PETITIONED
HEALTH CONSULTATION

Talladega TCE
Talladega, Talladega County, Alabama

Prepared by:

Alabama Department of Public Health
Under a Cooperative Agreement with
the Agency for Toxic Substances and Disease Registry

Foreword

The Agency for Toxic Substances and Disease Registry (ATSDR) was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also called the *Superfund* law. That law set up a fund to pay for identifying and cleaning up our country's hazardous waste sites. The United States Environmental Protection Agency (EPA) and state environmental agencies oversee the site investigation and clean up actions. Historically, public health assessments and health consultations are conducted by environmental and health scientists from ATSDR. In 1993, the Alabama Department of Public Health (ADPH) entered into a cooperative agreement with ATSDR, the goal of which was that ADPH would develop the capacity to perform this function for ATSDR.

Public health assessments seek to discover whether people are being exposed to hazardous substances. If people are exposed or have the potential to be exposed, ATSDR decides whether the exposure is harmful and at what level health effects might occur; from these data, a decision can be made whether the exposure should be stopped or reduced.

Exposure: ADPH health assessors review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. ADPH does not collect and analyze environmental samples**,** but, instead, reviews sampling data provided by EPA, other government agencies, businesses, or the public. When there is not enough environmental information available, the assessment will indicate that further sampling data are needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ADPH scientists evaluate whether that exposure may result in harmful effects. ADPH, as well as ATSDR, recognizes that children, because of their play activities and their smaller body size, may be most susceptible to these effects. As a policy, unless data are available to suggest otherwise, ADPH health professionals responsible for assessing effects in populations consider children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to children is considered first when evaluating the health threat to a community. The health impact to other high risk groups within the community (i.e., elderly, those with compromised immune systems, chronically ill, women of child-bearing age, and people engaging in high risk practices) also receive special attention during the evaluation.

ADPH uses existing scientific information that can include the results of medical, toxicological, and epidemiologic studies and disease registry data to determine the health effects that may result from exposure. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances may not be available. In such cases, the report will document the need for further data collection activities.

Conclusions: The report assigns a public health hazard category and describes any hazards at the site. It contains a public health action plan that recommends ways to stop or reduce exposure. Because ATSDR is an advisory agency, the report identifies actions that are appropriate for EPA, other responsible parties, or the research or education divisions of ATSDR to conduct. However, if there is an urgent public health hazard, ATSDR can issue a public health advisory to warn

people of the danger. When appropriate, ATSDR also authorizes health education or pilot studies of health effects, full-scale epidemiology studies, diseases registries, surveillance studies, or research on specific hazardous substances.

Interactive Process: The development of a health assessment or consultation is an interactive process. The approach requires accumulation of information from many sources, including, but not limited to: ATSDR, many city, state, and federal agencies; the companies responsible for cleaning up the site, the principal responsible party (PRP), and the community. Once an assessment has been completed, the conclusions are shared with all interested parties. They are asked to comment on an early draft of the report to make sure the data they provided are presented correctly and responsibly. Sometimes agencies will begin to carry out recommendations when they read the draft conclusions and recommendations.

Community: ADPH needs to determine what people in the area know about the site and what health concerns they may have about the site. Therefore, ADPH gathers information and comments from the public. The public is broadly defined to include people who live or work nearby, property owners, business owners, civic leaders, health professionals, community groups, and anyone else who is interested or concerned. The public is asked to comment on a draft of the report to ensure that the report addresses their health concerns. The final report contains a written response to public comments.

Comments: If you have questions or comments after reading this health consultation, please send them to the Alabama Department of Public Health, 201 Monroe Street, Suite 1470, Montgomery, Alabama 36104.

Background and Statement of Issues

In November 2003, the Alabama Department of Public Health (ADPH) was notified by the Agency for Toxic Substances and Disease Registry (ATSDR) of a letter of petition from a community group in Talladega, Alabama. The letter requested a public health assessment be performed on the Grant Street Well Community and surrounding area in Talladega, Alabama. This group was concerned about potential exposure to contaminants in the public water supply.

ADPH has a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) to conduct public health activities at hazardous waste sites in Alabama. Sampling data from the Grant Street Well indicated the presence of volatile organic compounds (VOCs). However, the extent of completeness of environmental and health data do not permit a thorough consideration of parameters. Because of limited environmental health data available to evaluate possible human exposures, ADPH conducted a public health consultation instead of a public health assessment. A health consultation provides advice on a specific public health issue related to real or possible human exposure to toxic material. ADPH will review and summarize available relevant data, consider public health implications, state conclusions, and make public health recommendations. Public health consultations can sometimes lead to a health study, a public health assessment, or other public health activities.

