Public Health Assessment for

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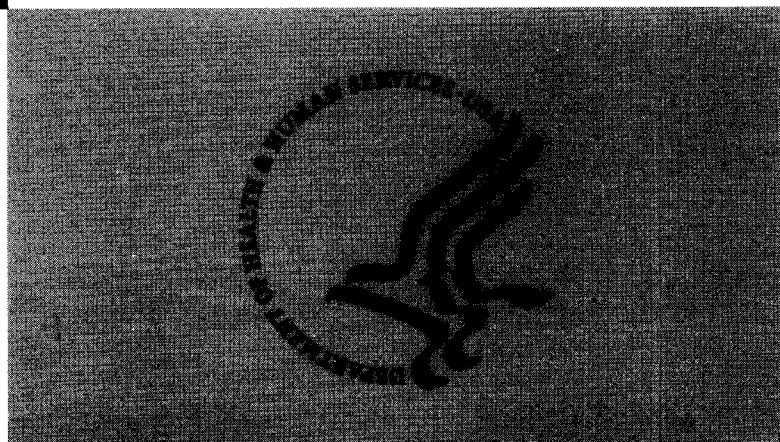
LINEMASTER SWITCH CORPORATION
WOODSTOCK, WINDHAM COUNTY, CONNECTICUT
CERCLIS NO. CTD001153923
SEPTEMBER 7, 1995

U.S. DEPARTMENT OF HEALTH & 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

LINEMASTER SWITCH CORPORATION

WOODSTOCK, WINDHAM COUNTY, CONNECTICUT

CERCLIS NO. CTD001153923

Prepared by

Connecticut Department of Public Health and Addiction Services
Under Cooperative Agreement With
The Agency For Toxic Substances and Disease Registry

FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, is an agency of the U.S. Public Health Service. It was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperataive agreements.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists then evaluate whether or not there will be any harmful effects from these exposures. The report focuses on public health, or the health impact on the community as a whole, rather than on individual risks. Again, ATSDR generally makes use of existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further research studies are needed.

Conclusions: The report presents conclusions about the level of health threat, if any, posed by a site and recommends ways to stop or reduce exposure in its public health action plan. ATSDR is primarily an advisory agency, so usually these reports

identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Interactive Process: The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When infomed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

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SUMMARY

The Linemaster Switch Corporation manufacturing facility is located in Woodstock, Connecticut. The facility has been manufacturing foot switches and other materials since 1952. Trichloroethylene (TCE[1]) was used as a degreaser for approximately 10 years, from 1969 to 1979. There is evidence suggesting spent TCE and paint solvents were released into an on-site dry well.

Based primarily on the human health risks resulting from past exposure to hazardous substances in the ground water, the Agency for Toxic Substances and Disease Registry (ATSDR) and the Connecticut Department of Public Health and Addiction Services (CT DPHAS) have concluded that the site is a Public Health Hazard. Residents in the area received exposures to site-related compounds from private drinking water wells for an undetermined amount of time.

Private residential wells were identified in 1986 as being contaminated with volatile organic compounds (VOCs). Three on-site wells including the Bald Hill Restaurant, and three off-site private wells including the Tarr Apartments, Town Hall, and the Fire Department wells were identified as contaminated in 1986 and 1987. Bottled water was initially provided to all those residences whose wells had been contaminated with site related compounds and granulated activated carbon (GAC) filters were later installed. The wells are monitored by Fuss & O'Neill for Linemaster Switch Corporation. The GAC filters are maintained under the direction of the Linemaster Switch Corporation.

Another source of ground water well contamination in the area not related to the Linemaster Switch Corporation National Priorities List (NPL) site is the Woodstock Public School site. Between 1991 and 1992, benzene, methyl tert butyl ether (MTBE), and other components of gasoline were found in eight private residential wells. The residences were initially provided with bottled water and subsequently with GAC filters.

Naturally occurring arsenic (also not related to the Linemaster site) has also been identified in over twenty wells in the area above comparison values. Residents in Woodstock should consider testing their wells for arsenic and consider treating their water if arsenic levels are found above health and regulatory standards.

The principal community concerns include the potential health effects from exposures to drinking water containing site related contaminants and naturally occurring arsenic.

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[1]Please refer to Appendix D for a list of acronyms used in this document.

The Connecticut Department of Environmental Protection (CT DEP) and the CT DPHAS have developed a Public Health Action Plan. As part of the action plan, the CT DEP and the CT DPHAS will continue to review monitoring reports from those private wells identified as contaminated from the Linemaster Switch and the Woodstock Public School sites.

The CT DPHAS will provide environmental health education for local public health officials, the local medical community, and the local citizens to assist the community in assessing possible adverse health outcomes associated with exposures to toxic substances. The CT DPHAS will attempt to coordinate a well survey of the Town of Woodstock to investigate the extent of naturally occurring arsenic contamination in the private wells.

BACKGROUND

In cooperation with the ATSDR, the CT DPHAS evaluated the public health significance of the Linemaster Switch Corporation site. The purpose of the public health assessment is to determine whether adverse health effects are possible and to recommend actions to reduce or prevent possible health effects.

A. SITE DESCRIPTION AND HISTORY

Linemaster Switch Corporation is located on Plaine Hill Road in Woodstock, Connecticut, Windham County, on a hill originally called Bald Hill. The 92-acre site is bounded by Plaine Hill Road, State Route 171, and State Route 169 (see Figure 1 in Appendix A). The site includes one 45-acre parcel that is used by the Linemaster Switch Corporation and one 45-acre parcel where the owner of the company resides. The owner's residence is 500 feet north of the manufacturing building. The Linemaster manufacturing facility is located near the center of the site. Located on-site in the southeast corner of the property are the Bald Hill Restaurant, a small cottage, and a private home (see Figure 2-1 in Appendix C1).

The facility manufactures electrical and pneumatic foot switches and wiring harnesses. Approximately 150 people are employed at Linemaster Switch Corporation.

Linemaster Switch Corporation began manufacturing operations in 1952 in the carriage house of an estate, later replaced by the present factory building. TCE, paint thinner, and other chemicals were used in the manufacturing process. TCE was used in a vapor degreaser apparatus beginning in 1969. The quantity of paint thinner used and disposed of is unknown. The estimated quantity of TCE used between 1969 and 1979 was approximately 100 to 600 gallons per year (7). Of this amount, approximately 20 to 200 gallons per year were disposed of on-site (7). Originally, solid paint waste was disposed of at the Woodstock Town Landfill. In 1980, the CT DEP conducted a Resource Conservation and Recovery Act (RCRA) inspection at the site, which found that on-site disposal of dried paint solids had occurred. The CT DEP concluded, among other things, that dried paint waste most likely was disposed of either on-site, taken to the Woodstock Town Landfill, or both, for approximately 20 to 30 years.

The U.S. Environmental Protection Agency (EPA) conducted site inspections in 1985 and 1986. Sampling from on-site and off-site private wells indicated the presence of VOCs, primarily TCE. Based on these results, bottled water was provided to the facility, one on-site residence, and several nearby off-site residences. Since that time, three on-site wells, the Woodstock Town Hall well, and three residential wells have been equipped with filter systems.

On April 8, 1986, an abatement order was issued by the CT DEP to Linemaster Switch requiring the company to conduct a hydrogeologic study for the area (1). In 1987, a Consent Order was signed by the EPA and Linemaster Switch Corporation instructing the company to "conduct a hydrogeological investigation, develop and evaluate removal actions to abate the contamination, provide an on-site and off-site ground water monitoring program, and provide alternative water supplies for certain drinking water sources." In 1989, an air stripping tower and carbon polishing filter were installed to remove VOCs from the on-site well water supply. This tower and filter are located in the southern portion of the factory building. In 1992, a groundwater collection and treatment system, (the Interim Removal Treatment System (IRTS)) was installed to prevent the migration of VOCs off-site. Contaminated groundwater is pumped from six bedrock extraction wells to the treatment system which consists of an air stripper and carbon polishing filters. The treatment system is located in a small building to the east of the manufacturing building. Since initiation of the IRTS, approximately 448 pounds of VOCs (407 pounds of TCE) have been removed from the groundwater (35).

The site was proposed for inclusion on the National Priorities List (NPL) on June 24, 1988. The site was listed on the NPL on February 21, 1990.

In 1986, the ATSDR provided a health consultation to the EPA regarding the public health significance of ground water, surface water, and soil sampling data. On the basis of the data available at the time, the ATSDR concluded the levels of VOCs in ground water represented an imminent and appreciable public health threat and measures should be taken to reduce that threat (2).

In 1990, a preliminary health assessment was performed by the ATSDR which concluded that although there were indications that human exposure to on-site and off-site contaminants may have occurred in the past, the site would not be considered for follow-up health activities at that time because there was no evidence of current exposure and no ability to ascertain past exposures to TCE (2).

Another source of ground water contamination not related to the Linemaster site was identified by the CT DEP. An investigation in September of 1991, by the CT DEP detected gasoline in the soil and ground water at the Woodstock Public School property. Subsequent sampling of residential wells south of the school detected several gasoline constituents including: benzene, toluene, ethyl benzene, xylene, and MTBE. These residents were initially provided with bottled water by the CT DEP and later with GAC filters. The Woodstock Public School was also equipped with a GAC filter. The CT DEP determined that the source of the contamination was two leaking underground storage tanks that had been removed from the Woodstock Public School property (5).

B1. Actions Planned During the Health Assessment Process

In response to community concerns, a Public Health Action Plan was developed. As part of the action plan, the CT DEP and the CT DPHAS will continue to review monitoring reports from those private wells identified as contaminated from the Linemaster Switch and the Woodstock Public School sites. In addition, the CT DPHAS will provide environmental health education for local public health officials, the local medical community and to the local citizens to assist the community in assessing possible adverse health outcomes associated with exposures to toxic substances. The CT DPHAS is also planning to coordinate a well survey of the Town of Woodstock to investigate the extent of arsenic contamination in the private wells.

B2. Actions Implemented During the Health Assessment Process

The public health actions that were implemented by the CT DPHAS are as follows:

1. Site specific information regarding possible adverse health outcomes associated with exposures to toxic substances was distributed to community residents around the Linemaster Switch Site.

2. The ATSDR has reviewed health statistics provided by the CTDPHAS. ATSDR has concluded that a further health statistics review is not indicated.

C. SITE VISIT

Edith Pestana and Kenny Foscue of the CT DPHAS and staff from the CT DEP conducted a site visit on Tuesday, March 30, 1993. During the site visit the CT DPHAS representatives met with the project manager at the Linemaster Switch Corporation, and Fuss & O'Neill, developers of the Remedial Investigation/Feasibility Study (RI/FS) for the Linemaster site. A tour of the Linemaster site was conducted, including visits to the manufacturing facility, the adjacent site buildings, and the area near ponds number two and number three.

During the inspection of the site, the following observations were made. These observations are not presented in order of significance or importance.

- The Linemaster manufacturing facility and office building are located atop a wooded hill. Access to the site is limited by a perimeter fence. Visitors to the site are required to sign in and out.

