

1. Name _____ Street Address _____

2. How long have you resided at this address? _____

3. Have you lived at another address in the study area? YES NO
What is the address of the other residence(s)? A. _____
B. _____

How long did you live at each address A. _____ B. _____

4. Did your house have a whole house filter installed? YES NO

When was it installed (year)? _____

Who maintained the filter? _____

Do you know what the level of contamination was after the water was filtered? YES NO

If yes, which contaminants came through? _____

What were the concentrations of each chemical? _____

5. What is your occupation? _____

Are you exposed to chemicals in your occupation? YES NO

If yes do you know what chemicals? _____

6. Is your current drinking water provided by a well? YES NO

If yes, how long have you been drinking it? _____

Do you use well water for any other purpose? _____

7. Was your water previously supplied by a well? YES NO

If yes how long? _____ At which residence(s) ? _____

8. Has your well water tested for contamination? YES NO

When was it tested? _____

Was it tested by the EPA or a private lab? EPA PRIVATE

Was contamination found in your well water? YES NO

If contamination was present list name(s) and concentration of substance(s).

9. What is your age? _____ Sex M F

10. Have you or anyone in your residence experienced a chronic illness? YES NO

What is the illness? _____

Was this confirmed by a physician? YES NO Physicians name _____

11. What are the symptoms? _____

12. Are you being treated now? YES NO

13. Have any children in the residence experienced a birth defect? YES NO

Name of defect _____

14. Are you concerned about any health problems in area children or neighbors? YES NO

Please describe your concern. _____

15. Have any family members died in the time you have lived in the study area? YES NO

Name _____ Relationship _____

What was the cause of death? _____

Who was the primary physician for the deceased? _____

16. Can you provide the name(s) of anyone who used to live in the study area but have relocated? YES NO

(Complete supplemental sheet with name, address, phone, or contact person).

17. Do you know the name of anyone who used to live in the survey area but is now deceased? YES NO

(Complete supplemental sheet with name, address, and phone of contact person).

18. Comments _____

Summary Findings of the Community-Based Public Health Survey Conrail Railyard Superfund Site Elkhart and St. Joseph Counties, Indiana

Introduction:

The Agency for Toxic Substances and Disease Registry (ATSDR), in conjunction with the Indiana State Department of Health (ISDH), has processed the community-developed, health surveys from residents living near the Conrail Railyard National Priorities List Site in Elkhart and St. Joseph Counties, Indiana. ISDH sent the completed surveys to ATSDR. Information contained in the surveys was entered into a database. This is a summary of the survey responses.

The questionnaire was developed by community members with help from Elkhart and St. Joseph County Health Departments. Elkhart and St. Joseph County Health Departments received a total of 769 volunteer-assisted or self-administered questionnaires and sent them to ISDH. Once ATSDR received the surveys, answers to survey questions were entered into a Microsoft (MS) Access 2000 database. All 769 surveys were reviewed, and concerns listed on all surveys will be addressed in the forthcoming Public Health Assessment. Information from 18 surveys was not included in the analysis because significant information was missing. Therefore, a total of 751 questionnaires were analyzed.

In the questionnaires, residents were asked 18 open-ended questions, such as whether individuals in each household used contaminated drinking water, what types of diseases household members experienced, and whether households that experienced chronic illnesses or death from chronic illnesses also used contaminated drinking water. The findings are presented in this summary in the Demographics, Contamination and Well Water Information, Chronic Illness, Birth Defects, and Deaths sections.

The information that community members provided in the survey helps ISDH and ATSDR better understand the medical conditions that are of great concern and interest to residents. The information is qualitative in nature. That means that the information cannot be used to draw definitive or absolute conclusions about whether a particular illness resulted from drinking contaminated water. However, the information is important to our overall evaluation of site conditions.

Demographics

1. The median age of the survey participants is 40 years. About 23% of household members were children and approximately 10% of household members were elderly (> 70 years).
2. The survey population is approximately 51% male and 49% female. This information, however, is inexact because many households did not completely answer this question.
3. The average length of time that survey participants lived in the study area was about 20 years. 74% of participants have lived in the study area for more than 5 years, with 68% of households having lived at their current address for more than 5 years; 20% have lived in

the study area for more than 1 year and up to 5 years; and 4% have lived in the study area for less than 1 year.

Contamination and Well Water Information:

- 69% of households reported they previously had their drinking water supplied by a private well, and 6% of households currently have their drinking water supplied by a private well.
- 40% of households reported they have had their well tested for contamination.
- 31%, or 92 households, that had their wells tested, reported their well tested positive for contamination.
- Among the 92 households whose wells tested positive for contamination, 26% reported trichloroethylene (TCE) was found in their well, 3% reported carbon tetrachloride, and 21% reported both TCE and carbon tetrachloride were found.

Chronic Illness:

- 42% of households reported someone in their residence had experienced a chronic illness. The types of chronic illnesses reported were diverse, with cancer and diabetes the most frequently reported.
- 84% of households that had experienced a chronic illness had lived in the study area more than 5 years.
- 86% of those reporting they had experienced a chronic illness reported their drinking water was previously or is currently supplied by a private well, and 17% of those reporting a chronic illness also reported their well tested positive for contamination.

Birth Defects:

- 7% of households reported having a child with a birth defect.
- 90% of households reporting a birth defect lived in the study area for more than 5 years.
- All of those reporting that a child in their residence experienced a birth defect also reported their drinking water had previously been or is currently supplied by a private well, and 18% of those reporting a birth defect also reported their well tested positive for contamination.

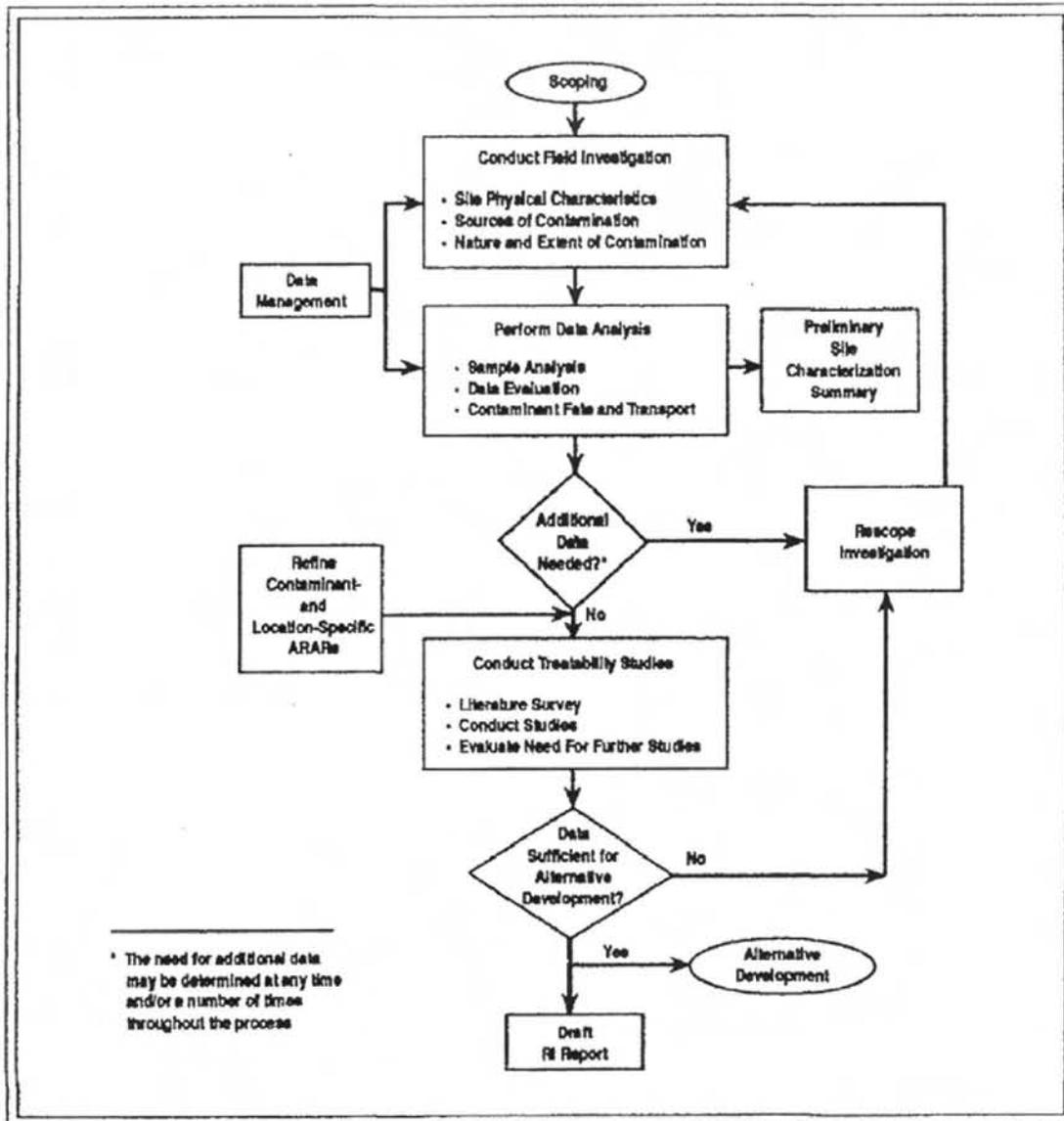
Deaths:

- 23% of households reported a family member(s) had died in the time they have lived in the study area. Less than 1% of the deaths were children.
- 94% of households reporting a death had lived in the study area for more than 5 years.
- 94% of households reporting a death also reported their drinking water had previously been supplied or is currently supplied by a private well, and 19% of those that reported a death also reported their well tested positive for contamination.
- Each reported death was categorized into one of 16 causes of deaths. The most frequent cause of death was cancer, followed by heart disease or heart attack.

Attachments include a chart that depicts survey responses, a graph depicting the age distribution of residents as obtained from the surveys, a chart depicting residents' gender distribution as obtained from the surveys, a graph depicting the number of residents who reported having specific illnesses, and a graph depicting the number of people who were reported as having died from a specific illness.

Appendix 5

Components of the Remedial Investigation



Appendix 6

Information on polychlorinated biphenyls (PCBs) <http://www.atsdr.cdc.gov/tfacts17.html>

Information on polycyclic aromatic hydrocarbons (PAHs)

<http://www.atsdr.cdc.gov/tfacts69.html>

ToxFAQs™
for
Polychlorinated Biphenyls (PCBs)
(Bifenilos Policlorados (BPCs))

This fact sheet answers the most frequently asked health questions about polychlorinated biphenyls (PCBs). For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls (PCBs)?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

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What happens to polychlorinated biphenyls (PCBs) when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas

far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.

- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

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How might I be exposed to polychlorinated biphenyls (PCBs)?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

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How can polychlorinated biphenyls (PCBs) affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

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How likely are polychlorinated biphenyls (PCBs) to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA

and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

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How do polychlorinated biphenyls (PCBs) affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported. In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

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How can families reduce the risk of exposure to polychlorinated biphenyls (PCBs)?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.
- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

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Is there a medical test to show whether I've been exposed to polychlorinated biphenyls (PCBs)?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

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Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L).

Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

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References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. [Toxicological Profile for polychlorinated biphenyls \(PCBs\)](#). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333
Phone: 1-888-42-ATSDR (1-888-422-8737)
FAX: (404)-498-0093
Email: ATSDRIC@cdc.gov

ToxFAQs™
For
Polycyclic Aromatic Hydrocarbons (PAHs)
(Hidrocarburos Aromáticos Policíclicos (HAPs))

This fact sheet answers the most frequently asked health questions about polycyclic aromatic hydrocarbons (PAHs). For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons (PAHs)?

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

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What happens to polycyclic aromatic hydrocarbons (PAHs) when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.

- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

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How might I be exposed to polycyclic aromatic hydrocarbons (PAHs)?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.
- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

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How can polycyclic aromatic hydrocarbons (PAHs) affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

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How likely are polycyclic aromatic hydrocarbons (PAHs)

to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

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Is there a medical test to show whether I've been exposed to polycyclic aromatic hydrocarbons (PAHs)?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

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Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m³). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m³ averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m³ for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

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Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

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References

Agency for Toxic Substances and Disease Registry (ATSDR).

1995. [Toxicological Profile for polycyclic aromatic hydrocarbons \(PAHs\)](#). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333
Phone: 1-888-42-ATSDR (1-888-422-8737)
FAX: (404)-498-0093
Email: ATSDRIC@cdc.gov

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ATSDR Information Center / ATSDRIC@cdc.gov / 1-888-422-8737

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Appendix 7

Exploratory Analysis of Indiana Birth Certificates 1990-1999 for Birth Defects in the Vicinity of the CONRAIL Superfund Site (Zip Codes 46516 and 46561)

As a part of its public health assessment process, ATSDR, in cooperation with the Indiana State Department of Health (ISDH), examined birth certificate data to evaluate certain adverse birth outcomes such as preterm birth, small for gestational age (i.e., having a low weight given one's gestational age at birth), and several birth defects. Data were available for zip codes 46516 and 46561 in Elkhart (Elkhart County) and Osceola (St. Joseph County), Indiana, respectively, for the 10-year period 1990 through 1999.

The prevalence of preterm birth and small for gestational age for these two zip codes combined were compared to the prevalence for the rest of the state. In addition, an exploratory analysis was conducted to see if the prevalence of particular birth defects was higher in the two zip codes compared to the rest of the state. The exploratory analysis was performed using the available birth certificate data with the understanding that birth certificate data tends to seriously underestimate the frequency of birth defects (Watkins ML, et al., 1996). However, citizens in the vicinity of Conrail had expressed concerns about the number of children born with birth defects in their community. Exposures had occurred in the community at levels that the literature appear to indicate could cause increased rates of adverse birth outcomes, so the exploratory analysis, despite limitations, was justified.

ATSDR used SPSS software to perform data management and analysis. For each adverse birth outcome, an odds ratio (OR) was calculated to determine whether the prevalence was higher within the two zip codes when compared to the rest of the state. An odds ratio (relative odds) is a measure of association between an exposure and health outcome for a comparison analysis. An odds ratio greater than 1.0 indicates that the zip codes have a higher prevalence than the rest of the state; an odds ratio less than 1.0 indicates a lesser prevalence. Both the size of the odds ratio and the number of cases in the exposed population will influence the interpretation of the odds ratio. Odds ratios based on a larger number of cases are more stable; those based on a fewer number are more influenced by chance. To take the number of cases into account, a 95% confidence interval is calculated. Confidence intervals for the odds ratio show the precision of the risk estimates. A smaller interval reflects a stronger precision. If the confidence interval contains 1.0, no statistically significant difference in prevalence is indicated.

The three main adverse birth outcomes of interest analyzed for the two zip codes were as follows:

1. low birth weight among term births (i.e., being a term birth but weighing <2500 grams or <5.5 pounds at birth);
2. small for gestational age (having a weight at or below the 5th percentile given the child's gestational week at birth); and
3. preterm birth (gestational age less than 37 weeks at birth).

In order to determine the sex-specific, 5th percentile weight for each gestational week, all birth certificates for the state during the 10-year period 1990 through 1999 were used. Gestational

weeks less than 28 or greater than 44 were considered invalid. Weights of less than 350 grams (approximately 0.75 lbs) or greater than 7,000 grams (approximately 15.4 lbs) were also considered invalid. Births with invalid birth weights and/or gestational ages were excluded from the analyses of small for gestational age and low birth weight among term births. In addition, births with invalid gestational ages were also excluded from the analysis of preterm birth. Comparisons between the two zip codes and the rest of the state were made for these three main adverse birth outcomes over the combined 10-year period and for each individual year.

Over the combined 10-year period, the prevalence for these three main adverse birth outcomes were similar to the prevalence in the rest of the state, with odds ratios near 1.0 (Table A7-1), indicating that the risks are not elevated to any appreciable level. After taking into account socio-economic factors such as mother's education, race/ethnicity, and information from the birth certificate on maternal smoking, these odds ratios were still approximately equal to 1.0. That indicates no difference between the prevalence in zip codes 46516 and 46561 and the prevalence in the rest of the state.

When individual years were evaluated (1990–1999), there was some indication that the prevalence in the two zip codes was slightly higher than the rest of the state during some of the years, especially during the period 1998–1999. For example, both small for gestational age and low birth weight among term births were elevated during 1995, 1998, and 1999, with odds ratios ranging between 1.2 and 1.4. Preterm birth was also elevated in 1998 (OR=1.2).