Site Investigation and History

Located in the foothills of the Appalachian Mountain range in the East Central area of the State of Alabama, the City of Talladega is located in north-central Talladega County , and has a population of about 15,000 (1). The Water and Sewer Board of the City of Talladega (TWSB) utilizes seven public-supply wells: Harmon Park; Mount Olive; Sloan Avenue; Bingham Street; Grant Street; Speedway 1; and, Speedway 2. The seven public-supply wells derive ground water from two aquifers: the Rome (a fractured mixed carbonate-shale aquifer) and the Knox (a carbonate aquifer). Both aquifers strike northeast to southwest and dip predominantly to the southeast at low to moderate angles (1).

The Grant Street well was drilled in 1977 by Graves Well Drilling Company to a depth of 175 feet in the Rome Formation. According to local residents, the park where the well is located was once used as a dumping ground by Brecon Munitions and residents of Talladega prior to the drilling of the well (1).

The name given to the site by EPA is the Talladega TCE site. The contaminants in the municipal water system are tetrachloroethylene (also called perchloroethylene or PCE) and trichloroethylene (also called TCE). The source or sources of contamination for the Talladega TCE (TTCE) site have not been identified. Therefore, site boundaries have not been established for the source or the extent of contamination. Several businesses that may have used these substances have operated in the area.

Discussion

ADPH was contacted because residents in the southwest area of the city believed that a higher-than-normal incidence of cancer was occurring in their community. They felt this was caused by exposure to contaminants in the potable water supply from the Grant Street well.The community is concerned most about tetrachloroethylene and trichloroethylene that have been reported in the local press as having been detected in the Grant Street well. Talladega has an integrated water system, but not a blended water system. Due to local hydrology, when a well is online, the community closest to that well will receive the majority of the water from that well.

An initial meeting with a citizens group, Citizens Organized to Resist Eradication (CORE), was held on August 25, 2003. Subsequent telephone calls were made, with the first being on September 8, 2003, with an ADPH staff member. ADPH conducted a site visit to the Grant Street well on January 16, 2004. Photographs of the site were made, and a meeting with a representative from CORE was held. CORE indicated that the illnesses of concern in Talladega are liver cancer, rashes, cysts/boils, lupus, and acid reflux.

A public meeting was held on January 22, 2004, at the B.N. Mabry Center in Talladega with community members, ADPH staff, and a representative from ATSDR. At this meeting ADPH collected information about the community's health concerns. These included high blood pressure, ulcers, colon polyps, bladder cancer, back pain, headaches, stomach cramps, miscarriages, kidney cancer, birth defects, hepatitis, inflammation of the membranous lining of the abdominal cavity, sinus congestion, bladder problems, heart problems, dysplasia, eye problems, seizures, and diabetes.

ADPH has gained access to some of the data pertinent to the Talladega water system from attorneys representing the water board. Other data has been obtained from ADEM. TCE has been detected at levels up to 36.5 parts per billion (ppb) in water from the Grant Street Well. PCE has been detected at levels up to 6.0 ppb in water from this same well. Tables 1 and 2 list the sampling date and the results for TCE and PCE.

No information has been provided by TWSB, including specifically requested documentation and schematics of the design of the water system. In part, this reluctance to share information is because the water board is under federal and state investigation.

Exposure Pathways

ADPH's pathways analysis determines whether people have come into contact with chemicals from the Grant Street well and whether those contacts were substantial enough to cause harm. To make this determination, ADPH identifies exposure pathways or ways in which a chemical could enter a person's body (e.g. ingestion, inhalation, or dermal (skin) contact). If an exposure pathway contains all five elements and exists now or did exist in the past, that pathway is considered complete. The five major elements of an exposure pathway include:

- A Source of the toxic chemicals of concern;

- A method of Environmental Transport which allows the chemical to move from the source and bring it into contact with the residents (surface water, groundwater, soils, entrained dust, vapors, soil gas);

- A Point of Exposure which is the place where a resident comes into direct contact with the chemical (on-site versus off-site);

- A Route of Exposure which is how the resident comes into contact with the chemical (drinking it, eating it, breathing it, touching it); and

- A Population at Risk which are the people living near the site who could possibly come into physical contact with site-related chemicals.