- The manufacturing operation appeared very clean. The plant has converted its metal degreasing operation from solvent-based cleaning to a system employing an ultrasound wash tank

with a water-based detergent. The painting operation has switched from solvent-based to water-based paint for spraying parts.

- The area around the contaminated dry well was covered with soil[2].
- The ground water treatment system (an air stripper and carbon absorption system) is located in a small building east of the manufacturing facility.
- A drainage ditch runs along the access road to Ponds number two and number three.
- Three piles of soil covered with plastic tarps were observed near Pond number two. According to Fuss and O'Neill, this soil was contaminated and had been excavated and moved from the Zone number one area around the dry well.
- A structure housing three above-ground 550 gallon fuel tanks (one diesel and two gasoline) was observed near the facility.
- The new and old leaching fields for the private residence on-site were observed downhill to the east of the manufacturing facility.

D. DEMOGRAPHICS, LAND USE, AND NATURAL RESOURCE USE

The town of Woodstock, CT has a population of approximately 6,000 people based on the 1990 Census (6). Ninety-nine percent of the population is white. Eight percent of the population is under the age of six. Seventeen percent of the population is between the ages of six and nineteen. Fifty-six percent of the population is between the ages of twenty and fifty-nine. Seventeen percent of the population is over the age of fifty-nine. The per capita income for the town of Woodstock is 18,649 dollars per year.

Approximately fifty homes and two apartment buildings are located within a one-half mile radius of the site. The closest residents are located approximately 25 feet from the north property boundary (7). A review of deed information in the Woodstock Town

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[2] After the site visit, the US EPA provided the following verbatim: In June 1989, pursuant to a CT DEP Abatement Order, Linemaster removed the dry well. At that time, approximately, 1,000 gallons of hazardous liquid were removed from the well and disposed at a licensed hazardous waste storage facility. After the Removal Action, Linemaster filled the area with clean soils, placed a plastic barrier over the soils in the Zone 1 area, and have spread bark mulch over the area (36).

Hall indicated that the majority of these homes were built and occupied during the time period of potential exposure (1969 to 1988). There are fifty-one private residential drinking water wells located at the periphery of the site, used by approximately 130 people. Approximately 2,888 people are served by ground water from both bedrock and overburden wells within three miles of the site (1) (see Appendix A).

The Woodstock Public School, with an enrollment of 835 students, is approximately 1,800 feet from the Linemaster facility. The school has a drinking water well.

An outdoor running track is located to the north approximately 1,400 feet from the site.

Surface water streams in the vicinity of the site generally flow east or northeasterly into Roseland Lake, approximately 0.75 miles east of the site area. Roseland lake drains into the Little River, which flows south to the Quinebaug River in Putnam. The nearest surface-water bodies off-site are: an easterly flowing unnamed stream located approximately 2,000 feet to the north, an unnamed stream west of the site that flows southerly, and Mill Brook, which flows easterly parallel to Route 171.

Four ponds; Northeast Pond, Pond 1, Pond 2, Pond 3, and one unnamed stream are located in the eastern section of the site. Pond 2 has no surface-water inlet and drains south by a small stream that empties into wetlands (located 1,000 feet to the south of the site), adjacent to the Mill Brook (21). Pond 3 discharges into the unnamed stream just north of Pond 1. The unnamed stream originates at Northeast Pond, enters and exits Pond 1 and eventually discharges into Mill Brook southwest of the site.

There are two aquifers under the site, the overburden and the bedrock (2). Linemaster and one on-site residence obtain water from one on-site production well (GW-08db). The water is treated by air-stripping and carbon filtration to remove VOCs. Two other on-site residences and the restaurant obtain water from another well (GW-09db).

There are monitoring programs for the Interim Removal Treatment System wells, on-site monitoring wells, and on-site and off-site domestic water supply wells. Forty six domestic supply wells are monitored; five wells are monitored bi-monthly, twenty wells are monitored quarterly, nineteen wells are monitored semi-annually, and two wells are monitored annually.

Currently there are no municipal water or sewer utilities in the area. The Town of Woodstock plans to install sewer service along Routes 169 and 171, just outside the eastern and southern boundaries of the Linemaster property. Construction is expected to begin by the summer of 1995.

E. HEALTH OUTCOME DATA

Based on our review of the environmental data and the toxicologic implications associated with the identified completed exposures pathways, the CT DPHAS has gathered data from the CT Tumor Registry specifically for the Town of Woodstock for evaluation. This health statistics review of existing data has been evaluated. The findings are reported in the Health Outcome Data Evaluation Section.

COMMUNITY HEALTH CONCERNS

Concerns from citizens were compiled by reviewing historical records and documented complaints at a number of agencies. The CT DEP Water, Solid Waste, and Superfund files were reviewed. In addition, local and state health officials were contacted. The concerns of the citizens were also gathered from the EPA public informational meeting held April 14, 1993, at the Woodstock Town Hall. This EPA meeting had an attendance of approximately 40 people. As part of the Health Assessment process, an availability session for local residents to express their concerns was conducted at the Woodstock Town Hall on April 27, 1993 (see the CT DPHAS notice in Appendix B). A total of six residents attended the availability session. The community concerns include:

1. Does itching skin after bathing indicate that the well is contaminated or has been re-contaminated?

2. Could dizziness, fainting, and a feeling of weakness be related to exposures connected with the Linemaster Switch site?

3. Is it safe for farm animals such as cattle to drink water contaminated by the Linemaster Switch or the water that was contaminated by the Woodstock School leaking fuel tank?

4. Are the levels of arsenic in some wells safe? What are the health effects of arsenic in drinking water?

5. Could Grave's disease result from exposures to the contaminants found in the drinking water?

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The majority of the sampling that was performed at the Linemaster Switch site was included in the 1987 report from the NUS Corporation Field Investigation Team (1), and the 1992 Fuss and O'Neill Inc., Draft Remedial Investigation and Feasibility Study

(4,7). During site investigations, ground water, private wells, soil, surface water, and air sampling were conducted.

The following discussion and data tables present the contaminants of concern. Contaminants are presented by the media (soil, ground water, air, and etc.) in which they were found. The contamination is also divided into on-site and off-site. On-site refers to sampling points within the boundaries of the Linemaster Switch property and off-site refers to sampling points not within these boundaries.

These contaminants will be evaluated in subsequent sections of this public health assessment to determine whether exposures to them has public health significance. These contaminants were selected based upon the following factors:

1. Concentrations of contaminants on-site and off-site.

2. Field data quality, laboratory data quality, and sample design.

3. Comparison of on-site and off-site concentrations with health assessment comparison values for non-carcinogenic and carcinogenic end points.

4. Community health concerns.

The listing of a contaminant does not mean that it will cause adverse health effects from exposure. The list indicates which contaminants will be discussed further in the public health assessment.

Comparison values for health assessments are contaminant concentrations in specific media that are used to select contaminants for further evaluation. These values include Environmental Media Evaluation Guides (EMEGs), Cancer Risk Evaluation Guides (CREGs), and other relevant guidelines. EMEGs are calculated from Minimal Risk Levels (MRLs). An MRL is an estimate of daily human exposure to a chemical that is likely to be without appreciable risk of an adverse, non-carcinogenic risk. CREGs are estimated contaminant concentrations based on one excess cancer in a million people similarly exposed over a lifetime. Reference Dose Media Evaluation Guides (RMEGs) are used when EMEGs or CREGs are not available for a specific medium. RMEGs are calculated from the EPA Reference Dose (RfD) which are estimates of the daily exposure to a contaminant that is unlikely to cause adverse health effects. A concentration is calculated from RfDs making certain assumptions about human intake of water or ambient air. Maximum Contaminant Levels (MCLs) represent concentrations that the EPA deems protective of public health (considering the availability and economics of water treatment technology) over a 70 year period of

exposure drinking two liters of water per day. A Lifetime Health Advisory (LTHA) is a concentration the EPA has determined to be protective of public health over a lifetime at an exposure rate of two liters of water per day.

A. ON-SITE CONTAMINATION

Preliminary investigations at the site located four potential contaminant source areas; Zone 1, the area of the former dry well and former paint settling booth; Zone 2, the former facility wastewater disposal system; Zone 3, the residential leaching field of the former site owner, and Zone 4, the paint shed area (4). The Zone 1 area east of the facility building was considered a potential source area because it contains the dry well where waste solvents were disposed of from 1969 to 1979. Zone 2 contains the facility wastewater disposal system which was suspected as a potential source area since water obtained from the facility's contaminated production well was discharged into the system. Zone 3 contains the owner's contaminated private water supply well which discharged into this resident's leaching field. Zone 4 contains the paint shed which was used to store solvents and other manufacturing chemicals, this area also was considered a potential source.

The contamination identified in these 4 areas are discussed in this section by medium.

Ground Water

Ground water occurs in unconsolidated overburden till and in shallow bedrock and deep bedrock formations. Ground water flows radially outward in till and shallow bedrock units from the central topographic high where the facility is located.

Ground water flow in the deep bedrock is partially radial and is controlled by fractures and supply-well pumping. Ground water migrates vertically downward from the unconsolidated overburden to the bedrock in the central area of the site. Ground water also migrates vertically upward from the bedrock to the overburden along the site boundaries.

Ground water monitoring data indicate VOCs are present at the highest concentrations in the Zone 1 area and are migrating primarily to the east-northeast in the overburden and bedrock formations.

Metals have been detected in ground water samples and some may be naturally-occurring in the overburden and bedrock formations.

Ground Water Monitoring Wells

Forty-six monitoring wells were installed in till, shallow bedrock, and deep bedrock in 1987, 1989, 1991, and 1992 by the RI/FS

consultants (4,7). Ground water samples were collected from monitoring wells by Fuss and O'Neill, in September and October of 1987 and February of 1988 prior to the RI/FS. Additional ground water sampling rounds were conducted in July of 1990 and December of 1990, June and August of 1991 and January and April of 1992, as part of Phase 1 and 2 of the RI/FS. The round 1 sampling of Phase 3, conducted in June, July, and August of 1991, included sampling from: till, shallow bedrock, and deep bedrock wells.

In June of 1992, the Interim Removal Treatment System (IRTS) was initiated for the purpose of recovering and treating VOC contaminated ground water. After six months of operation of the IRTS, the levels of VOCs decreased in seven deep bedrock monitoring wells on-site. However, when the data (through December of 1992) was evaluated, the levels of VOCs in till and shallow bedrock wells had remained relatively unchanged after six months of operation of the IRTS.

Table 1 lists the contaminants detected during these sampling events above comparison values (4,7).