For exploratory purposes, the birth certificate data were used to determine prevalence for particular birth defects for the two zip codes and the rest of the state (Table A7-1). For the combined 10-year period, two central nervous system birth defects, anencephaly and spina bifida, were elevated in the two zip codes when compared with the rest of the state. The odds ratios were 2.8 for anencephaly (seven cases in the two zip codes) and 1.7 for spina bifida (four cases in the two zip codes). These two central nervous system birth defects are often grouped together as “neural tube defects” or NTD. When grouped together, the odds ratio for NTD over the 10-year period was 2.3. Another birth defect that was elevated in the two zip codes when compared to the rest of the state was diaphragmatic hernia (OR=4.9 based on five cases in the two zip codes). An intestinal defect, omphalocele had a statistically insignificant elevation (OR=1.5 based on four cases in the two zip codes). The prevalence of cleft lip and cleft palate was not elevated. Because of the small numbers of particular birth defects, other risk factors such as maternal smoking, education, and race/ethnicity could not be taken into account in the analysis of birth defects.

A serious limitation of these analyses was the use of zip codes to define the exposed population. If some of the mothers residing in the two zip codes were not exposed to the Conrail drinking water contaminants during their pregnancies, then the risk of adverse birth outcomes from exposures to the contaminated drinking water may be underestimated. Further evaluation of these adverse birth outcomes will require a more precise definition of the exposed population. In addition, in order to evaluate neural tube defects, it will be necessary to identify a suitable unexposed comparison population, and it must be feasible to achieve complete ascertainment of neural tube defects in both the exposed and unexposed populations using multiple sources of information including the review of hospital records.

Another limitation to the interpretation of this analysis is that birth certificate data was only available for the ten year period 1990 through 1999. Many adverse birth outcomes are related to concurrent exposure and time of pregnancy. For instance, many structural birth defects occur during the 3rd to 8th week of an unborn baby's development; at this sensitive period of development, exposure to teratogens (agents that interfere with normal development such as alcohol, some chemicals, x-rays, viruses, and some medications) can have the most serious impact. Since most of the residents around the Conrail area had been placed on city water in the late 1980s, this analysis does not reflect the prevalence of these adverse outcomes during the time of greatest exposure to the community. A review of hospital or other sources of data from the period before 1990 would be necessary.

In the United States, one of every 33 babies is born with a birth defect. The mother's age at childbirth, her nutritional status, obesity prior to pregnancy, alcohol, cigarette and certain medication use during pregnancy, genetic factors, viruses, and some environmental exposures (including trichloroethylene and carbon tetrachloride) are associated with the occurrence of birth defects or other adverse birth outcomes. With the exception of the mother's age and smoking status, the birth certificate data used in these analyses do not provide information on other risk factors. Depending on whether the mothers who reside in the two zip codes had more or less risk factors as compared to those in the rest of the state, the risk of adverse birth outcomes in the study area will be under or overestimated.

This exploratory analysis was conducted even though it is likely that most of the children with birth defects will not be identified using birth certificate data. Some birth defects of concern to the community, such as heart defects, are detected after the birth certificate is issued, so would be underreported. Birth defects that resulted in miscarriage, fetal death, or a stillborn child would not be captured on birth certificate data. Therefore, any findings must be interpreted with extreme caution. An excess in a particular birth defect may warrant further study if there is some evidence in human or animal studies that suggests that the birth defect may be related to exposure to drinking water contamination. To determine accurate prevalence for particular birth defects, a review of hospital records is necessary. In some states, population-based, birth defect registries have been established in order to determine accurate prevalence, but Indiana does not have a population-based, birth defect registry.

In summary, over the 10-year period 1990–1999, the prevalence of preterm birth, small for gestational age, and low birth weight among term births in the two zip codes surrounding the Conrail site were similar to the prevalence in the rest of the state. However, for a few years, especially 1998 and 1999, the prevalence was slightly elevated in the two zip codes when compared to the rest of the state. It is unknown whether these elevations in a few of the individual years are related to exposures to the Conrail site contaminants in drinking water or simply reflect chance fluctuations in the prevalence. The findings for neural tube defects are suggestive and may warrant further evaluation.

Table A7-1. Odds Ratios* and 95% Confidence Intervals (C.I.) for birth defects and other birth outcomes in the vicinity of Conrail (zip codes 46516 and 46561), 1990–1999.

	Exposed Cases	Odds Ratio*	Lower C.I.	Upper C.I.
Adverse Birth Outcomes				
Term Low Birth Weight	206	1.02	0.88	1.17
Small for Gestational Age	404	0.97	0.87	1.07
Preterm Birth	548	1.03	0.94	1.12
Birth Defects				
Neural Tube Defects	11	2.30	1.26	4.17
Anencephaly	7	2.83	1.34	6.00
Spinal Bifida	4	1.68	0.63	4.51
Cleft Lip	3	0.51	0.16	1.57
Cleft Palate	2	0.75	0.31	1.80
Diaphragmatic Hernia	5	4.95	2.02	12.13
Omphalocele	4	1.54	0.58	4.14

**Note: The odds ratios for adverse birth outcomes (term low birth weight, small for gestational age and preterm birth) are adjusted for race/ethnicity. The odds ratios for the selected birth defects listed are unadjusted.*

Appendix 8

Review of Indiana Cancer Registry Data (1990-1999)

In response to community concerns about the occurrence of several types of cancers in the area adjacent to Conrail and knowledge of possible associations of TCE and CCl₄ to the development of certain cancers, ISDH conducted analyses of available cancer data. ISDH evaluated total cancer, 21 specific types of cancer in children and adults, and all child cancer combined, between 1990 and 1999.

Using the Indiana Cancer Registry, all new cases of cancer diagnosed among residents of the Conrail area for the most recent 10 years of complete data, 1990 through 1999, were identified. Indiana State Public Law P.L.2-1993, SEC.21. specifies reporting requirements of the cancer registry. Reporting is mandatory and the state is responsible for assurance and protection of the data in the registry.

The area for the analysis was the geographic region defined by the groundwater plume from the Conrail site (Figure 2). Therefore, the geographic unit used for the analysis is at the level of the potentially impacted area. Because the population around Conrail in this geographic unit was predominantly white, the comparison population used for the analysis to calculate predicted or expected numbers was the white population of the state of Indiana.

In addition to all cancers combined, liver, bladder, four types of leukemia, two types of lymphoma, kidney, brain, esophageal, breast, lung, laryngeal, prostate, ovarian, melanoma, multiple myeloma, colon, anal and rectal cancers were evaluated for this 10-year period. These cancers are reported for the primary site of the cancer and not for metastatic disease that may occur in other organs. All cancers combined occurring in children ages 0–19 years of age was also analyzed.

For this analysis, once the new cases of cancer were identified, standardized incidence ratios (SIRs) were calculated. The SIR is calculated by dividing the number of observed cases of cancer identified in the study area by the expected number determined by using a comparison population for the 10-year period. SIRs were calculated for the 21 types of cancer and for the two groupings (all cancers and cancers in children). In calculating the SIRs, the cancer cases were evaluated by their occurrence by age groups and gender in the study and comparison populations.

An SIR is a ratio of the observed over expected number of cases. A ratio greater than 1.0 indicates more cases than expected; a ratio less than 1.0 indicates fewer cases occurred than expected. For example, a ratio of 1.5 would be interpreted as 1.5 times more cases found as were expected. The interpretation of the ratio depends on both the size of the ratio and the number of cases used to calculate the ratio. Ratios based on a larger number of cases are more stable; ratios based on a fewer number are more influenced by chance. To take this into account, a 95% confidence interval is calculated. The confidence interval is a statistical measure showing the precision of the estimated risk ratio. A small interval will reflect a stronger precision. If the confidence interval contains 1.0, no statistically significant excess number of cases is indicated.

Incidence-based registries that are used in calculating SIRs are generally considered more reliable than and more complete than mortality-based data. Incidence based registries identify each case at the time a diagnosis of cancer is reported, rather than at the time of death. Incidence data will not be affected by the difference of survival across cancer sites and types, while mortality data are susceptible to bias from difference in treatment and access to health care.

For the Conrail cancer analyses, none of the analyses indicated there were a significant excess number of cancers of any type or grouping in the population around the Conrail site. (Table A8-1). For all cancers combined, the incidence of cancer among residents in the study area was 125 cases observed, with 272 expected based on the white comparison population; the SIR was 0.46. For the combined grouping of cancers occurring in children aged 0–19 years, two cases were observed, while about three cases were expected. No cases of primary liver cancer, chronic lymphocytic leukemia (CLL), or Hodgkin’s lymphoma were recorded for the Conrail area for the ten year period. Six cancers, acute lymphoblastic leukemia (ALL), chronic myeloid leukemia (CML), kidney, brain, laryngeal, and anal cancers, had SIRs slightly above 1.0. However, none of these ratios were statistically significant.