A completed pathway with respect to TCE and PCE in groundwater exists at this site. From 1989 until 2004, people residing near the Grant Street well drank and bathed in VOC-contaminated water from the Grant Street municipal well. Approximately 6,200 customers (households and businesses) receive water from Talladega Water and Sewer Board. However, it is unlikely that all the customers received water from this well. The Grant Street well supplied 700 gallons per minute (gpm) of water when operational (5).

The routes of exposure include ingestion, inhalation, and dermal absorption. Ingestion would result from drinking and cooking with contaminated water. Inhalation would occur during showering , bathing, or washing. Inhalation would result when PCE or TCE evaporates from shower spray or water left standing uncovered. Dermal absorption would result from bathing, showering, and washing activities.

Exposure pathways can also be characterized by when the exposure occurred or might occur in the *past*, *present*, or *future*. The Grant Street well has been removed from service until the necessary corrective action takes place. Therefore, no current exposure to site contaminants is occurring. No current public health hazard exists from the compounds found in this well, because the well has been taken offline by the removal of a portion of the water pipe connecting this groundwater source to the remainder of the water processing and distribution system until corrective actions can be implemented (please see the attached figure). If groundwater remediation is not implemented and this well was used as a source of potable water, individuals could be exposed to PCE and TCE in the future.

Physical contact with a chemical contaminant in and by itself *does not* necessarily result in adverse health effects. A chemical's ability to affect the resident's health is also controlled by a number of other factors including:

- How much of the chemical a person is exposed to (the *dose*).

- How long a person is exposed to the chemical (duration of exposure).

- How often a person is exposed to the chemical (acute versus chronic).

- The chemical's toxicity and how it impacts the body.

Other factors affecting a chemical's likelihood of causing adverse health effects upon contact includes the resident's:

- History of past exposure to chemicals;
- Smoking, drinking alcohol, or taking certain medicines or drugs;
- Current health status;
- Age and sex; and
- Family medical history.

Toxicological Evaluation

Introduction

A review of the toxicological literature is conducted to determine whether a specific exposure situation represents a hazard to public health. APDH evaluated chemical contaminants at the TTCE site by comparing concentrations of chemical contaminants in the samples with health-based assessment comparison (HAC) values for non-cancer and cancer endpoints. Contaminants of concern at this site were selected from those chemicals for which the concentration in groundwater exceeded a health-based comparison value. Comparison values used in this report are the U.S. EPA Safe Drinking Water Act Maximum Contaminant Levels (MCLs). Because of the health-protective nature of the assumptions used to calculate the comparison values, exposures to the contaminant at levels below the comparison values do not pose a public health hazard. However, exceeding a comparison value does not mean that a contaminant represents a public health hazard. Rather it suggests that the public health significance of the contaminant warrants further evaluation. If no comparison values for a chemical in a medium exist, or there is no cancer risk value available for a carcinogen, the chemical is retained for further evaluation. In addition, if the community has expressed specific concerns about exposure to a chemical, that chemical will be retained as a contaminant of concern.

Tetrachloroethylene

Tetrachloroethylene is a manufactured nonflammable liquid solvent that is widely used in dry cleaning, wood processing, fabric manufacturing, and metal degreasing. It readily evaporates into the air and has a sharp, sweet odor. Other names for tetrachloroethylene include PCE, perc, perchloroethylene, and tetrachloroethene. Results from animal and human health studies indicate that exposure to high doses of PCE can result in adverse effects on the nervous system and the reproductive system. Findings from human studies provide some suggestive evidence for a causal relationship between exposure to PCE *in utero* and reproductive and developmental effects, including reduced birth weight and infants born small for gestational age. Studies in

animals and humans suggest that the developing fetus may be susceptible to PCE exposure as a result of maternal exposure (2).

The site-specific child and adult exposure doses calculated using the highest concentration of PCE measured in drinking water (36.5 ppb) are 0.007 and 0.002 milligrams per kilogram per day (mg/kg/day), respectively. Please see the appendix for these calculations. EPA's Chronic Reference Dose (RfD) is an estimate of the amount of chemical that a person would have to be exposed to over a lifetime before any observable health effects (excluding cancer) would be expected. The estimated exposure dose of PCE for both children and adults is less than the RfD of 0.01 mg/kg/day. Therefore, non-carcinogenic health effects are unlikely to occur for residents exposed to the maximum level of PCE from the Grant Street well.