TABLE 1
GROUND WATER CONTAMINATION IN ON-SITE MONITORING WELLS(4,7)
(PRE-REMEDIAL LEVELS)

CONTAMINANT	CONCENTRATION RANGE ppb	COMPARISON VALUE ppb	SOURCE
1,1,1-Trichloroethane	ND - 300	200	LTHA
1,1,2-Trichloroethane	ND - 23	0.6	CREG
1,1-Dichloroethylene	ND - 280	0.06	CREG
1,2-Dichloroethane	ND - 7.8	0.4	CREG
Acetone	ND - 50,000	4,000	RMEG
Arsenic	ND - 399	0.02	CREG
Benzene	ND - 54	1	CREG
Beryllium	ND - 87	0.008	CREG
Cadmium	ND - 757	20	EMEG
Carbon tetrachloride	ND - 14	0.3	CREG
Chloromethane	ND - 67	3	LTHA
cis-1,2-Dichloroethylene	ND - 26,000	70	LTHA
Hexachlorobutadiene	ND - 250	0.4	CREG
Methyl ethyl ketone	ND - 38,000	20,000	RMEG
Methylene chloride	ND - 5.9	5	CREG
Nickel	ND - 6,000	100	LTHA
Tetrachloroethylene	ND - 720	0.7	CREG
Toluene	ND - 64,000	1,000	LTHA
Trichloroethylene	ND - 800,000	3	CREG

CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
LTHA - Lifetime Health Advisory
ND - none detected
ppb - parts per billion
RMEG - Reference Dose Media Evaluation Guide

Ground Water - Private Non-Potable Wells

There are seven water supply wells located on the Linemaster Switch Property. Three are used for drinking and are discussed in the next section. The four other wells are used for production and landscaping. The wells used for landscaping, production etc., are monitored quarterly (March, June, September, and December). VOCs were detected in four private, non potable water wells on-site. These include: the facility's backup well and leaching field landscaping well, the Bald Hill Restaurant's landscaping well, and a well located in a private home used to supply water to two swimming pools. The Linemaster Switch backup production well had the highest levels of VOCs detected above comparison values. Concentrations of TCE have ranged from 5,100 ppb to 59,000 ppb. In addition, sampling in 1986 detected naturally occurring arsenic and lead concentrations above comparison values in the Linemaster Switch backup well.

After four months of the initiation of the IRTS, the levels of VOCs had decreased in the facility backup well from 2,601 ppb

(prior to the initiation) to 464 ppb. The VOC levels in the other deep bedrock private wells on-site (*e.g.* GW-08db and GW-12db; see Figures 2-1 and 2-2 in Appendix C) did not change. Table 2 lists the contaminants detected in on-site non-potable water wells above comparison values.

TABLE 2
ON-SITE PRIVATE NON-POTABLE WATER WELLS (4,7)

CONTAMINANT	CONCENTRATION RANGE ppb	COMPARISON VALUE ppb	SOURCE
1,1,2-Trichloroethane	ND - 3.3	0.6	CREG
1,1-Dichloroethylene	ND - 61	0.06	CREG
1,2-Dichloroethane	ND - 2.8	0.4	CREG
Arsenic	ND - 513	0.02	CREG
Benzene	ND - 3.5	1	CREG
Bromodichloromethane	ND - 2.6	0.6	CREG
Carbon tetrachloride	ND - 3.5	0.3	CREG
Chloroform	ND - 30.7	6	CREG
Chromium(VI)*	ND - 189	100	LTHA
cis-1,2-Dichloroethylene	ND - 15,000	70	LTHA
Lead	ND - 16.3	0	MCLG
Manganese	ND - 1,978	200	RMEG
Methylene chloride	ND - 24	5	CREG
Tetrachloroethylene	ND - 100	0.7	CREG
Toluene	ND - 2,100	1,000	LTHA
trans-1,2-Dichloroethylene	ND - 10,177	100	LTHA
Trichloroethylene	ND - 59,000	3	CREG
Vinyl chloride	ND - 10	0.7	EMEG

CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
LTHA - Lifetime Health Advisory
MCLG - Maximum Contaminant Level Goal
ND - none detected
ppb - parts per billion
RMEG - Reference Dose Media Evaluation Guide

Groundwater - Private Potable Wells

There are three drinking water supply wells located on the Linemaster Switch Property. These include two private residential wells and one well located at the Bald Hill Restaurant. TCE concentrations were detected above comparison values in all three of these wells. One residence received their water from GW-12 only until 1992 when the IRTS was initiated. Currently, that residence shares a treated water-supply well with the manufacturing facility (GW-08).

* When the data presented in the RI/FS did not specify whether chromium was either form (III) or form (VI), the most toxic form (VI) was assumed.

The sampling of 1986 also detected arsenic concentrations above comparison values in one private residential well located on-site. Arsenic occurs naturally in the soils and bedrock in the area.

The drinking water wells are monitored bi-monthly (February, April, June, August, October, and December). As noted earlier, these wells have GAC filters. Table 3 lists the contaminants detected, at levels above comparison values, during these sampling events and prior the installation of GAC filters. The concentration of TCE (10,327) was detected in a supply well (GW-12) that is not currently being used.

TABLE 3
ON-SITE PRIVATE DRINKING WATER WELLS (4,7)

CONTAMINATION	CONCENTRATION RANGE ppb	COMPARISON VALUE ppb	SOURCE
1,1-Dichloroethylene	ND - 29	0.06	CREG
1,2-Dichloroethane	ND - 1.3	0.4	CREG
Arsenic	ND - 288	0.02	CREG
Bromodichloromethane	ND - 5.1	0.6	CREG
Bromoform	ND - 889	4	CREG
Cadmium	ND - 30	20	EMEG
Chloroform	ND - 15.8	6	CREG
Chromium(VI)	ND - 625	100	LTHA
cis-1,2-Dichloroethylene	ND - 670	70	LTHA
Lead	ND - 87.3	0	MCLG
Manganese	ND - 530	200	RMEG
Nickel	ND - 367	100	LTHA
Tetrachloroethylene	ND - 430	0.7	CREG
trans-1,2-Dichloroethylene	ND - 3,558	100	LTHA
Trichloroethylene	ND - 10,327	3	CREG
Vinyl chloride	ND - 0.89	0.7	EMEG

CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
LTHA - Lifetime Health Advisory
MCLG - Maximum Contaminant Level Goal
ND - none detected
ppb - Parts Per Billion
RMEG - Reference Dose Media Evaluation Guide

Subsurface Soil Gas

Soil gas screening surveys were conducted in June of 1987 and December of 1991, at the site. This type of investigation can help identify whether volatile compounds are present beneath the surface. There were four areas of concern which were selected: Zones 1, 2, 3, and 4.

The results of these surveys indicate that VOCs were present in the soil gas in the vicinity of the paint booth, and the former dry well area. TCE was only detected in one gas sample from the private residence's leaching field.

The soil gas screening surveys consisted of field measurements for total VOCs and sampling of vapors for laboratory analysis. Soil gas samples were collected by driving a hollow probe 2 to 3 feet into the subsurface. The field measurements and laboratory samples were taken in soil borings at depths of 0 to 30 feet.

At depths of 0 to 30 feet, VOC gases were detected in Zones 1, 2, 3, and 4. At depths of 0 to 5 feet, Zone 1 had the highest field gas readings ranging from 0 to 71,000 ppb. The highest of these gas readings were found along the east side of the manufacturing building, in the dry well area, and areas directly east of the dry well area. VOC readings detected at depths of 5 to 15 feet ranged from none detected to 210,000 ppb, with the highest gas measurements in the dry well area. At depths of 15 to 30 feet, the highest field gas measurements were 51,590 ppb.

The most common VOC gas detected by laboratory analyses was TCE. It was detected in 67 of 106 samples collected, and all four Zones. Toluene and xylene were found in Zones 1, 2, and 4. Soil gas samples collected beneath the manufacturing building had TCE concentrations ranging from none detected (at 9 to 10 feet) to 5,400 ppb (at 19 to 20 feet). Tetrachloroethylene (PCE) was the second most common VOC detected and was present in a total of five samples collected from Zone 1. In general the highest concentrations were detected in the dry well area. It appears that VOCs have moved under the building toward the northwest, possibly due to ground water transport (4,7). No VOCs were detected on the west side of the manufacturing building, or west of Zone 1.

TABLE 4
LABORATORY SOIL GAS RESULTS(4,7)

CONTAMINANT	CONCENTRATION RANGE (ppb)
Acetone	ND - 12,000
1,1-Dichloroethane	ND - 3,900
Cis-1,2-dichloroethylene	ND - 1,800
1,1-Dichloroethylene	ND - 92
Ethyl benzene	ND - 7,000
Methyl ethyl ketone	ND - 12,000
Methyl isobutyl ketone	ND - 2,600
Tetrachloroethylene	ND - 2,800
Toluene	ND - 16,000
1,1,1-Trichloroethane	ND - 1,000
Trichloroethylene	ND - 210,000
Xylene	ND - 52,000

ND - None detected
ppb - Parts per billion

Subsurface Soil

Approximately 100 soil samples were collected by Fuss & O'Neill between 1987 and 1992 and analyzed for VOCs, semivolatile organic compounds (SVOCs), and metals (4,7). The samples were taken at depths ranging from 0 to 47 feet. VOCs were detected in soils taken from Zones 1, 2, and 4. The highest concentrations of VOCs were found in soils at Zone 1 indicating this zone as the primary source area for contamination at the site. TCE was detected in 13 out of 41 samples at a minimum depth of 1 to 2 feet and a maximum depth of 15 to 16 feet. Other VOCs detected are PCE, toluene, and xylene at depths of 3 to 15 feet.

There were no VOCs detected in soil samples collected in Zone 3.

In general, the highest VOC concentrations were detected in samples collected from below the water table in the area adjacent to the former dry well location (Zone 1). The lowest VOC concentrations were detected in the soil samples taken on the western side of the manufacturing facility. The soil investigation indicates that the contaminants are migrating underneath the building in Zone 1.

Arsenic and cadmium were detected in Zone 1, (in the vicinity of the former dry well) and in Zone 2, (at the brick dry well area). Table 5 lists the contaminants detected during these sampling events above comparison values.

TABLE 5
SOIL CONTAMINATION (4,7)

CONTAMINANT	CONCENTRATION RANGE ppm	COMPARISON VALUE ppm	SOURCE
Arsenic	ND - 38.1	0.4	CREG
Beryllium	ND - 1.3	0.2	CREG
Cadmium	ND - 40.3	40	EMEG-C
Manganese	ND - 637	300	RMEG-C
Trichloroethylene	ND - 210	60	CREG

CREG - Cancer Risk Evaluation Guide
ND - None detected
ppm - parts per million
EMEG-C - Environmental Media Evaluation Guide for Children
RMEG-C - Reference Dose Media Evaluation Guide for Children

Sewage Sludge

Sludge samples were collected from the sewage settling tank, and from a trench in the vicinity of the sewage holding tanks in Zone 2, and the area in the vicinity of the brick dry well. The brick dry well was sampled because this area received most of the facility sewage. Low levels of VOCs were found in the sludge samples collected from the trench area. TCE was the primary compound found. It is believed that this contamination resulted from ground-water transport.

Surface Water

In December of 1985, February of 1986, and March of 1987, NUS collected 9 surface water samples from 6 locations on-site. These sampling locations were at a wetland area at the northwest corner of the site, Pond 1, Pond 2, Pond 3, and from an unnamed stream located along the southeastern property boundary which crosses Route 171. In July of 1990, Fuss & O'Neill collected 8 surface water samples from these same water bodies. Surface water samples were collected from Pond 3 in December of 1990, March of 1991, April of 1991, June of 1991, and May of 1992 (7).