An analysis of new cases of cancer should be considered exploratory and a way to evaluate if more rigorous analyses are warranted. Information on other potential causes and risk factors of cancer, other than proximity to the Conrail site, is not available. Cancer is a common disease; there is a lifetime risk of one in three of getting cancer. There are many causes of cancer; the leading preventable cause of cancer is cigarette smoking. Exposure to carcinogenic chemicals and other industrial chemicals account for less than 5% of human cases.

Because of how the cancer case data are collected, this analysis substitutes geographical area for potential exposure over time. From the cancer registry, it is not possible to determine how long an individual may have resided in the community (a surrogate of exposure for drinking the contaminated private well water). Similarly, this information is not available for the comparison population. Therefore, it was not possible to adjust for how long an individual may have resided in a TCE contaminated neighborhood and/or drank water containing TCE. Cancers, other than leukemia, usually have long latency times between exposure and onset of clinically recognized disease. Latency periods can be more than 10 years; new cancers diagnosed in the 1990s may have started in the 1970s or 1980s.

For many of the cancers, very few cases were reported. A non-significant difference sometimes reflects the low number of cases rather than the absence of differences. In this analysis of new cancer diagnoses, breast, lung, colon and prostate cancers had the highest number of cases and show more precise confidence intervals, meaning our confidence in the interpretation of risk is better. These four cancers are the most commonly occurring cancers in men and women in the United States. For the analysis of the Conrail area, for all four of these cancers, the number of cases observed was less than what was expected.

In summary, the incidence of cancer around the Conrail area as determined by the 1990–1999 cancer incidence data did not show an excess number for all cancers or specific types of cancer.

This analysis does not allow for conclusions to be made for any causal relation between the occurrence of cancer and drinking contaminated water.

Table A8-1. Standardized Incidence Ratios* (SIRs) and 95% Confidence Intervals (C.I.) for Newly Diagnosed Cancers near the Conrail Site 1990–1999.

Cancer Type	Observed Cases	Expected Cases*	SIR	Lower C.I.	Upper C.I.
ALL Sites	125	272	0.46	0.38	0.55
Liver	0	2	0	< 0	2.33
Bladder	4	13	0.31	0.08	0.79
Leukemia–ALL	1	1	1.13	0.01	6.31
Leukemia–AML	1	2	0.55	0.01	3.06
Leukemia–CLL	0	2	0	< 0	1.93
Leukemia–CML	2	1	2.39	0.27	8.63
Hodgkin’s	0	2	0	< 0	2.21
Non-Hodgkin’s	2	11	0.19	0.02	0.68
Kidney and Renal Pelvis	8	7	1.09	0.47	2.15
Brain	4	4	1.01	0.27	2.58
Esophagus	1	3	0.38	0.01	2.13
Breast	15	43	0.35	0.19	0.57
Lung	18	46	0.39	0.23	0.62
Children (0–19 years)–all	2	3	0.74	0.08	2.66
Larynx	4	3	1.17	0.32	3.00
Prostate	14	33	0.42	0.23	0.71
Ovary	2	6	0.36	0.04	1.31
Colon	12	25	0.49	0.25	0.85
Melanoma	6	7	0.85	0.31	1.84
Multiple Myeloma	1	3	0.36	0.01	2.02
Rectum/rectosigmoid	7	10	0.71	0.29	1.48
Anus, anal canal	1	1	1.22	0.02	6.81

Cases rounded to nearest whole number.

ALL = acute lymphocytic leukemia

AML = acute myelogenous leukemia

CLL = chronic lymphocytic leukemia

CML = chronic myelogenous leukemia

Appendix 9

Review of Indiana Cancer Mortality Data (1992-2001)

To further address community concerns about cancer in the area around Conrail, ISDH analyzed cancer mortality data for cancers of concern or plausibly associated with TCE or CCl₄ exposure as based on the scientific literature.

The smallest geographic level at which cancer mortality data were currently available is the zip code. The zip code was not included in the mortality data files prior to 1992; therefore, the data were analyzed for the 10-year period 1992–2001. The area for the analyses was defined as zip code areas 46516 and 46561 in Elkhart (Elkhart County) and Osceola (Saint Joseph County), Indiana, respectively (Figure 11). These two zip codes were considered because they overlie the groundwater plume from the Conrail site. Private well users and well contamination are captured in the zip code boundaries. The average population of zip code 46516 was 32,019 over the years 1992–2001, and the population of 46561 averaged 9,917 over the same period.

All deaths from cancer among the residents of the two zip codes during the period 1992–2001 were identified. The source of these data was the Indiana State Department of Health mortality database. This information is collected on the death certificate, and the state is responsible for the assurance and protection of the data.

In addition to all cancers combined, liver, bladder, four specific types of leukemia as well as all leukemias combined, two types of lymphoma, kidney, brain, esophageal, breast, lung, laryngeal, colon, anal and rectal, melanoma, and multiple myeloma cancers were evaluated for the 10-year period. All cancers combined occurring in children ages 0–19 years were also analyzed. These cancers are reported as the underlying cause of death. Cancers which may be present in persons dying of unrelated causes, such as accidents, are therefore, not included. However, metastatic disease occurring in organs other than the primary site may be reported as the underlying cause of death when the primary site is unknown.

For this analysis, once the deaths from cancer were identified, standardized mortality ratios (SMRs) were calculated. The SMR is calculated by dividing the number of observed cancer deaths identified in the defined area by the expected number using a comparison population for the ten year period. Because the population in the area was predominantly white, the comparison population used was the white population of the state of Indiana. SMRs were calculated for the 18 types of cancer and for the three groupings (all leukemias, all cancers, and cancers in children). In calculating the SMRs, the cancer cases were evaluated by their occurrence by age groups in the two zip codes and in the comparison population.

Similar to the SIR, an SMR is a ratio of the observed over expected number of deaths. A ratio greater than 1.0 indicates more cases than expected; a ratio less than 1.0 indicates fewer cases than expected. The interpretation of the ratio depends on both the size of the ratio and the number of cases used to calculate the ratio. Ratios based on a larger number of cases are more stable; ratios based on a fewer number are more influenced by chance. To take this into account, a 95% confidence interval is calculated. This statistical measure shows the precision of the

estimated risk ratio. A small interval will reflect a greater precision. If the confidence interval contains 1.0, no statistically significant excess number of cases is indicated.

The analyses for zip code 46516, including Conrail neighborhoods and the city of Elkhart, indicated that there were a significant excess number of cancer deaths for all cancers combined, for lung cancer, and for anal-rectal cancer (Table A9-1). For all cancers combined, the number of cancer deaths among the residents of zip code 46516 was 639 cancer deaths observed with 532 expected based on the white comparison population; the SMR was 1.20. This means there is a 20% excess risk of dying from cancer as compared to the state white population. For the combined grouping of all cancer deaths in children aged 0–19 years, there were four deaths observed, with three expected. There were 205 deaths observed from lung cancer in zip code 46516 over the 10-year period, with 164 expected (SMR = 1.25). This means there was a 25% increased risk of dying of lung cancer as compared to the state white population. For anal-rectal cancer, 17 deaths were observed whereas eight were expected (SMR = 2.17), an excess of twice that expected for the state population. Many other specific cancers had SMRs above 1.0; these were, however, not statistically significant.

None of the analyses for zip code 46561 (mainly Mishawaka area including Penn Township) indicated that there were a significant excess number of cancers of any type or grouping (Table A9-2). For all cancers combined, the number of cancer deaths among the residents of zip code 46561 was 154 cancer deaths observed, with 160 expected; the SMR was 0.96. For the combined grouping of all cancer deaths in children aged 0-19 years, there were no observed deaths. No deaths from chronic lymphocytic leukemia (CLL), or chronic myelogenous leukemia (CML) were recorded for zip code 46561 for the 10-year period. Nine cancers, liver, acute myelogenous leukemia (AML), Hodgkin's lymphoma, non-Hodgkin's lymphoma, kidney, brain, laryngeal, colon and melanoma cancers, had SMRs above 1.0. However, none of these ratios were statistically significant.

Limitations for these analyses include those detailed for incidence analyses, as well as the inherent absence in the mortality files of some persons with cancer, due to their deaths from unrelated causes. In contrast to incidence data, mortality data are affected by the difference of survival across cancer sites and types. In addition, mortality data are susceptible to bias from differences in treatment and access to health care.

The geographic area used for the mortality analyses were two zip code areas that include the groundwater plume. This area is larger than the area potentially affected by the Conrail site. Mortality data were only available to the zip code level. Because of the inability to use a smaller geographic unit, the findings may not truly reflect the cancer mortality of those residents who drank contaminated private well water near Conrail. These limitations need to be considered before drawing conclusions from this analysis.