The International Agency for Research on Cancer (IARC) classifies PCE as a probable carcinogen in humans (2). The findings from animal and human studies provide some evidence of PCE carcinogenicity in animals and limited evidence for carcinogenicity in humans. Cancer effects of PCE have been studied in laundry and dry-cleaning workers, who may also have been exposed to other petroleum solvents. Among these workers, excess incidence was reported of the following cancers: lymphosarcomas, leukemia, and cancers of skin, larynx, colon, lung, urogenital tract, and urinary bladder. Although these studies suggested a possible association between occupational exposure to PCE and TCE and increased lymphatic malignancies, the evidence was inconclusive because the workers were also exposed to petroleum solvents.

The cancer slope factor for PCE from EPA's Region 9 Preliminary Remediation Goals is 0.052 $(mg/kg/day)^{-1}$. Assuming a person drank 2 liters of water containing PCE at the maximum concentration every day for the maximum estimated exposure time of 70 years, the predicted increased risk of cancer would be low (1in 10,000). Therefore, residents are not at increased risk for noncancerous health effects and have a low increased risk for cancer.

Trichloroethylene

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 removers. Other names for trichloroethylene are TCE, Triclene, and Vitran (3). Trichloroethylene does not occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical. TCE has been linked with a variety of noncancerous conditions, including anemia and other blood disorders, stroke, urinary tract disorders, liver problems, kidney dysfunction, diabetes, eczema, and skin allergies. A study on the reproductive effects of TCE suggests that more miscarriages might occur when mothers drink water that contains TCE. Other studies have linked prenatal TCE exposure with congenital heart disease, eye malformations, neural tube defects, and oral cleft palates. The combined results of these studies are unclear; however, and further study is needed to understand the risk of reproductive and developmental effects associated with TCE exposure (3).

The site-specific child and adult exposure doses calculated using the highest concentration of TCE measured in drinking water (6 ppb) are 0.001 and 0.0003 mg/kg/day, respectively. Currently, there are no chronic MRL (Minimum Risk Level) or RfD (Reference Dose) values available for this chemical. The level of exposure for residents, however, does not exceed ATSDR's acute oral MRL of 0.2 mg/kg/day. Animal studies involving acute exposures have shown effects at levels several orders of magnitude higher than the doses calculated for residents. Therefore, non-carcinogenic health effects are unlikely to occur for residents exposed to the maximum level of TCE in the Grant Street well.

On the other hand, recent epidemiologic studies suggest that the exposures that occurred could possibly result in adverse health effects to children, exposed as a fetus. A recent ATSDR study of exposure to VOCs in drinking water and occurrence of adverse pregnancy outcomes was conducted for residents of the U.S. Marine Corps Base at Camp LeJeune, North Carolina (7). The researchers reported a significantly decreased mean birth weight and increased small for gestational age babies for two potentially susceptible subgroups: infants of mothers older than 35 years of age and infants of mothers with histories of fetal death. However, length of exposures to VOCs was not known for the entire period during which pregnancy outcomes were evaluated. Therefore, this study provides limited evidence for a causal relationship between exposure to VOCs and the reproductive and developmental effects evaluated.

A childhood cancer study conducted in Woburn, Massachusetts, identified a statistically significant increase of childhood leukemia cases and associated the increase to fetal exposure because the mothers drank TCE and PCE contaminated water (8). This study did not find any association between the development of childhood leukemia and the children drinking contaminated water. The study researchers said that their conclusions were based upon imprecise estimates of leukemia risk because of the small number of subjects in the study. In addition, the researchers were not sure when exposure began. Therefore, this study may not accurately predict the amount or strength of any effect that TCE and PCE may have on the fetus.

Both of these studies have limitations (e.g., no accurate prediction of exposure and small study populations) which make it difficult to determine whether there is or is not an association between fetal exposure to TCE and PCE and childhood leukemia. In addition, the levels of TCE found at the sites mentioned in these studies were an order of magnitude greater than the levels found at the Grant Street well. Overall, the associations drawn from these limited epidemiological data in humans are suggestive, yet inconclusive, that exposure to VOCs may cause birth defects or childhood leukemia in children exposed while a fetus. ATSDR and others are conducting or sponsoring research to clarify this possible relationship.

The International Agency for Research on Cancer (IARC) has determined that TCE is a probable human carcinogen. TCE has been shown to cause liver and kidney cancer in experimental animals. Studies on the epidemiology of cancer among people exposed to TCE have found increases in kidney cancer, liver cancer, non-Hodgkin's lymphoma, cervical cancer, Hodgkin's disease, multiple myeloma, and pancreatic cancer, although the association between exposure to TCE and cancer has been inconsistent across studies.