Arsenic and TCE were detected in Pond 1 at 1.8 ppb and 6.7 ppb respectively. There was no TCE detected in Pond 2, but Arsenic was detected at 1.6 ppb, and chloroform was detected at an estimated value of 2 ppb. Arsenic and TCE were detected in Pond 3 at 3.7 ppb and 10 ppb respectively.

Sediment

In December of 1985, and February of 1986, NUS/FIT collected sediment samples. The samples were obtained from the wetland area at the northwest corner of the site, Pond 1, Pond 2, Pond 3, and from an unnamed stream located along the southeastern property

boundary. This stream crosses Route 171. No contaminants were detected above health comparison values (1).

Indoor Air

According to the NUS/FIT 1987 report, the Occupational Safety and Health Administration (OSHA) performed air monitoring inside the factory building near the painting booths and the TCE vapor degreaser. No contaminants were detected in the breathing zone.

Ambient Air

No ambient air sampling was performed during the RI/FS. However, as part of the RI/FS, Fuss and O'Neill performed Air Dispersion Modeling starting with the meteorologic year of 1972 to present. The model is an estimate of potential contaminant concentrations from exposure points. The point sources modeled in this study fall into three categories: a point source consisting of an ongoing manufacturing process producing air emission, a point source from the exhaust of the existing air stripping column that treats contaminated ground water, and the emissions from a contaminated soil source located in Zone 1. The model was used to predict potential ground-level concentrations of TCE on an annual basis. The maximum ground-level concentrations predicted for TCE along the property boundary are above health comparison values.

However, the results of the modeling are not based on actual ambient air sampling data but extrapolations and interpretations of data from other media (soil and ground water). Thus, the reader should recognize that models contain assumptions that influence the validity of the predictions derived from this model. The ATSDR policy states that modeling cannot serve as proxy for actual measurement of existing conditions when determining public health implications. Table 6 lists the range of contaminant concentrations derived from the ambient air model.

Table 6
Range of Contaminant Concentration of Modeled Ambient Air(4,7)

CONTAMINANT	CONCENTRATION RANGE (ug/m^3)	COMPARISON VALUE (ug/m^3)	SOURCE
Trichlorethylene	0.10-1.31	0.6	CREG

ug/m^3 - microgram per cubic meter
CREG - Cancer Risk Evaluation Guide

B. OFF-SITE CONTAMINATION

Ground Water - Private Wells

There are 51 private residential drinking water wells located along the periphery of the site that supply water to approximately 130 people (see Figures 2-1 and 2-2 in Appendix C).

In December of 1985, and February and June of 1986, NUS sampled a total of 13 off-site residential wells to assess what wells may have been impacted by contaminants migrating off-site. These wells are located northeast on Route 169 and southeast on Route 171. The initial two rounds of sampling detected TCE above comparison values in three private residential wells, and at the Woodstock Town Hall drinking water well.

As part of the RI/FS (4,7) 26 off-site residential wells have been tested by Fuss and O'Neill. A total of fourteen wells located north and south of the site have been found to contain TCE.

There is another source of private drinking water well contamination in the area not related to the Linemaster Switch site. Eight wells located along Frog Pond Road and Wainwright Drive have been contaminated with benzene and MTBE above comparison values from a leaking underground fuel storage tank located at the Woodstock Public School. In 1993, TCE was detected in three of the eight wells. The wells are located approximately 400 feet northeast of the Linemaster Switch property boundary. All the wells that have been identified as contaminated were initially provided with bottled water and subsequently with granulated activated carbon filters.

During sampling conducted in July of 1990, concentrations of arsenic were detected above health comparison values in private drinking water wells GW-21 and GW-34db. In January of 1993, a third private well GW-69db (see Figures 2-1 and 2-2 in Appendix C), had arsenic detected at levels above health comparison values. Because this well is not contaminated with site-related compounds, a filter system has not been provided for them. Although the residents treat their water with a water softener to lower the arsenic levels, the arsenic levels after treatment are still above comparison values. As noted above, these arsenic levels are not related to Linemaster Switch, but are naturally occurring.

Table 7 lists those contaminants detected in off-site private wells above comparison values (prior to treatment).

TABLE 7
OFF-SITE GROUND WATER CONTAMINATION IN PRIVATE WELLS(4,7,25)

CONTAMINANT	CONCENTRATION RANGE ppb	COMPARISON VALUE ppb	SOURCE
1,1,2,2-Tetrachloroethane	ND - 2.1	0.2	CREG
1,1-Dichloroethylene	ND - 0.35	0.06	CREG
Arsenic	ND - 57.3	0.02	CREG
Benzene	ND - 250	1	CREG
Chloroform	ND - 111	6	CREG
Lead	ND - 19.8	0	MCLG
Methyl tert butyl ether	ND - 250	40	LTHA
Tetrachloroethylene	ND - 7.8	0.7	CREG
Trichloroethylene	ND - 220	3	CREG

CREG - Cancer Risk Evaluation Guide
LTHA - Lifetime Health Advisory
MCLG - Maximum Contaminant Level Goal
ND - none detected
ppb - parts per billion

After six months of the initiation of the IRTS, the TCE levels at GW-06db, GW-09db, GW-53, GW-55 and GW-57 were reduced to below 5 ppb.

C. QUALITY ASSURANCE AND QUALITY CONTROL

There are two consulting firms that have conducted analyses of soil, ground water, surface water, and sewage leachate (1,4,7). The Quality Assurance-Quality Control (QA-QC) procedures used by these consultants were not evaluated by the CT DPHAS. The QA/AC summary procedures were not obtained from the EPA in the RI/FS data. Therefore, the conclusions drawn for this health assessment are determined by the availability and reliability of the referenced information and it is assumed that adequate quality assurance and quality control measures were followed with regard to chain of custody, laboratory procedures, and data reporting.

D. TOXIC RELEASE INVENTORY

To identify possible facilities that could contribute to contamination near the site, Toxic Release Inventory (TRI) was searched for the years: 1987, 1988, 1989, 1990, and 1991. The TRI contains information on total releases of chemicals from certain industries. There were no releases reported in Woodstock, CT, for the years 1987, 1988, 1989, 1990, or 1991.

E. PHYSICAL AND OTHER HAZARDS

No physical or other hazards were identified during the site visit or data investigation.

PATHWAYS ANALYSES

To determine whether nearby residents have been or are being exposed to contaminants migrating from the site, the CT DPHAS and the ATSDR evaluate the environmental and human exposure and an exposed population. The pathway analysis consists of five elements: a source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and an exposed population. The exposure pathways discussed here are ground water and soil. The ATSDR categorizes exposure pathways as either completed or potential pathways. For an exposure pathway to be completed all five elements of the pathway must be present. Potential pathways are those where there is not sufficient evidence to show that all the elements are present now, could be present in the future, or were present in the past.

A. COMPLETED EXPOSURE PATHWAYS

People on-site and off-site who drank or used water from contaminated wells were exposed to volatile organic compounds and metals. These exposures ceased after bottled water was provided and water filtration units were installed. Table 8 depicts the location, type of property and estimated number of persons exposed to PCE or TCE above the comparison values.

Table 8
ESTIMATED NUMBER OF PERSONS EXPOSED TO DRINKING WATER CONTAMINATED WITH PCE ABOVE 0.7 OR TCE ABOVE 3.0

Location	Type of property	Estimated number of persons at one point in time
On-site	1 Residence	5
On-site	Linemaster Switch	210 Employees
Off-site	9 Residences	50
Off-site	2 Apartment buildings with 10 apartments	28
Off-site	Town Hall	13 Employees
Off-site	Restaurant	Current business status is unknown
Off-site	Fire Station	0 (normally empty)

Ground Water
Contamination Source: Linemaster
Exposure Location: On-site
Exposed Population(s): Workers and residents

People who worked at Linemaster Switch, the Woodstock Town Hall, the Woodstock Fire Station, the Bald Hill Restaurant, and residents living on the Linemaster Switch site were exposed to contaminated water for an unknown period of time between 1969 and 1986. Private well water was contaminated with volatile organic compounds including TCE which was used at the Linemaster Switch facility. Exposures occurred through ingestion and skin contact with contaminated water, as well as through inhalation of chemicals that enter the air during water usage. These exposures stopped in 1986 at which time the water filtration devices were installed.

Ground Water
Contamination Source: Linemaster
Exposure Location: On-site
Exposed Population(s): Residents using on-site swimming pools

People who used one or more of the swimming pools located on the Linemaster Switch site were exposed to contaminated water for an unknown period of time between 1960 and 1986. These pools were supplied with water containing TCE and PCE. However, because of the volatility of the compounds detected in the ground water, the actual presence of VOCs in the on-site swimming pools is questionable.

Ground Water
Contamination Source: Linemaster
Exposure Location: Off-site
Exposed Population(s): Residents

Private drinking water wells from nine residences and two apartment buildings located off-site were contaminated with volatile organic compounds including TCE which was used at the Linemaster Switch facility. These residents were exposed to contaminated water for an unknown period of time between 1969 and 1986. Exposures occurred through ingestion and skin contact with contaminated water, as well as through inhalation of chemicals that enter the air during water usage. These exposures stopped in 1986 at which time the water filtration devices were installed.

Ground Water
Contamination Source: Woodstock School
Exposure Location: Off-site
Exposed Population(s): Residents

Residents who used wells located on Davis Drive, Frog Pond Road, and Wainwright Road found to be contaminated, were exposed to MTBE and benzene contaminated water for an unknown period of time prior to 1992. Exposures occurred through ingestion and skin contact with contaminated water, as well as through inhalation of chemicals that enter the air during water usage. Private well water was contaminated with MTBE and benzene from underground fuel tanks that were removed from the Woodstock School in November of 1988.

Eight wells were contaminated with benzene and MTBE above comparison values. Sampling performed by the CT DEP detected the contamination between January of 1991 and November of 1992. Present and future exposures to benzene, MTBE, and other VOCs are unlikely since GAC treatment devices are installed and monitoring is being conducted. However, if individual filters fail to function properly, then future exposures are possible from water contaminated with benzene and MTBE.

Bottled water was initially provided by the CT DEP in 1992. Granulated activated carbon (GAC) filtration systems were subsequently installed in all eight wells in the vicinity of the Woodstock School in 1992 and 1993.

Ground Water
Contamination Source: Plumbing-based lead
Exposure Location: On-site and Off-site
Exposed Population(s): Residents

People were and may continue to be exposed to lead from drinking water contaminated with lead. Lead was detected in two private wells on-site and five wells off-site. The source of lead is believed to be from the plumbing fixtures[1] in the individual homes since lead was not detected in monitoring wells. Therefore the

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[1] Lead enters drinking water primarily as a result of the corrosion (i.e., wearing away) of lead-containing materials in the household plumbing. These materials include lead-based solders used to connect copper pipe and brass and chrome-plated brass faucets. In 1986, the U.S. Congress banned the use of lead solder containing greater than 0.2% lead, and restricted the lead content of faucets, pipes and other plumbing materials to 8%. You may reduce the concentration of lead in your water by flushing your household plumbing. To flush, let the water run until the water gets noticeably colder, usually about 15 to 30 seconds. You may want to repeat this procedure any time the water in a faucet has gone unused for more than six hours. Additionally, you may want to avoid cooking with, or drinking water from the hot water tap. Hot water dissolves more lead more quickly than cold water. If you need hot water, draw water from the cold tap and then heat it on the stove.

potential exists for persons to be exposed to lead through ingestion. While lead can be ingested, inhalation of lead during showering is unlikely.