In summary, the analysis of mortality data for 1992–2001 for zip code 46516 showed an excess of deaths from all cancers combined and from lung and anal-rectal cancers. The analyses for zip code 46561 did not show an excess number of cancer deaths for all cancers or for specific types of cancer. The study design does not permit conclusions to be made for any causal relation between cancer deaths and exposures from the Conrail site.

Table A9-1. Calculation of SMRs and 95% Confidence Intervals (C.I.) for Cancers in Conrail zip code 46516, 1992-2001

Cancer Type	Observed Cases	Expected Cases*	SMR	Lower C.I.	Upper C.I.
ALL sites	639	532	1.20	1.11	1.30
Liver	13	9	1.37	0.73	2.34
Bladder	15	11	1.35	0.76	2.23
Leukemias—all types	23	20	1.12	0.71	1.69
Leukemia—ALL	4	2	2.59	0.70	6.62
Leukemia—AML	5	8	0.61	0.20	1.43
Leukemia—CLL	5	4	1.22	0.39	2.85
Leukemia—CML	5	2	2.41	0.78	5.63
Hodgkin's	3	1	2.05	0.41	5.98
Non-Hodgkin's	26	23	1.12	0.73	1.64
Kidney and Renal Pelvis	16	13	1.27	0.72	2.06
Brain	12	13	0.91	0.47	1.58
Esophagus	10	11	0.93	0.44	1.71
Breast	43	41	1.04	0.75	1.40
Lung and Bronchus	205	164	1.25	1.09	1.43
Children (0–19 years)—all	4	3	1.35	0.36	3.47
Larynx	5	3	1.64	0.53	3.84
Colon	61	49	1.25	0.96	1.61
Rectum and Anus	17	8	2.17	1.26	3.48
Melanoma	9	8	1.18	0.54	2.23
Multiple Myeloma	7	9	0.75	0.30	1.55

Cases rounded to nearest whole number.

ALL = acute lymphocytic leukemia

AML = acute mylogenous leukemia

CLL = chronic lymphocytic leukemia

CML = chronic mylogenous leukemia

Table A9-2. Calculation of SMRs and 95% Confidence Intervals (C.I.) for Cancers in Conrail zip code 46561, 1992-2001

Cancer Type	Observed Cases	Expected Cases*	SMR	Lower C.I.	Upper C.I.
ALL sites	154	160	0.96	0.82	1.13
Liver	6	3	2.10	0.77	4.57
Bladder	3	3	1.00	0.20	2.93
Leukemias—all types	3	6	0.51	0.10	1.49
Leukemia—ALL	1	0	2.13	0.03	11.85
Leukemia—AML	2	2	0.84	0.09	3.03
Leukemia—CLL	0	1	0.00	<0	3.35
Leukemia—CML	0	1	0.00	<0	5.76
Hodgkin's	2	0	4.47	0.50	16.12
Non-Hodgkin's	8	7	1.17	0.50	2.30
Kidney and Renal Pelvis	5	4	1.27	0.41	2.97
Brain	5	4	1.16	0.37	2.71
Esophagus	3	3	0.89	0.18	2.59
Breast	12	13	0.92	0.47	1.60
Lung and Bronchus	50	51	0.98	0.73	1.29
Children (0–19 years)—all	0	1	0.00	<0	4.15
Larynx	1	1	1.04	0.01	5.81
Colon	14	14	1.01	0.55	1.70
Rectum and Anus	3	4	0.80	0.16	2.34
Melanoma	4	3	1.60	0.43	4.09
Multiple Myeloma	2	3	0.74	0.08	2.66

Cases rounded to nearest whole number.

ALL = acute lymphocytic leukemia

AML = acute myelogenous leukemia

CLL = chronic lymphocytic leukemia

CML = chronic myelogenous leukemia

Public Comments and Response to Public Comments

On August 3, 2004, ATSDR conducted public availability sessions for the Conrail Rail Yard Superfund site. The public availability sessions were followed by a public meeting at which ATSDR presented an overview of the findings of this public health assessment, and EPA presented an update on the site remediation status. ATSDR distributed documents and fact sheets at the meetings that contained information about how people could submit comments to us if they had other questions or comments after reviewing the information. Earlier that day, ATSDR met with Elkhart County, Elkhart City, and St. Joseph County officials. We presented an overview of our findings and answered questions they had about exposures to their citizens. The following information is a summary of questions and concerns expressed at those meetings, actual written comments, and responses to those concerns and comments.

Comments and Concerns from the Meeting with County and City Officials

Concern: What do we need to do to ensure the continued safety of our citizens?

Response: Prevent people, as already done in St. Joseph County, from drilling new wells in the contaminated area. Also, be sure that people living in the contaminated area have a source of safe, affordable water so that they will not feel a need to seek alternative water supplies, such as drilling new wells.

Another issue is the potential for vapor intrusion. Elkhart County now has plat restrictions for new homes and businesses that are built within the area of groundwater contamination. The restrictions call for vapor mitigation systems to be installed on new homes and businesses built over the groundwater contamination. Enforcement of the plat restrictions is an excellent precaution to prevent exposure through vapors entering buildings should natural or man-made events alter local geologic conditions. Additionally, the restriction has the added benefit of protecting people from naturally occurring radon, which is a problem throughout this area of Indiana.

Concern: This community seems to be ideal for some sort of follow-up study because of the levels of exposure, the number of contaminants found in the drinking water, and the length of time people used the contaminated water. Are you planning any kind of follow-up study?

Response: We would first need to know whether people in the community were willing to participate or would be interested in any kind of health follow-up study. There are issues that would be interesting to study, such as birth outcomes that occurred while pregnant women were exposed to contamination in their drinking water; however, any study is very resource intensive and costly. We would not propose such a study to the community if we did not have confidence that something of this nature would be supported locally and would be funded.

Concern: What benefit would such a study have on the people now? Wouldn't that be useless to those who might have been affected?

Response: You are correct that the information gained through such a study would not necessarily benefit anyone who might have been affected in the past. Such a study would add to the scientific knowledge that could eventually help us better understand any risk from using drinking water containing TCE and/or CCl₄. Some people might feel closure if such a study were conducted, but others might feel that such a study is delaying their healing process. Among all considerations to do a study, this is one of the most important issues to resolve.

Comments and Concerns from the Public Availability Session

Concern (heard from more than one person or family): We purchased our home and the original owner did not connect to the public water supply. Should we be concerned?

Response: Not all private wells in the area contained contamination. If the original owner decided not to connect to the public water supply because the well was clean, then likely you are still using clean water. On the other hand, it is possible the original owner simply did not want to pay a water bill, which occurred after one year of connection to public water. Most wells that have historically been clean are likely to remain so; however, because both natural and man-made changes can alter area conditions, there is no guarantee that well water will always remain clean. For that reason, we encourage you to use a permanent, safe water supply.

Wells found to contain contaminants over the maximum contaminant levels for each chemical were provided with filtration systems; however, the filters must be maintained to ensure effectiveness. If your well has a filter, and the water has not been sampled routinely or the filter maintained, there is a risk that you are being exposed to whatever levels of contaminants were present before the filter was installed. ATSDR recommends that no private wells in the area be used for drinking or other uses. If you live in the contaminated area and purchased a home where the previous owner failed to connect to the public water supply, we suggest that you contact EPA to discuss your options for well sampling and for a long-term, safe water supply.

Concern: Are garden vegetables that are watered with private well water safe to eat?

Response: Yes. Home-grown fruits and vegetables are safe to eat because they will not accumulate the volatile organic compounds found in some of the private wells in the area. As with store-bought produce, we recommend washing and peeling or paring produce to clean away bacteria, dirt, and possible pesticide residue.

The concern we have is that people who use contaminated private well water to irrigate gardens and lawns can breathe the volatile compounds if they stand over the hose as they water. We are concerned about people, especially children, who might drink from the water hose or who might play in sprinklers during hot weather. These types of exposures are minimal and, in themselves, would not likely result in harmful health effects, but exposures should be avoided whenever possible. People with operable private wells might also be tempted to use the well water for domestic and drinking water purposes if their water bills become too costly. If the well water is clean, that would not be a health hazard; however, if the water is contaminated, the levels of contamination might not be safe.

Concern: Are children who play in the yard at risk of breathing vapors coming from the ground?