The estimated risk of developing cancer from exposure to the contaminants was calculated by multiplying the exposure dose by EPA's corresponding cancer slope factor for TCE. EPA is currently reviewing the slope factor for TCE; therefore, no cancer slope factor for TCE is available at the time of the writing of this document. However, EPA Region 9 Preliminary Remedial Goal (PRG) values were used instead. Assuming a person drinks 2 liters of water containing TCE at the maximum concentration every day for the maximum estimated exposure time of 70 years, and assuming a conservatively high cancer slope factor of 0.4 $(mg/kg/day)^{-1}$, the predicted increased risk of cancer would be low (1 cancer case per 10,000 people exposed, or 1×10^{-4}).

Child Health Concerns

ADPH recognizes that infants and children may be more sensitive to environmental exposure than adults. Because of this sensitivity, routes and means of exposure must be examined. Children potentially incur increased exposure to contaminants and have a greater adverse reaction as a result of the following factors:

- Children are smaller, so exposure results in higher doses of contaminants in relation to their body weight.

- Children are at greater risk to sustain permanent damage if they are exposed to toxic chemicals during critical growth stages. • Recent epidemiologic studies suggest that the exposures that occurred could possibly result in adverse health effects to children, exposed as a fetus.

ADPH took these factors into consideration during the development of this health consultation.

Conclusions

At the request of the community, ADPH conducted an assessment of the Talladega TCE site in Talladega County, Alabama. For the TTCE site, ADPH reviewed environmental data and information about the community. The purpose of this report is to present an evaluation of existing information, identify any exposure pathways, document potential public health hazards, and recommend ways to protect public health.

Based on this assessment, ADPH has concluded the Grant Street well represented "no apparent public health hazard" in the past. Residents are not at increased risk for noncancerous health effects and have a low increased risk of cancer. Recent epidemiologic studies suggest that exposure to TCE could possibly result in adverse health effects to infants/fetuses; however, these studies involved sites where the concentrations of TCE were detected at levels an order of magnitude greater (or more) than the levels found in the Grant Street well. Currently, the Grant Street Well has been taken out of service. Therefore, no exposure is occurring now. ADPH concludes that no public health hazard currently exists.

Recommendations

Because the levels of PCE and TCE are above EPA's MCLs, it is prudent public health practice to reduce exposures to these contaminants. Therefore, ADPH recommends that the well remain offline until Talladega Water and Sewer Board takes the necessary steps to prevent the contaminants from entering the water supply.

ADEM should serve as the regulatory agency responsible for determining that appropriate corrective measures were implemented and that the water provided to citizens of Talladega meets all relevant criteria.

Outreach and education should be conducted to inform the affected community (business, residential, and government) of the groundwater contamination and to encourage compliance with the recommendations above.

Outreach to individual citizens, facilitated by CORE, should involve detailing of steps to lessen or lighten exposure.

Public Health Action Plan

Actions Completed

ADPH attended meetings conducted by a community group in the City of Talladega and conducted a community survey of all individuals who had expressed an interest or concern about the site.

Actions Planned

ADPH plans to administer an additional survey to discover community concerns and address them through health education.

Preparer of Report

If you have questions or comments after reading this report, please contact:

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References

1. Guthrie Environmental Services, Inc., The Water and Sewer Board of the city of Talladega Wellhead Protection Delineation Report. November 1998

2. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Tetrachloroethylene. Atlanta: U.S. Department of Health and Human Services;1997

3. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Trichloroethylene. Atlanta: U.S. Department of Health and Human Services; 1997

4. Agency for Toxic Substances and Disease Registry. National exposure registry trichloroethylene (TCE) subregistry, baseline technical report. Atlanta: ATSDR, 1993

5. Eco-USA, Tetrachloroethylene; www.eco-usa.net/toxics/pce.shtml

6. Alabama Department of Environmental Management, Water Supply Permit for the Talladega Water and Sewer Board; 1997

7. Agency for Toxic Substances and Disease Registry. Volatile organic compounds in drinking water and adverse pregnancy outcomes, interim report, United States Marine corps Base camp LeJeune, North Carolina.. Atlanta: ATSDR, 1997.

8. Massachusetts Department of Public Health. Woburn childhood leukemia follow-up study. Boston: Bureau of Environmental Health Assessment, Massachusetts Department of Public Health, July 1997.