Ground Water

Contamination Source: Naturally occurring arsenic
Exposure Location: Off-site
Exposed Population(s): Residents

Arsenic occurs naturally in the overburden and bedrock aquifers in the town of Woodstock. Arsenic was identified above comparison values in twenty-five off-site private wells. Therefore, the potential exists for a large portion of the population to be exposed to levels of arsenic above comparison values. These persons would be exposed to arsenic through ingestion and skin contact. While arsenic can be ingested, inhalation of arsenic during showering is unlikely.

B. POTENTIAL EXPOSURE PATHWAYS

Ground Water - Private Well Pathway

Present and future ingestion, inhalation, and dermal exposures to ground water contaminated with VOCs are unlikely to occur for residents with private wells in the area. The levels of TCE have been decreasing in those wells located directly north and south of the site since the ground water recovery system was installed. Moreover, the CT DEP in cooperation with the EPA have setup an extensive groundwater monitoring program designed to monitor on-site and off-site potable and non-potable wells. The monitoring program, in addition to the granulated activated filter installations and the IRTS installation, would reduce the possibility that residents in the area could be exposed to TCE through ingestion, inhalation or dermal contact. Such exposure would occur only if the monitoring and treatment systems in place do not function as designed. The monitoring system has been effective at detecting contaminant migration. For example, TCE was detected in the Spring of 1993 in wells located to the northeast of the site.

Soil Pathway

Inhalation exposures of airborne soil particulates is unlikely since the site is heavily vegetated and landscaping of the soil areas is very well maintained. In addition, Zones 1 and 4 have been capped with a plastic cover. However, future ingestion, inhalation, and dermal exposures to VOCs could occur if the soil were excavated for landscaping, construction or road work purposes on-site and in the surrounding areas where contaminated ground water has been identified (to the south, north, and northeast of the site).

Indoor Air Pathway

Present and future inhalation exposures are possible in on-site and off-site residential basements where VOC contaminated ground waters were detected.

PUBLIC HEALTH IMPLICATIONS

A. TOXICOLOGICAL EVALUATION

Completed and potential exposure pathways have been identified for ground water. In this section, the health effects associated with exposure to contaminants of concern will be discussed.

To evaluate health effects, the ATSDR has developed a Minimal Risk Level (MRL) for contaminants commonly detected at hazardous waste sites. The MRL is an estimate of daily human exposure to a contaminant below which non-cancer, adverse health effects are unlikely to occur. MRLs are developed for each route of exposure such as ingestion, inhalation, and dermal absorption and for the length of exposure, such as acute (less than 15 days), intermediate (15 to 364 days), and chronic (greater than 364 days).

We used the ATSDR Toxicological Profiles in our review of the health effects associated with site contaminants. The ATSDR Toxicological Profiles are chemical-specific profiles which provide information on health effects, environmental transport and human exposures (8, 9, 10, 12, 13, 14; 23, 24; 26, 27, 28, 29, 30, 31, 32, 33).

Trichloroethylene (TCE)

Exposure to TCE occurred in the past to persons who drank water from contaminated private wells for 19 years. The maximum concentration of TCE detected in potable wells located on-site was 10,327 ppb. The maximum concentration of TCE detected in off-site wells was 220 ppb. We will be calculating two different exposure scenarios. One utilizing the maximum TCE detected on-site (10,327 ppb), and one utilizing the maximum TCE detected off-site (220 ppb).

The amount of TCE ingested per body weight was calculated for adults and children. This value is commonly represented as a mass of contaminant per mass of body weight per day. The mass of contaminant is often listed in milligrams (mg). There are one thousand mg in one gram. The mass of body weight is often listed as kilograms (kg). One kg equals one thousand grams. The mass of contaminant per mass of body weight per day is thus written as follows: mg/kg/day. This number is defined as an ingestion exposure. These values are then compared to a minimal risk level (MRL). The MRL represents a level of exposure of a chemical to a person that is likely to be without adverse health effects for a given period of exposure.

Many compounds have three MRL values that represent three exposure durations: acute (less than 15 days), intermediate (15 to 364 days), and chronic (greater than 364 days). There is only one MRL for TCE, namely the intermediate value which equals 0.7 mg/kg/day.

Calculations Based On Maximum TCE Detected On-Site Non-cancerous Effects

The ingestion exposure calculated for adults is 0.295 mg/kg/day and for children is 1.03 mg/kg/day. The ingestion exposure calculated for an adult does not exceed the intermediate MRL, therefore adverse health effects would not be anticipated in adults who drank this water for up to one year. This maximum concentration does, however, exceed the intermediate MRL for children. Since chronic MRLs for other compounds, when available, are always equal to or smaller than the intermediate MRLs, we conclude that non-cancerous adverse effects are possible for children who drank water containing 10,327 ppb TCE from on-site wells for as long as 19 years*. We are unable to conclude if non-cancerous adverse effects are possible for adults who drank water containing 10,327 ppb TCE from on-site wells for as long as 19 years.

Calculations Based On Maximum TCE Detected Off-Site Non-cancerous Effects

Using the highest TCE concentrations detected in the off-site wells (220 ppb) the ingestion exposure calculated for adults is 0.006 mg/kg/day, and for children is 0.02 mg/kg/day. Neither value exceeded the ATSDR intermediate MRL of 0.7 mg/kg/day. Therefore, non-cancerous adverse health effects are unlikely to occur in children or adults who drank TCE from off-site wells for up to one year.

Inhalation and ingestion studies indicate that the bone marrow, CNS, liver, and kidney are principal targets of TCE in animals and humans. CNS effects are related primarily to narcosis. Effects on the liver and kidney include organ enlargement and biochemical changes. Less adequately characterized effects include impaired blood component production. Other blood changes have been observed in rats exposed to TCE by inhalation. The use of TCE as an anesthetic

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* We assume that adults drink 2 liters (66 ounces) of tap water each day for over one year and weigh 70 kg (154 pounds). For children we assume that they drink one liter (33 ounces) of tap water for over one year and weigh 10 kg (22 pounds).

agent has been associated with cardiac arrhythmias. When pregnant rats were exposed to very high concentrations of TCE there is evidence that the offspring born exhibited a reduced birth weight (9).

One investigation conducted in Michigan examined the relationship between human consumption of water contaminated by solvents, (including: benzene, TCE, and PCE among others), and the incidence of low birth weight. This investigation concluded, among other things, that there was an association between consumption of water contaminated with solvents and the incidence of low birth weight (34).

Inhalation studies with rats and mice indicate that TCE is a developmental toxicant. Toxicity to the fetus is observed primarily as skeletal alterations, and other effects consistent with delayed maturation. Oral studies with rats and mice showed no TCE-related effects on fertility or other indicators of reproductive performance. Commercial grade TCE may be weakly mutagenic (ability to alter DNA) in humans.

Carcinogenicity Classification:
TCE was classified as a probable human carcinogen (EPA group B2). Currently, however, this classification has been withdrawn, and a review of this compound is being conducted by the EPA (9). Although the review is not yet complete, we calculated cancer risks for adults and children using available information from the Environmental Criteria and Assessment Office of the U.S. EPA (37). The longest period of time children and adults may have been exposed to TCE is 19 years. Consequently, we utilized this value in our estimates. The cancer risks listed below, were based on worst case scenarios. The actual risks may be lower, perhaps even zero.

Calculations Based On Maximum TCE Detected On-Site
Cancerous Effects

These calculations were based on the maximum concentration of TCE detected on-site, 10,327 ppb. On the basis of our conservative estimates, children and adults who drank and bathed in water containing TCE at the maximum concentration detected in on-site wells of 10,327 ppb for 19 years, may have a moderate increased risk for developing cancer.

Calculations Based On Maximum TCE Detected Off-Site
Cancerous Effects

These calculations were based on the maximum concentration of TCE detected off-site, 220 ppb. On the basis of our conservative estimates, children and adults who drank and bathed in water containing TCE at the maximum concentration detected in off-site wells of 220 ppb for 19 years, have a low increased risk for developing cancer.

There are various occupational investigations that examined workers who have been exposed to TCE. Many investigations have concluded that workers exposed to TCE do not have higher rates of cancer when compared to workers who were not exposed to TCE (9).

There were two investigations examining populations exposed to TCE in their drinking water. One study examined populations exposed to TCE and PCE from two municipal wells in Woburn, Massachusetts. An increase in childhood leukemia was observed in this community (19). A second study of New Jersey communities found an increase in leukemia in females exposed to TCE (19). The scientific community has raised concern over the reliability of this evidence. Consequently, the conclusions drawn from these studies are irresolute (9).

Brief Description of Chemical:
TCE is a non-flammable liquid that has a sweet odor. This man-made compound is not detected naturally in the environment. TCE is used as a metal degreaser, paint thinner, spot remover and in the manufacture of adhesives.

1,1,2,2-Tetrachloroethane

Exposure to 1,1,2,2-tetrachloroethane occurred in the past to persons who drank from contaminated private wells for 19 years. Using the highest 1,1,2,2-tetrachloroethane concentration detected in the wells (2.1 ppb) the ingestion exposures calculated for adults (0.00006 mg/kg/day) and children (0.00021 mg/kg/day) do not exceed the ATSDR chronic MRL (0.3 mg/kg/day). Therefore, non-cancerous adverse health effects are unlikely to occur in those who drank water contaminated with 1,1,2,2-tetrachloroethane for over one year.

Carcinogenicity Classification:
1,1,2,2-Tetrachloroethane has been classified by the EPA as a possible human carcinogen (group C). Chemicals classified as group C carcinogens generally lack sufficient information to calculate cancer risk estimations. Moreover, these compounds are in a category in which the information available is equivocal and generally inadequate.

Brief Description of Chemical:
1,1,2,2-Tetrachloroethane is a colorless, synthetic liquid that has no natural sources. This compound has a penetrating sweet smell, and historically has been used to clean and degrease metals. Additionally, 1,1,2,2-tetrachloroethane has been used in the production of paints and pesticides.

1,1-Dichloroethylene (1,1-DCE)

Exposure to 1,1-dichloroethylene occurred in the past to persons who drank from contaminated private wells for 19 years. Using the highest 1,1-dichloroethylene concentration detected in the wells (29 ppb) the ingestion exposures calculated for adults (0.00083 mg/kg/day) and children (0.0029 mg/kg/day) do not exceed the ATSDR chronic MRL (0.009 mg/kg/day). Therefore, non-cancerous adverse health effects are unlikely to occur in those who drank water contaminated with 1,1-dichloroethylene for over one year.

Carcinogenicity Classification:

1,1- Dichloroethylene has been classified by the EPA as a possible carcinogen (group C). There is insufficient information to calculate cancer risk estimates for individuals potentially exposed via contaminated drinking water.