Response: Children can safely play in yards that are over the groundwater plume. In most areas, the contamination in groundwater is at depths which make it unlikely for vapors to reach the surface. Children are safe playing outside even in areas where contamination is shallow and vapors have entered homes and businesses. Any vapors escaping to outdoor air would disperse quickly. A child would be expected to have little or no exposure. The concern is greater when vapors enter confined spaces or living areas of homes. Vapors can accumulate in indoor air, especially during winter months, when ventilation is minimal. That is why vapor mitigation systems were installed in buildings where indoor CCl₄ levels exceeded the EPA action level of 3 parts per billion by volume.

Concern: Our home was built over the area of groundwater contamination, but a vapor mitigation system was not installed. Are we in danger of exposure? Will we be able to make our developer install one?

Response: You are not likely in danger of exposure from vapor intrusion into your home. The plat restrictions were put into place as a precautionary measure to prevent future exposure in the event that natural or man-made changes in area conditions bring the contamination closer to building foundations. To date, the only buildings that have contained contaminants in indoor air associated with the Conrail Superfund site plume have been in an area near the St. Joseph River in St. Joseph County. ATSDR supports Elkhart County's efforts to prevent possible future exposure by placing restrictions on new buildings in the groundwater plume area. ATSDR cannot enforce regulations, but Elkhart County will be able to answer your questions.

Concern: Are the people who work at a company in the area of groundwater contamination at risk from the process water used? The process water is from a well.

Response: Without data from the specific well, ATSDR cannot comment on whether workers are being exposed to contamination. Also, the way the process water is used would contribute to exposure if the well water is contaminated. An open system in which process water is used but not contained could result in worker exposure if the water is contaminated. The exposures could be higher if the work area is not well ventilated and people are working in proximity to the water. On the other hand, if the process water is used in a closed system, where the water is not in contact with indoor air workers breathe, then the risk of exposure is much less and may be non-existent. At minimum, if process water is within an open system, the water should be monitored to determine if workers are exposed to contamination.

Concern: ATSDR was asked about some specific health effects that included different types of cancer, seizures in an adult male, a child born with a heart condition, kidney and urinary tract problems, and liver problems. In addition to specific health concerns, some people wanted a better understanding of results of the health outcome data that were analyzed for the public health assessment.

Response to all of these health concerns: ATSDR cannot say whether any one individual's health problems could have resulted from exposure. Every individual had a different exposure level and duration, and some people were never exposed to contaminants in their drinking water even though they lived over the area where groundwater is contaminated. What we can say is that people who were exposed to higher levels of contamination for longer periods of time were at greater risk of developing certain adverse health effects. Those effects are discussed in this document, and people who expressed these concerns spoke with ATSDR representatives who provided them with information about other risk factors as well as possible risk from exposure to site contaminants. An ATSDR physician, Dr. Michelle Watters, was on hand to better explain results of the health outcome data reviews, which included birth certificate screening, cancer incidence data, and cancer mortality data. Dr. Watters also presented information during the public meeting about the findings of the health outcome data analyses and findings about other health conditions about which community members had previously expressed concerns.

Comments from Community Members Who Provided Comments in Writing or by Telephone

Comment: The fact sheet would have been more helpful if some information on dispersion of plume and current level of toxicity in control area or how is the problem reducing with time.

Response: This information is provided in the public health assessment, and ATSDR is hopeful that you have been able to read that document. The purpose of the fact sheet was to provide a brief overview of public health assessment findings. We will consider your comments when developing future fact sheets that need to provide useful information to all community members.

Comment: In regard to the fact sheet that was mailed to community members: Thank you for mailing the information about this "Superfund Site" to us. As new homeowners in the area right next to the site, it was very much appreciated to be informed about the situation.

Response: No response necessary.

Comment: The fact sheet mailed to community members might have been more helpful if it contained (1) an exact map of the exposed areas; (2) which areas have most to worry about; (3) do we need to worry about vegetable gardens?

Response: As previously noted, garden vegetables, even those irrigated with well water, are safe to eat. Other information is provided in the public health assessment. We do appreciate your time in helping us make our fact sheets better for communities, and we will consider your comments when developing new fact sheets.

Comment: I live south of the site. My water has a funny taste and odor. Could my well water be affected by the Conrail Rail Yard site?

Response: No. Groundwater from the Conrail Rail Yard site flows away from you. However, you should have your water tested if you are concerned about its quality. Contact the Elkhart County Health Department to get details about how you can have your water tested.

Comment: I live in the County Road 1 area that has been identified to be within the groundwater plume. My neighbor uses private well water to irrigate his garden. The neighbor allows the water to spill over onto other people's property. Are we at risk of exposure?

Response: You are not at risk as long as no one comes in contact with the water; therefore, we recommend that no one, especially children, drink, touch, or breathe air near the water. The water may not be contaminated because the contamination is at depth. If the well is shallow, then the water may be clean. We cannot know unless the water is tested. Even if the water is clean when tested, we encourage people not to use private wells in the area because conditions could change over time.

Comment: We were out of town when you held the public meeting. Where can we see a copy of your public health assessment?

Response: Both the Elkhart County Library and the St. Joseph County Library have copies for the public to review. If you need a personal copy, you may request one from ATSDR. The document is available on CD or in hard copy.

Comments from URS on Behalf of Consolidated Rail Corporation and American Premier Underwriters

Comment: Additional Technical Reports that Were Not Considered: Several additional technical reports have been prepared and submitted to the US EPA and IDEM regarding Site investigations and remediation. Some of the information contained in these additional reports supercedes or supplements information contained in the technical reports that were considered by the ATSDR in the preparation of the Health Assessment. The more significant technical reports that were not considered by the ATSDR include:

- URS and GeoTrans, Inc., 2001. Second Remedial Design/Remedial Action Work Plan.
- URS, 2002. Addendum Second Remedial Design/Remedial Action Work Plan.
- URS and GeoTrans, Inc., 2002. Preliminary Design Report: Second Remedial Design/Remedial Action.
- URS and GeoTrans, Inc., 2003. Conceptual Design Summary Draft.
- URS, 2003. Second Remedial Design/Remedial Action Prefinal Design Report—Groundwater Containment Pumping and Treatment System.

Response: ATSDR reviewed most, if not all, of those documents, as well as numerous other historical documents or information. However, ATSDR's perspective is different from EPA's in that our mission for this site investigation was to review information regarding past exposure, data for any possible current exposure, and possible future exposure for people residing in the area. The documents you cite provide excellent information on remediation progress and future plans for site remediation. Mr. Brad Bradley of EPA presented information to community members on that topic at the public meeting ATSDR held in Elkhart in August 2004. We do not believe that information provided in those technical documents make a difference in our health call or provide information beneficial to the community about the consequences of their

exposure. We do encourage community members who are interested in the remediation process to review those documents.

Comment: The Site Boundary is Incorrectly Shown on Several Figures: The eastern boundary of the Conrail Railyard Superfund Site has been defined by EPA to be Nappanee Street. Nappanee Street is also the eastern boundary of the Railyard. Several maps contained in the Health Assessment report, such as Figures 1 and 2, incorrectly show the eastern boundary of the Site to be more than one mile east of Nappanee Street. The boundaries shown on these figures do not coincide with either the Conrail Railyard Superfund Site boundary or the Railyard boundary.

Response: The eastern boundary of the Conrail Rail Yard Superfund Site has been corrected in the figures.

Comment: The Health Assessment is inconsistent regarding acknowledging the presence of groundwater contamination sources other than the Railyard: The Health Assessment correctly acknowledges that there were other sources of groundwater contamination at the Site in addition to the Railyard. For example, the Health Assessment acknowledges that the drag strip off Ash Road is the likely source of the indoor air contamination found in certain buildings within the Vistula Avenue area (Health Assessment, p. 34), and that the Larue Street area has possibly been affected by sources of contamination in addition to the Railyard (Health Assessment, p. 12). In other instances, however, it appears that the Health Assessment is attributing all contamination to releases at the Railyard. The confusion apparently is caused by the inconsistent use of the word "Conrail." In some instances "Conrail" is used to mean the Railyard, and in other instances "Conrail" appears to refer to the Conrail Superfund Site, which is a larger geographic area than the Railyard. Within the larger geographic area there are other known or suspected sources of groundwater contamination that are not related to the Railyard.

Response: ATSDR agrees that a number of sources could be adding to the contamination that is found throughout the area. However, ATSDR is concerned about providing information to community members about their exposures to contaminants, primarily TCE and CCl₄, rather than sorting out who is responsible for contamination of individual wells or areas. We are sure that EPA will do an excellent job of defining responsible parties and will make that clear to community members. ATSDR reviewed the document and made changes if we believed the text caused confusion.