Table 1
Grant Street Well Results
for Tetrachloroethylene (PCE)

Sample date	sample level (ppb)	Comparison value (ppb)	Reference
4/19/1989	7.30	5.00	MCL
6/21/1989	16.80	5.00	MCL
8/22/1989	7.80	5.00	MCL
12/7/1989	10.30	5.00	MCL
2/5/1990	7.20	5.00	MCL
4/18/1990	6.70	5.00	MCL
11/27/1990	12.20	5.00	MCL
5/27/1991	12.60	5.00	MCL
11/7/1991	20.90	5.00	MCL
11/19/1993	5.30	5.00	MCL
11/14/1994	11.30	5.00	MCL
6/30/1995	6.70	5.00	MCL
8/24/1995	6.70	5.00	MCL
4/23/1996	7.20	5.00	MCL
2/11/1997	36.50	5.00	MCL
5/13/1997	7.30	5.00	MCL
2/19/2000	14.70	5.00	MCL
5/24/2000	12.50	5.00	MCL
12/18/2000	10.30	5.00	MCL
9/11/2001	7.50	5.00	MCL
11/28/2001	12.10	5.00	MCL
2/18/2002	13.10	5.00	MCL
9/3/2002	13.50	5.00	MCL
6/11/2003	10.90	5.00	MCL
6/11/2003	12.00	5.00	MCL
8/6/2003	8.45	5.00	MCL

MCL – Maximum Contaminate Level for Drinking Water

Table 2
Grant Street Well Results
for Trichloroethylene (TCE)

Sample date	Sample level (ppb)	Comparison value (ppb)	Reference
2/11/1997	6.00	5.00	MCL

MCL – Maximum Contaminate Level for Drinking Water

Appendix A

Exposure Dose Calculations and Results for the Talladega TCE site

When chemical concentrations at the site exceed the established comparison values (CVs), it is necessary for a more thorough evaluation of the chemical to be conducted. In order to evaluate the potential for human exposure to contaminants present at the site and potential health effects from site-specific activities, ATSDR estimates human exposure to the site contaminant from different environmental media by calculating exposure doses. A brief discussion of the calculations and assumptions is presented below.

Well Water Pathway (Ingestion, Inhalation, Dermal Contact)

The ATSDR exposure dose formula used for the well water pathway is:

$$ED = \frac{C \times IR \times EF}{1000 \times BW}$$

where:

ED = exposure dose in milligrams per kilogram per day (mg/kg/day)
C = maximum concentration of contaminant in water in parts per billion (ppb or µg/L)
IR = ingestion rate in liters per day (L/day)
EF = exposure factor, days of exposure divided by 365 (unitless)
1000 = conversion factor in micrograms per milligram (ug/mg)
BW = body weight in kilogram (kg)

Assumptions used were based on default values and/or professional judgment. The drinking water ingestion rate for adults was assumed to be 2 L/day and 1 L/day for children. For average body weight, 70 kg and 11 kg was used for adults and children, respectively. The exposure factor was 1 because residents were assumed to be exposed for 365 days per year (365/365). The exposure dose was multiplied by 2 to account for dermal and inhalation exposure during showering or bathing. The doses derived from this calculation, along with the applicable health guideline, are presented in Table A1 below.

Table A1. Adult and Child Exposure Doses Calculated for Residential Wells

Contaminant	Maximum concentration in water (ppb)	Child Dose (mg/kg/day)	Adult Dose (mg/kg/day)	Health Guideline (mg/kg/day) and source
PCE	37	0.007	0.002	0.01 – Chronic Oral RfD
TCE	6.0	0.001	0.0003	0.2 – Acute oral MRL

Excess cancer risk is estimated by multiplying the adult exposure dose by the cancer slope factor. Table A2 below presents the results of this calculation for the contaminants of concern in the Grant Street well. The oral cancer slope factors for TCE and PCE were not available from EPA's Integrated Risk Information System (IRIS) at the time of the writing of this document; therefore, EPA Region 9 Preliminary Remedial Goal (PRG) values were used instead.

Table A2. Excess Cancer Risk Calculations for Residential Wells

Contaminant	Maximum concentration in water (ppb)	Cancer slope factor, 1/ $(mg/kg/day)^{-1}$	Excess cancer risk
PCE	36.5	0.052	1×10^{-4}
TCE	6	0.4	1×10^{-4}

Figure 1: Grant Street Well – Note missing section of pipe.

CERTIFICATION

This Talladega TCE Health Consultation was prepared by the Alabama Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Technical Project Officer, Cooperative Agreement Team, SPAB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

Team Leader, Cooperative Agreement Team, SPAB, DHAC, ATSDR