Brief Description of Chemical:

1,1-Dichloroethylene is a colorless, synthetic liquid that has no natural sources. This compound may be detected in groundwater as a breakdown product of TCE and PCE.

1,2-Dichloroethane

Exposure to 1,2-dichloroethane occurred in the past to persons who drank from contaminated private wells. The duration of exposure was 19 years. Using the highest 1,2-dichloroethane concentration detected in the wells (1.3 ppb) the ingestion exposures calculated for adults (0.000037 mg/kg/day) and children (0.00013 mg/kg/day) do not exceed the ATSDR intermediate MRL (0.2 mg/kg/day). Therefore, non-cancerous adverse health effects are unlikely to occur in those who drank water contaminated with 1,2-dichloroethane for up to one year. For exposures beyond one year, we lack sufficient information to conclude if health effects may occur. The maximum concentration is below the EPA established Maximum Contaminant Level (MCL) for 1,2-dichloroethane of 5 ppb. MCLs represent contaminant concentrations that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an ingestion rate of two liters of water per day. Consequently, if the maximum level detected in <u>private wells</u> was detected in a <u>public water supply</u> these levels would be permitted for all drinking, cooking, and bathing needs.

Carcinogenicity Classification:

1,2-Dichloroethane has been classified by the EPA as a probable human carcinogen (group B2). The estimated cancer risks were calculated using the highest 1,2-dichloroethane concentration detected (1.3 ppb). The cancer risk estimates were calculated for children and adults for a nineteen year period indicate that there is an insignificant risk for developing cancer.

Brief Description of Chemical:
1,2-Dichloroethane is a man-made liquid not detected naturally in the environment. This compound has a mild odor. 1,2-Dichloroethane has been used as a solvent to remove grease from metals parts.

1,2-Dichloroethylene

Exposure to 1,2-dichloroethylene occurred in the past to persons who drank from contaminated private wells for 19 years. This compound exists in two forms, one known as *cis*-1,2-dichloroethylene, the other as *trans*-1,2-dichloroethylene. Since there are two forms of this compound, the most toxic form (*trans*-1,2-dichloroethylene) will be used as a worst case assumption for exposure dose calculations.

Using the highest 1,2-dichloroethylene concentration detected in the wells (3558 ppb) the ingestion exposures were calculated for adults (0.10 mg/kg/day) and children (0.36 mg/kg/day). Since there is no chronic MRL, the calculated dose from the maximal concentration of 3558 ppb has been compared to a reference dose. The reference dose (RfD) is an estimated daily intake of a chemical that is likely to be without an appreciable risk of health effects, and has been developed by the EPA. Using the RfD as a comparison the non-carcinogenic health risks for an adult exposed to *trans*-1,2-dichloroethylene may be characterized as low. The risks for a child are potentially higher.

There is little information in the scientific literature about the effects of oral exposure to 1,2-dichloroethylene in humans. There is evidence that suggests when animals were exposed to very high concentrations of this compound depressed breathing and decreased activity were observed. Additionally, adverse toxic effects included liver damage (increase in liver enzymes), and kidney damage (an increase in kidney weight) (24).

Carcinogenicity Classification:
There is insufficient information regarding human carcinogenicity for both cis,1,2-dichloroethylene and trans-1,2-dichloroethylene.

Brief Description of Chemical:
1,2-Dichloroethylene is a flammable, colorless liquid with a pungent odor. This compound is man made, and has no natural sources. This compound is also a breakdown product of trichloroethylene and tetrachloroethylene.

Arsenic

Arsenic was detected in twenty-seven private residential wells, the Woodstock School well, a well serving an apartment,

and two wells serving a restaurant. The levels measured in all the wells ranged from ND to 57.3 ppb. This is not related to the Linemaster site.

Exposures to arsenic may have occurred in the past, and could be occurring presently to persons who drink water from arsenic contaminated private wells. We will be calculating two different exposure scenarios. One utilizing the maximum arsenic detected on-site (288 ppb), and one utilizing the maximum arsenic detected off-site (57.3 ppb).

Calculations Based On Maximum Arsenic Detected On-Site
Non-cancerous Effects

Exposures to arsenic may have occurred in the past, and could be occurring presently to persons who drink water from arsenic contaminated on-site private wells. Using the highest arsenic concentration detected in raw well water (288 ppb) the ingestion exposures calculated for adults (0.0082 mg/kg/day) and children (0.0288 mg/kg/day) do exceed the ATSDR chronic MRL (0.0003 mg/kg/day).

Chronic ingestion investigations in humans indicate that the lowest observable adverse effect level (LOAEL) for skin effects is approximately 0.019 mg/kg/day. Because certain individuals may be more sensitive to arsenic exposures, the possibility exists for skin irritations or darkening of skin color to occur to people who consume drinking water contaminated with arsenic at the maximally detected concentration of 288 ppb. Additionally, people exposed to arsenic at levels of 288 ppb for extended periods of time may experience abdominal pain or irritation.

These non-cancerous health effects were based on the highest arsenic concentration. The actual concentration of arsenic people may have been exposed to from drinking contaminated water may have been lower or perhaps even zero. We assume that adults drink 2 liters (66 ounces) of tap water each day for one year and weigh 70 kg (154 pounds) and children drink one liter (33 ounces) of tap water each day for a year and weigh 10 kg (22 pounds).

Calculations Based On Maximum Arsenic Detected Off-Site
Non-cancerous Effects

Exposures to arsenic may have occurred in the past, and could be occurring presently to persons who drink water from arsenic contaminated off-site private wells. Using the highest arsenic concentration detected off-site in well water (57.3 ppb) the ingestion exposures were calculated for adults (0.00164 mg/kg/day) and children (0.00573 mg/kg/day) and are above the

chronic MRL of 0.0003 mg/kg/day. However, this level did not exceed the LOAEL for skin effects (0.019 mg/kg/day). Consequently, non-cancerous adverse health effects are not likely to occur in persons who drink arsenic contaminated water for more than one year.

Carcinogenicity Classification:
Arsenic has been classified by the EPA as a known human carcinogen (EPA group A). When people are exposed to high levels of arsenic through drinking water over extended durations (many years), there is an increased risk for developing skin cancer.

Calculations Based On Maximum Arsenic Detected On-Site Cancerous Effects

Because arsenic is a known human carcinogen (EPA group A), the estimated cancer risks were calculated using the highest arsenic concentration detected on-site (288 ppb). The cancer risk estimates calculated for children and adults for a nineteen year period indicate that there is a high increase risk for developing skin cancer.

Calculations Based On Maximum Arsenic Detected Off-Site Cancerous Effects

The cancer risk estimates using the highest arsenic concentration detected off-site (57.3 ppb) for children and adults for a nineteen year period indicate that there is a moderate increased risk for developing skin cancer.

Brief Description of Chemical:
Inorganic arsenic is a naturally-occurring element found in higher concentrations in the overburden and bedrock in the Woodstock area. This is apparently the source of contamination of local wells.

Benzene

Benzene was detected at the well serving the Woodstock Public School (2.6 ppb) and in eight private residences at levels ranging between none detected to 250 ppb. This is not related to the Linemaster Switch site. The duration of potential exposure is likely to have been four years from 1988 through 1991.

Carcinogenicity Classification:
Benzene has been classified by the EPA as a known human carcinogen (EPA group A). When people are exposed to high levels of benzene over extended durations (many years), there is an increased risk for developing leukemia.

The cancer risks were calculated for residents who drank from wells contaminated by the Woodstock School underground storage tank. We used the maximum benzene concentration (250 ppb), and conclude that there is a low increased risk for developing leukemia (10).

Brief Description of Chemical:
Benzene is a colorless liquid with a sweet odor. This compound dissolves in water easily and evaporates readily into the air. Benzene is a highly flammable liquid and is a component of gasoline.

Bromodichloromethane (BDCM)

Exposure to BDCM occurred in the past to persons who drank from contaminated private wells. The duration of exposure was 19 years. Using the highest BDCM concentration detected in the wells (5.1 ppb) the ingestion exposures calculated for adults (0.00015 mg/kg/day) and children (0.00051 mg/kg/day) do not exceed the ATSDR chronic MRL (0.02 mg/kg/day). Therefore, non-cancerous adverse health effects are unlikely to occur in those who drank water contaminated with BDCM for over one year.

Carcinogenicity Classification:
BDCM has been classified by the EPA as a probable human carcinogen (EPA group B2). The cancer risk estimates calculated for children and adults for a nineteen year period indicate that there is no apparent risk for developing cancer.

Brief Description of Chemical:
BDCM is a man-made compound used as a solvent and was used as a flame retardant. This compound is an intermediate for other chemical processes. BDCM is also formed as a by product of water chlorination.

Bromoform

Exposure to bromoform occurred in the past to persons who drank from contaminated private wells for 19 years. Using the highest bromoform concentrations detected in the wells (889 ppb) the ingestion exposures calculated for adults (0.0254 mg/kg/day) and children (0.0889 mg/kg/day) do not exceed the ATSDR chronic MRL (0.2 mg/kg/day). Therefore, non-cancerous adverse health effects are unlikely to occur in those who drank water contaminated with bromoform for over one year.

Carcinogenicity Classification:
Bromoform has been classified by the EPA as a probable human carcinogen (EPA group B2). Epidemiologic studies suggest an association between cancer (12) of the large intestine, rectum, and/or bladder in humans and the constituents of chlorinated drinking water. Bromoform is one of several

volatile organic contaminants typically found in chlorinated drinking water that are considered to have carcinogenic potential. The cancer risk estimates calculated for children and adults for a nineteen year period indicate that there is a low increase risk for developing bladder cancer.

Brief Description of Chemical:
Bromoform is a colorless, heavy, nonflammable liquid with a sweetish odor. This compound has been used to dissolve dirt and grease. Bromoform is also a by product of water chlorination.

Cadmium

Exposure to cadmium occurred in the past to persons who drank from contaminated private wells. The duration of exposure was 19 years. Using the highest cadmium concentration detected in the wells (30 ppb) the ingestion exposures calculated for adults (0.00086 mg/kg/day) and children (0.003 mg/kg/day) do exceed the ATSDR chronic MRL (0.0007 mg/kg/day). Although the chronic MRL was exceeded, the health effects described in human studies indicate that the non-carcinogenic health risks for an adult exposed to cadmium are minimal, and the risks for a child may be characterized as low (28).

The main target of cadmium toxicity is the kidney. This specificity has been confirmed in animal studies examining rats, mice, and rabbits. These investigations have lead to a better understanding of cadmium toxicity. The toxic effect appears only to occur after a critical concentration is reached. In other words, low levels of cadmium may not cause damage. However, once the cadmium level has reached the critical value, kidney damage may continue subsequent to exposure cessation. This damage may alter the calcium balance in the body, and increase the risk for osteoporosis among women (28).

Carcinogenicity Classification:
Cadmium has been classified by the EPA as a probable human carcinogen (EPA group B1) by inhalation. However, there is insufficient evidence to ascertain whether cadmium is a carcinogen by ingestion. No cancer risk estimates were calculated for individuals potentially exposed via contaminated drinking water.