Comment: The Outline of the County Road 1 Plume is Incorrectly Shown on Figures 2 and 3. Figure 2 of the Health Assessment incorrectly identifies the boundaries of the County Road 1 plume. The outline of the County Road 1 plume shown on figure 2, and also included on figure 3, is based on an outdated and superseded interpretation of the groundwater flow direction from the Railyard toward the St. Joseph River. The County Road 1 flow directions shown on Figure 2 were contained in the Petition for a Technical Impracticability Waiver and Request for Remedy Reconsideration (HIS GeoTrans, 2000, Figure 3–8) and they were identified as model-calculated groundwater flow paths. Neither that report, nor any other report, concluded that the model-calculated flow paths were an actual representation of the boundary of groundwater contamination. The Petition for a Technical Impracticability Waiver and Request for Remedy

Reconsideration (HIS GeoTrans, 2000, p. 5–18) proposed the installation and monitoring of several wells north of the Railyard to better characterize the migration pathway of groundwater contamination in this portion of the Site. Subsequent to submitting that document, an investigation was done to determine the validity of the groundwater flow direction from the Track 69 Release area shown on Figure 3–8 of that document. The results of that investigation determined that previously undocumented low permeability silt and clay deposits located north of the Railyard caused groundwater flow from the portion of the Railyard north of the Track 69 CCl₄ release area to be westerly and not northerly as shown on the Health Assessment Figures 2 and 3. The results of that investigation, including a better characterization of groundwater flow direction north of the Railyard, were contained in Preliminary Design Report: Second Remedial Design/Remedia Action (URS, 2002, Appendix A, figure 4–5).

Response: ATSDR used the map from HSI GeoTrans, 2000, with other data that included groundwater flow analyses performed at ATSDR and through mapping individual addresses with documented well water contamination. There may be slight variations to the contamination because when data are digitized using different software and different maps, the areas can appear slightly different. ATSDR believes the important message lies with the individual well water data that were mapped. The maps show the general areas where the highest levels were found in the community without providing exact addresses that could result in a violation of ATSDR privacy policies. Again, our findings were based on actual data from private well water samples rather than general maps, all of which may have small discrepancies in depicting actual locations and conditions.

Concern: The Computerized maps of CCl₄ and TCE Contamination Exaggerate the Areal Extent of Groundwater Contamination: The maps of carbon tetrachloride and TCE concentrations contained in the Health Assessment (Figures 4 and 5) show extremely irregular boundaries that are inconsistent with groundwater flow at the Site. These maps reflect computational limitations of the computer software used to make the figures. The County Road 1 plume maps contained in Appendix 2 of the Health Assessment, as well as the figures contained in the Interim Remedial Action Monthly Reports (Groundwater Technology, Inc, 1996), are a more reasonable, but not exact, representation of the boundaries of the region within which there is contaminated groundwater northwest of the Railyard than are Health Assessment Figures 4 and 5.

Response: The private well water data provide the information needed for the health evaluation, and that data were factored into the model ATSDR used to predict plume boundaries. EPA will decide on the site boundaries and affected areas. We do agree that different software will yield slightly different estimates of contaminant boundaries. However, for groundwater to flow in a clearly organized, never changing line is highly unlikely. Areas of less permeable soil can cause variations in contaminated groundwater flow. Underground channels or bedrock fractures can also influence flow direction. Investigations using monitoring wells and private well water data have done an excellent job of estimating flow direction and extent; however, no model is exact.

Concern: The Estimated Potential CCl₄ Exposure Period is Based on an Overly Simplistic Evaluation of Contaminant Migration in Groundwater. The ATSDR assumed people were exposed to CCl₄ in their drinking water within about a year of a reported tank car spill (Health Assessment, p. 39).² The ATSDR assumption was arbitrary and was not based on a specific

evaluation of CCl₄ migration in groundwater. The tank car release area is approximately 1500 feet south of the northern boundary of the Railyard. It is unlikely that CCl₄-contaminated groundwater could have migrated more than 1500 feet from the area of the tank car spill within a year. A more-detailed evaluation of CCl₄ migration in groundwater at the Site would be necessary to establish a possible exposure period. More recent Site investigations show that CCl₄ released at the Track 69 area may not have migrated very far north of the northern Railyard boundary.

(Footnote 2 reads: There has been significant dispute about the exact timing of historic railcar spills in the southeast (Track 69) area of the Railyard, as well as the identity of the materials spilled there.)

Response: ATSDR looks at any exposure over one-year duration as chronic exposure. For the contamination to have been present in the private well water at the levels found, the contamination had to have been present for a number of years. Whether all of the contamination came from a railcar spill or from poor waste handling is irrelevant for a health evaluation, although that might concern EPA. At the levels of exposure, the risk associated with the exposure would not change substantially whether the people were exposed 12 years or 35 years.

Concern: The Potential for Groundwater Contamination to Volatilize into Indoor Air is Overstated: The Health Assessment implies that there is a potential for groundwater contamination to volatilize into the indoor air of any structure located above the region of contaminated groundwater at the Site. This is incorrect. Volatilization of groundwater contamination into soil gas and then into indoor air can only occur when the contaminated groundwater is located at the water table, and in contact with soil gas. Much of the groundwater contamination at the Site is in the deeper portions of the aquifer and the shallow groundwater does not contain contamination. In the portions of the Site where the shallow groundwater is not contaminated, there could be no volatilization into soil gas and indoor air. The lack of correlation between the concentration of CCl₄ present in well water and the concentration found in indoor air (Health Assessment, p. 34) probably reflects the fact that few, if any, of the well water samples represent contaminant levels at the water table. It is only in the portions of the Site where the shallow groundwater is contaminated that there is a potential for groundwater contamination to volatilize into indoor air. For example, the shallow CCl₄ groundwater contamination that originates at the Ash Road Drag Strip is the likely source of the CCl₄ contamination detected in indoor air in the nearby Vistula Avenue area (Health Assessment, p. 34).

Response: ATSDR's responsibility is to identify any possible future exposure pathways so that actions can be taken to stop exposure before it happens. The public health assessment states that although it is unlikely that buildings not currently affected by vapor intrusion would ever be, conditions could change as a result of natural and made-made actions on water tables and depth of buildings to the contamination. The possibility becomes somewhat greater as the natural grade decreases and depth to contamination becomes shallower. Elkhart County has taken responsible action in requiring new development within the plume area to be equipped with vapor mitigation systems. ATSDR supports that action as proactive and protective. ATSDR also encourages existing property owners to install the systems as a precautionary measure.

Because no one can guarantee future conditions, enforcing the building restrictions and encouraging installation of vapor mitigation systems is sound public health practice.

Comment: The Results of the Woburn Health Effects Study are Incorrectly Stated: Table 9 and the associated text imply that the Woburn Health Effects Study concluded that exposure to trichloroethylene (TCE) in the City of Woburn public water supply resulted in adverse health effects. The conclusion of the Woburn Health Effects Study did not specifically identify TCE, or any other chemical, as the cause of the adverse health effects. Instead the Woburn Health Effects Study concluded that there was an association between exposure to “water pumped from the wells” and adverse health effects.

The public supply wells in the Woburn Study were located within a highly industrialized area, and water pumped from the wells contained several different types of contaminants. The Massachusetts Bureau of Environmental Health Assessment Woburn Childhood Leukemia Follow-up Study Information Booklet (1997) specifically states that the findings of the Woburn Health Study:

“should be interpreted with caution due to the limitations of conducting statistical analyses on small populations. The conclusions suggest, however, that the risk of developing childhood leukemia was greater for a child whose mother drank water from the contaminated wells while pregnant with the child. The results also suggest that the greater the amount of contaminated water provided to the house and available for use while the mothers were pregnant, the greater the risk of their child developing leukemia.” (Massachusetts Bureau of Environmental Health Assessment Woburn Childhood Leukemia Follow-up Study Information Booklet, 1997, p. 2).

The Woburn Health Study did not associate any specific compound contained in the water pumped from the public supply wells, including TCE, to the adverse health effect.

Response: The limitations of epidemiologic studies are discussed in the document. The study was not designed to show a cause/effect relationship between any chemical and disease. The study was designed to see if there was an increase in disease among the population using the water supply, which was contaminated with chemicals, including TCE. Since that time, other studies conducted, as cited in the public health assessment, suggest TCE exposure could have some effects. The public health assessment discusses the risk of developing health effects at different levels of exposure. At this point in time, no one can tell a person why someone might experience an effect while another person, with the same exposure, does not. We can only tell people what we, as scientists, think their risk may be.