Brief Description of Chemical:
The element cadmium occurs naturally in the crust of the earth. The pure form is a soft, white-silver metal. Cadmium is used in many industrial and consumer products including metal coatings.

Chloroform

Elevated levels of chloroform were detected in the well serving the Tarr Apartments at levels ranging from ND to 111 ppb. Consequently, exposure to chloroform occurred in the past to persons who drank from contaminated private wells for 19 years. Using the highest chloroform concentration detected in the wells (111 ppb) the ingestion exposures were calculated for adults (0.003 mg/kg/day) and children (0.01 mg/kg/day). These values were compared to the ATSDR chronic MRL (0.01 mg/kg/day). Non-cancerous adverse health effects are unlikely for adults, and minimal for children who drank water contaminated with chloroform for over one year.

Carcinogenicity Classification:

Chloroform has been classified by the EPA as a probable human carcinogen (EPA group B2). The cancer risk estimates calculated for a nineteen year period indicate that there is no apparent risk for developing cancer.

Brief Description of Chemical:

Chloroform is a colorless liquid that has a pleasant odor, and a slightly sweet taste. Chloroform is used in the production of paper, and is a by product of water chlorination.

Chromium

Exposure to chromium occurred in the past to persons who drank from contaminated private wells for 19 years. The maximum concentration detected in on-site drinking water wells was 625 ppb. This element exists in several different forms, chromium(0), chromium(III), and chromium(VI) (30). The most toxic form is chromium(VI). Using the highest chromium concentration detected in the wells (625 ppb), the ingestion exposure was calculated for adults (0.018 mg/kg/day) and children (0.063 mg/kg/day). These values are usually compared to MRLs. However, there are no acute, intermediate, or chronic MRLs for chromium(VI) to compare with these ingestion exposures. The RfD for chromium(VI) is 0.005 mg/kg/day. This value was exceeded. Consequently, we reviewed human investigations examining the health effects of prolonged exposure to chromium in drinking water. The lowest level of human exposure to chromium in drinking water reported to result in an adverse effect was 0.57 mg/kg/day. Since this value is greater than either the adult or child ingestion exposures, non-cancerous adverse health effects are unlikely for adults or children who drank water contaminated with chromium at the maximum concentration.

Carcinogenicity Classification:

Chromium (VI) has been classified by the EPA as a known human carcinogen (EPA group A) by inhalation. However, there is insufficient evidence to ascertain whether chromium(VI) is a

carcinogen by ingestion. No cancer risk estimates were calculated for individuals potentially exposed via contaminated drinking water.

Brief Description of Chemical:
Chromium is a element that occurs naturally in rocks and soil. This element exists in several different forms, chromium(0), chromium(III), and chromium(VI). None of these forms have any known taste or odor. Chromium compounds are used in the industrial manufacture of chrome plating, manufacture of dyes, and wood preserving.

Lead

Lead was detected in off-site wells as high as 19.8 ppb, and on-site as high as at 87.3 ppb.

There are no regulations for lead in private wells, however, the EPA has developed an action level of 15 ppb.

Lead in private drinking water is probably due to lead plumbing fixtures in individual homes and unlikely to be site-related. Although not likely to cause adverse health effects alone, long term exposure to lead in drinking water would contribute significantly to the overall body burden of lead. This could increase the lead exposure in individuals at risk for lead toxicity due to other sources (lead-based paint, food, and soil). Children under the age of six are at greatest risk for lead poisoning.

Studies indicate that long term exposure to low levels of lead can cause brain damage and lowered Intelligence Quotient (I.Q.). Lead exposure can increase blood pressure in middle-aged men. If a pregnant women is exposed to lead in drinking water it can be carried to the unborn child and may have an adverse effect on the mental development of the fetus.

Carcinogenicity Classification:
Lead has been classified by the EPA as a probable human carcinogen (EPA group B2). There is insufficient information to calculate cancer risk estimates for individuals potentially exposed via contaminated drinking water.

Brief Description of Chemical:
Lead is a naturally occurring gray metal detected in small quantities in the earth's crust. This compound has no taste or odor. Lead is used in the manufacture of batteries and in lead solder. However, as of 1986, the U.S. Congress banned the use of lead solder containing more than 0.2 percent lead. When water stays in pipes containing lead or lead containing plumbing systems for several hours the lead in the pipes or solder may dissolve into your drinking water.

Manganese

Exposure to manganese occurred in the past to persons who drank from contaminated private wells for 19 years. The maximum concentration detected was 530 ppb. Since there is no chronic MRL, the calculated dose from the maximal concentration of 530 ppb has been compared to a reference dose. Using the highest manganese concentration detected in the wells (530 ppb), the ingestion exposures were calculated for adults (0.015 mg/kg/day) and children (0.053 mg/kg/day). The RfD for manganese is 0.005 mg/kg/day. This value was exceeded. Consequently, we reviewed human investigations examining the health effects of prolonged exposure (50 years) to manganese in drinking water. From these studies, there is evidence to conclude that water contaminated with manganese at 530 ppb may represent an increase risk in non-cancerous adverse health effects. These risks may be characterized as low for adults, and moderate for children.

Investigations in humans and in animals indicate that neurologic effects may include: weakness, fatigue, tremors, ataxia (inability to coordinate muscle movement), and altered ability to walk (11, 31).

Carcinogenicity Classification:
Manganese is not currently classified by the EPA regarding its carcinogenicity.

Brief Description of Chemical:
Manganese is a naturally occurring compound detected in many rock formations. This element is similar in chemical and physical properties to iron. Manganese has numerous industrial uses including the formation of batteries and ceramics.

Methyl Tertiary Butyl Ether (MTBE)

MTBE was detected at levels in two private wells maximally at 250 ppb. The presence of MTBE is not related to the Linemaster Switch Site. MTBE exposure through ingestion and potentially through inhalation occurred in the past to persons who drank water from contaminated private wells.

Using the highest MTBE concentration detected in the wells (250 ppb), the ingestion exposures were calculated for adults (0.007 mg/kg/day) and children (0.025 mg/kg/day). There is no chronic MRL, however, the intermediate MRL for MTBE is 0.3 mg/kg/day. Since the intermediate MRL was not exceeded, non-cancerous adverse health effects are unlikely for adults or children who drank contaminated water for up to one year. The duration of exposure to MTBE is assumed to be similar to that of the benzene exposure duration of 4 years. The duration of potential exposure is likely to have been from 1988 through

1991. For exposures beyond one year, we examined the EPA longer-term health advisory. The longer-term health advisory is a concentration that both adults and children could be exposed to for up to seven years without any adverse health effects. Since the EPA longer-term health advisory was not exceeded, non-cancerous adverse health effects are unlikely for adults or children who drank water contaminated with MTBE at the maximum concentration for the entire exposure duration of four years.

Carcinogenicity Classification:
MTBE is categorized by the EPA as a group D chemical. A group D chemical in one which is not classifiable as to human carcinogenicity.

Brief Description of Chemical:
MTBE is a man made flammable liquid with an unpleasant odor. MTBE is now added to some gasoline formulations in an effort to reduce pollutants such as carbon monoxide. Additionally, this compound is used in medicine and industry.

Nickel

Exposure to nickel occurred in the past to persons who drank from contaminated private wells for 19 years. The maximum concentration detected on-site was 367 ppb. Using the highest nickel concentration detected in the wells (367 ppb), the ingestion exposures were calculated for adults (0.01 mg/kg/day) and children (0.037 mg/kg/day). These values are usually compared to MRLs. However, there are no chronic, intermediate, or acute MRLs for nickel to compare with these ingestion exposures. The RfD is 0.02 mg/kg/day. Although the RfD was exceeded slightly for children, the non-cancerous effects are low for children, and minimal for adults who drank water contaminated with the maximum nickel concentrations detected on-site (367 ppb).

Carcinogenicity Classification:
Nickel is categorized by the EPA as a group D chemical. A group D chemical in one which is not classifiable as to human carcinogenicity.

Brief Description of Chemical:
Nickel is a silver-white hard metal that is often combined in mixtures called alloys. Stainless steel, jewelry, and coins are important uses for nickel.

Tetrachloroethylene (PCE)

PCE exposure occurred in the past to people who drank water from contaminated private wells for 19 years. Using the highest PCE concentrations detected in the wells (430 ppb) the ingestion exposures calculated for adults (0.0123 mg/kg/day) and children (0.043 mg/kg/day) do not exceed the ATSDR intermediate MRL (0.1 mg/kg/day). Therefore, non-cancerous adverse health effects are unlikely to occur in those persons who drank PCE contaminated water for one year. For exposures beyond one year, we lack sufficient information to conclude if health effects may occur. The maximum concentration exceeds the EPA established MCL for PCE of 5 ppb. Consequently, if the maximum level detected in private wells was detected in a public water supply these levels would not be permitted for drinking or cooking.

Carcinogenicity Classification:

PCE was classified as a probable human carcinogen (EPA group B2). Currently, however, this classification has been withdrawn, and a review of this compound is being conducted by the EPA (9). Although the review is not yet complete, we calculated cancer risks for adults and children using available information from the Environmental Criteria and Assessment Office of the U.S. EPA (37). The longest period of time children and adults may have been exposed to PCE is 19 years. Consequently, we utilized this value in our estimates. When animals were exposed to very high levels of PCE there was an association with an increased incidence of liver cancer.

The estimated cancer risks were calculated using the highest PCE concentration detected (430 ppb). The cancer risk estimates calculated for a nineteen year period indicate that there is a moderate increased risk for developing cancer possibly including liver cancer.

Brief Description of Chemical:

PCE is a synthetic compound used as a metal degreaser and fabric dry cleaner. PCE is nonflammable liquid with a sweet odor. There are no natural sources of PCE.

Vinyl Chloride

Exposure to vinyl chloride occurred in the past to persons who drank from contaminated private wells for 19 years. Using the highest vinyl chloride concentration detected in the wells (0.89 ppb) the ingestion exposures calculated for adults (0.000025 mg/kg/day) and children (0.000089 mg/kg/day) do exceed the ATSDR chronic MRL (0.00002 mg/kg/day). Although the MRL was exceeded, the maximum concentration was below the EPA longer-term health advisory. For exposures beyond seven years, we lack sufficient information to conclude if health effects may occur. The maximum concentration is below the EPA established MCL for vinyl chloride of 2 ppb. Consequently, if

the maximum level detected in private wells was detected in a public water supply these levels would be permitted for all drinking, cooking, and bathing needs.

Carcinogenicity Classification:
This compound is a known human carcinogen, (EPA group A). Most of the information about this compound has been obtained from inhalation exposures. Consequently, there is insufficient information to calculate cancer risk estimates for individuals potentially exposed via contaminated drinking water. When workers were exposed to this compound at high levels, there was a greater than expected incidence of liver cancer (33).

Brief Description of Chemical:
Vinyl chloride is a colorless vapor that has a sweet odor. This compound is man made and may be detected in groundwater as a result of the breakdown of TCE or PCE. Vinyl chloride is used in the formation of plastics such as polyvinyl chloride.