Concern: Table 15 of the Report does not accurately describe the arrangement made by US EPA, Conrail and APU regarding vapor mitigation systems: EPA with the cooperation of the Conrail Railyard Superfund Site Settling Parties would implement vapor mitigation systems in connection with the Site upon discovery that indoor air CCl₄ concentrations exceed EPA-approved action levels and such systems are required.

Response: The table is now corrected. Please note, however, that ATSDR's Strike Team health consultation that EPA requested states that the action level (3.0 ppbv) is protective if detected in building areas that are not occupied all the time (living areas). ATSDR also warned that other areas could be affected in the future.

Comments from Chrostowski, Pearsall, Foster, Durda & Preziosi (CPF Scientific Research and Consulting)

Overall comment: In general, it is difficult to understand the basis for the conclusions in the report because of (1) missing information on the derivation of a health criterion and no information on the quality of the studies selected as the basis of lowest observed adverse effect levels (LOAELS), all of which are used to make conclusions; (2) an uneven presentation of uncertainties and limitations associated with the studies as discussed in the ATSDR toxicological profiles and by the study authors themselves; (3) a lack of clarity on which studies were actually used in formulating the conclusion; and (4) a general blur in the distinction between association and causation in the report, particularly in the conclusions but also sometimes in the general discussion.

Response: ATSDR's goal is to provide health information to the communities it serves. ATSDR strives for a balance of scientific accuracy expressed in language that the majority of the specific community is likely to understand. ATSDR interprets complex study results and provides the "bottom line" to the community members. We cite studies reviewed so that the scientific community can see what was used as a basis for our decisions. We disagree that more of the scientific detail was necessary to make our message clearer to the reader. Additionally, ATSDR made no attempt to make an association or state causation between a specific health effect and an exposure. ATSDR expressed the risk of developing plausible health effects based on a range of exposures.

Comment: The data upon which the TCE minimum risk level (MRL) is based upon is missing in the report. The TCE MRL shown in Table 10 differs from the MRLs listed in the ATSDR MRL list and toxicity profile (TCE Profile Appendix A). There is no discussion of how this health criterion was derived or what the effect is based upon.

Response: The MRL information has been corrected. Information on how MRLs are derived can be found in the toxicological profiles. Because MRLs are used as screening tools rather than as the level that health effects are seen, ATSDR felt no need to go into detail in the document as to how numbers are derived. The citations provided explain the scientific basis for numbers and conclusions drawn. ATSDR believes that the document provides enough information about the scientific basis for decisions without compromising the goal to provide clear, accurate health information community members need to make good decisions to protect their health.

Comment: The basis for all tabulated health effects, health criteria, such as MRLs and LOAELs, and the dose and risk estimates should be discussed in the report and referenced in Table 9 through 12. Studies used as the basis for LOAELs should be carefully reviewed and discussed in the text. Study citations, assumptions and equations should be identified and footnoted. Uncertainties associated with the studies summarized in Tables 9 and 11 should be included in the tables. On Table 11, cancer risks at various levels are presented, but the notation of risk together with the term “at 0.001” for each level is confusing and needs to be clarified.

Response: ATSDR feels the discussions about the studies used to evaluate plausible health effects are adequate. For those who want to know more about the individual studies, the citations provide adequate information on how to locate the information. Information about “at 0.001,” at 1 in 1,000, has been added to Table 11.

Comment: Johnson et al. 1998 is mentioned as a citation on page 47 but not listed in the references. Was this study used as the basis for the conclusions? There is no discussion of the findings and limitations of the study in the text of the report.

Response: The reference has been added. ATSDR feels the modified discussions in the text are adequate for the public health assessment.

Comment: On page 47 of the report it is stated: “A study of people in Arizona exposed to TCE in their drinking water identified an association with congenital heart malformations (Goldberg, et al. 1990). This observation has been **confirmed** by an animal study described in the next section (Dawson 1993).” But in the next line on page 47, the report mentions that “However, other animal studies have not demonstrated these effects (ATSDR 1997).” How were these other studies taken into account in this report? With respect to the Goldberg study, the ATSDR toxicological profile points out that other chemicals were present in drinking water, and there were other study limitations on exposure. In fact, Goldberg states that the study does not show a cause and effect relationship. With respect to the Dawson study, the ATSDR profile points out that the study is limited by two widely spaced exposure concentrations and that a significant dose response relationship was not observed for several exposure scenarios. None of this was mentioned in the report. In recent correspondence entitled, “Trichloroethylene and Cardiac Malformations,” in the August 2004 issue of Environmental Health Perspectives, it is noted by scientists associated with DuPont that there is much controversy surrounding the work of Dawson, Johnson and Goldberg and this particular endpoint.

Response: Community members expressed concern in both the community-based health questionnaire and at the public availability session about children in the area born with heart problems. ATSDR would be remiss in dismissing out of hand studies that suggest this might be a plausible end point from certain exposures that include TCE. ATSDR feels the limitations of the studies are adequately discussed. The controversy suggests that better designed studies are needed rather than nullifying the findings.

Comment: On page 51 of the report, there is a discussion of an association of carbon tetrachloride at >1 ppb with a decrease full-term birth weight and an increased incidence of neural tube defects. Although uncertainties due to the presence of other chemicals and lack of

defined exposure levels are mentioned, a major uncertainty was not mentioned. This is that the study was based on registry information and there was no control of alternative maternal risk factors, such as nutritional status, smoking or other types of exposures. The study author states: “By itself, this study cannot resolve whether some (or all) of the relations between the drinking water contaminants and the adverse birth outcomes are causal or due to chance or bias, nor can this study determine proper maximum contaminant levels.” (Bove 1995).

Response: The discussion of the limitations of the study has been expanded and is adequate. Better designed studies could provide better information; however, the information gathered for the study should not be dismissed out of hand. ATSDR feels the appropriate weight of evidence was used in drawing conclusions.

Comment: In the first bullet under the second conclusion on page 66, we are having difficulty understanding how the benchmarks shown have posed a health hazard, while at the same time it is stated that the data are inconclusive. There are great uncertainties expressed in the studies for TCE and carbon tetrachloride as well as in the ATSDR toxicological profiles themselves for the stated effects. As one example, the ATSDR profile states the following with respect to birth defects and TCE: “However, this body of research is still far from conclusive and there is insufficient evidence to determine whether or not there is an association between exposure to TCE and developmental effects.” Additionally, no time frame for exposure is mentioned in the conclusions. The statement that the levels mentioned in this bullet “may have posed a health hazard” would be more balanced.

Response: ATSDR feels the evidence concerning exposure is sufficient to discuss the risk the exposed population might experience as a result of exposure. ATSDR feels the evidence warrants the health calls and welcomes the research community to design and implement better studies, both toxicologic and epidemiologic, to help us better define dose and response of people living in contaminated environments.

Comment: On pages 47– 48, it is stated that “the most sensitive effects of TCE exposure are on the developing embryo, associated with heart defects in exposed animals. Levels of exposure to TCE in water that be associated with these development effects are greater than around 1,600 µg/L.” However, the conclusion states on page 66 that “For people who were exposed to over 300 µg/L of TCE, exposures **posed a public health hazard**. This conclusion is based on evidence that TCE exposure at these levels has been associated with specific birth defects.” The use of 300 µg/L as a benchmark in the conclusions does not appear to be consistent with earlier discussion in the report. Additionally, there is tremendous uncertainty surrounding this effect as previously discussed.

Response: When considering the difference in animals versus humans, ATSDR feels that a safety factor should be included to take into consideration any differences in effects of doses on different species. Discrepancies in the discussion have been corrected. The health call is appropriate and provides community members with important information for them to share with their health care providers when evaluating health status.

Comment: ATSDR should make a clear distinction between causation and association when discussing studies. An association in itself should not be used to imply that exposure results in adverse health effects. The determination of causation can only be made following application of the Bradford-Hill criteria: numerical strength of the association, consistency of human association, specificity of human association, temporal relationship, biological gradient, biological plausibility, coherence, experimental evidence, and analogy. These concepts should be defined early in the discussion and carried throughout.

Response: ATSDR clearly states that current studies are not adequate to determine whether one person's specific illness is caused by his or her exposure. All we can do is discuss possible health effects cited in different studies and the risk within the exposed population for individuals to experience any of those effects. We feel the level of discussion of the studies is appropriate and adequate for the target audience. Specialists are welcome to review studies cited and to voice a difference in opinion.