B. HEALTH OUTCOME DATA EVALUATION

The toxicologic evaluation of the ground water data suggest that persons who received ingestion exposures to water contaminated with TCE and arsenic, may be at an increased risk of developing cancer. The CT DPHAS conducted a review of cancer occurrence in Woodstock to assess if there was an increase in disease.

Information on the number of cancer cases in Connecticut and in Woodstock was obtained from the CT DPHAS, Tumor Registry. Information on the occurrence of cancer in Woodstock was obtained on the following tumor types: bladder, colon, kidney, leukemia, lung, melanoma, rectum, and all sites combined.

Since 1935, all tumors diagnosed to Connecticut residents are required by law to be reported to the Tumor Registry. Therefore, by reviewing data in the Tumor Registry we are able to make comparisons between the rates of cancer in specific towns with the rate of cancer in the State of Connecticut.

Age-specific cancer incidence rates were generated for Connecticut and Woodstock in five year periods for the thirty four year period from 1958 to 1991. The age-specific rates were calculated by dividing the number of cases identified during each five year period in an age group by the population in that age group according to the census (or an average for between census periods).

The standard incidence ratio (SIR) is an overall summary measure of the cancer risk. The SIR is calculated by multiplying the Connecticut cancer incidence rates by the population of the town to estimate an "expected" number of cancers in each age group. The actual (or observed) number of cases identified by the Tumor Registry are divided by the expected number to obtain the SIR. When

the SIR is less than one (1.00) the risk of cancer is less than expected, when the SIR is greater than one the risk is more than expected. When the range of the 95% Confidence Interval (95% CI) does not include the number 1.00 then the results are considered to be statistically significant. This method allows for the inclusion of age as a risk factor in the analysis. Age is important to consider because, in general, the risk of cancer varies with age.

The rates of cancer incidence in Woodstock, CT are what would be expected based on State rates for the majority of the cancer sites studied. The overall rate of cancer (or total of all cancer types combined) and the rate of bladder cancer were actually lower in Woodstock than the state. The results are summarized in Table 9.

Table 9
CANCER INCIDENCE IN WOODSTOCK
IN COMPARISON TO CONNECTICUT 1958 TO 1991

TUMOR SITE	NUMBER OF CASES (OBSERVED / EXPECTED)	AGE STANDARDIZED INCIDENCE RATIO	95 PERCENT CONFIDENCE INTERVAL
ALL SITES	562 / 611.93	0.92*	0.84, 0.99
BLADDER	18 / 27.31	0.66*	0.35, 0.96
COLON	68 / 68.41	0.99	0.76, 1.23
KIDNEY	99 / 106.65	0.93	0.75, 1.11
LEUKEMIA	15 / 16.23	0.92	0.46, 1.39
LUNG	73 / 82.42	0.89	0.68, 1.09
RECTUM	31 / 31.47	0.99	0.64, 1.33
SKIN MELANOMA	17 / 14.31	1.19	0.62, 1.75

* These Standard Incidence Ratios (SIR) are statistically significantly less than State rates for the same time period.

This review presents cancer rates in Woodstock in comparison with cancer rates for the State of Connecticut.

The overall rate of cancer in Woodstock was less than the State of Connecticut for the years 1958 to 1991. Bladder cancer also occurred less frequently than would be expected based on State rates. This type of data analysis does not gather information on any individual risk factors and does not allow any conclusions to be drawn regarding the cause of any specific types of cancer.

A review of birth records for Connecticut and Woodstock indicated that there is a lower incidence of low birth weight (defined as weighing below 2,500 grams at birth)in Woodstock in comparison to State rates. For the period 1979 to 1988, 20 of 624 births to Woodstock residents weighed below 2,500 grams for a rate of 4.6 per 100 births. For the same period the low birth weight rate among all races in Connecticut was 6.7 per 100, and approximately 5.5 per 100 among white Connecticut residents.

Eleven off-site residential wells were contaminated with TCE from Linemaster. This is too small a number of persons to conduct a more detailed evaluation of cancer or low birth weight in relations to exposure to TCE. A more complete study of cancer or birth weight would require acquisition of personnel records of Linemaster and Town Hall employees and crossing these records with the Tumor Registry and Vital Records from DPHAS. At this point in time a more extensive study of cancer incidence or the occurrence of low birth weight is not planned. See Table 8 for a depiction of the location, type of property and estimated number of persons exposed to PCE or TCE above the comparison values.

C. COMMUNITY HEALTH CONCERNS EVALUATION

We addressed the community concerns about health as follows:

1. Does itching skin after bathing indicate that the well is contaminated or has been re-contaminated?

Studies indicate that bathing with water contaminated with arsenic and TCE can cause itching and other skin ailments. These symptoms are more likely to occur at contamination levels higher than those identified in the private water wells. TCE is currently being filtered out of the water. Certain individuals may be more sensitive to the effects of arsenic and their itching skin may be the result of exposures to this element.

2. Could dizziness, fainting, and a feeling of weakness be related to exposures connected with the Linemaster Switch site?

The contaminants evaluated in this health assessment occur at levels that would not cause dizziness, fainting or a feeling of weakness in the general population. However, some people are more sensitive to chemicals than others. We recommend that you see a physician about the symptoms expressed above.

3. Is it safe for farm animals such as cattle to drink water contaminated by the Linemaster Switch or the water that was contaminated by the Woodstock school leaking fuel tank?

Currently we have no evidence that livestock in the area are being exposed to contaminated water. However, if a well that is used for livestock is found to be contaminated, the CT DPHAS recommends the installation of a water treatment system.

4. Are the levels of arsenic in some wells safe? What are the health effects of arsenic in drinking water?

As previously discussed in the Public Health Implications section, levels of naturally occurring (not related to Linemaster Switch) arsenic have been detected in private wells above health comparison values and non-cancerous health effects are possible. Persons exposed to high arsenic levels in drinking water may be at an increased risk of developing cancer.

Therefore, we recommend to those residents whose wells have been found to have arsenic levels above the recommended health values to treat their well water to remove the arsenic.

5. Could Grave's disease result from exposures to the contaminants found in the drinking water?

A review of the literature (15, 16, and 17) on the causes of Grave's disease indicates that it is an autoimmune thyroid disease caused by: a genetic predisposition; the presence of thyroid-stimulating immunoglobulin; and in some cases the cause may be uncertain. Stress is believed to play a major role (15,17). In some cases the onset of the disease follows a frightening episode in the patients life, or the loss of a loved one.

Because Grave's disease is an autoimmune disease, we reviewed the immunological effects of those contaminants found in drinking water wells more closely. The immunological effects in humans related to ingestion exposures to the contaminants identified in the drinking water wells have been reported and are controversial. Benzene has been found to effect the immune system of laboratory animals at levels much higher than those identified in the benzene contaminated drinking water wells. In addition, there is evidence that chronic exposure to mixed solvents (including TCE and PCE) in drinking water can produce some autoimmune effects (18,19). This is supported by a study in mice exposed to a mixture of solvents in drinking water (20).

6. Because of the on-site ground water recovery system wells residents are concerned that their wells may run dry.

Two wells in the area have run dry. The CT DEP and Linemaster Switch have responded in a timely manner to correct the situation. One resident's well was replaced. The other resident's well needed a new sediment filter.

CONCLUSIONS

Based on the information reviewed, the ATSDR has concluded that this site is a public health hazard based upon past exposure to VOCs. Residents in the vicinity of Linemaster Switch Corporation, who consumed water from contaminated wells, received exposures to site related compounds in private drinking water wells for an undetermined amount of time between 1969 to 1988. Currently, the site poses a no apparent public health hazard because site-related exposures are below levels of health concern.

1. Approximately eight private residences, employees of the Woodstock Town Hall and volunteers of the Woodstock Fire Department were exposed to a variety of site related compounds through the contamination of private drinking water wells. On-site and off-site wells were found to have levels of TCE that could increase the risk of developing cancer in persons who drank from contaminated wells.

   The maximum concentration of TCE detected in drinking water wells located on-site was 10,327 ppb. The maximum concentration of TCE detected in off-site drinking water wells was 220 ppb. The cancer risk estimates were calculated separately for on-site and off-site well contamination. Residents exposed to the maximally detected off-site concentration of TCE (220 ppb) have a low increased risk for developing cancer. Those exposed to the TCE detected in the on-site wells (10,327 ppb) have a moderate increased risk for developing cancer. The actual concentration children or adults may have been exposed to may have been lower.

   Analysis of samples taken after one year of operation of the Interim Removal System indicate that TCE concentrations have been reduced to less than 5 ppb in six water supply wells, including the wells which supply the Woodstock Town Hall and the restaurant. TCE concentrations in the well supplying the Tarr apartments remain unchanged.

2. Approximately eight private residences south of the Woodstock Public School received past exposures to benzene and MTBE for an undetermined amount of time between 1988 and 1991. No adverse health effects are expected based upon the detected levels of contaminants.

3. Residents in the area may be exposed to arsenic through contaminated private drinking water wells. Arsenic occurs naturally in the Woodstock area and is not related to the Linemaster Switch site. The arsenic occurs in both the overburden and bedrock aquifers. The presence of arsenic could explain why some residents complained about itchy skin. The CT DPHAS is concerned about the possibility of arsenic contamination in other wells in Woodstock. This is because as discussed in the Toxicologic Implication Section, several

wells had arsenic levels that could increase the risk of developing cancer.

4. Lead was identified in several wells. The source of lead is probably from plumbing fixtures in the individual homes. Therefore the potential exists for persons to be exposed to lead through ingestion. This is cause for concern because it can contribute to the overall body burden of lead. In addition, even at low exposure levels health effects have been documented.

RECOMMENDATIONS

1. The current well water quality monitoring program should continue. We understand that the current monitoring program has utilized various criteria for selecting wells for periodic sampling. Further, we understand that if wells previously not contaminated become contaminated confirmatory re-sampling will be conducted. If subsequent sampling confirms the contamination is above established drinking water criteria, treatment systems will be installed. Additionally, we understand that once previously uncontaminated wells become contaminated, the monitoring program will be expanded to include wells located downgradient from the Linemaster Switch site.

2. Those private wells where high levels of naturally occurring arsenic have been found (GW-21, GW-34db, and GW-69db) should continue to treat their drinking water to reduce the arsenic levels. Other residents in Woodstock should consider testing their wells for arsenic. If arsenic is found above comparison values, the well water should be treated.

3. Long-term exposures to low levels of lead in drinking water are cause for concern because it can contribute to the overall body burden. When the faucets have not been used for over an 8 hour period lead can accumulate in the pipes. Running the tap water up to three minutes can reduce the lead levels in water. Treating the water may be another alternative to eliminate the lead.

4. Residents living around the site should be educated as to the findings of the health assessment.

Health Activities Recommendation Panel (HARP) Recommendations

The data and information developed in the public health assessment for Linemaster Switch, Woodstock, CT have been evaluated by the ATSDR Health Activities Recommendations Panel for appropriate follow-up with respect to health actions. The panel determined that community health education is indicated for this site. The panel also determined that the ATSDR should evaluate the CT DPHAS health statistics review for consideration of additional health actions.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Linemaster Switch site contains a description of the actions to be taken by the ATSDR, the CT DPHAS, the CT DEP, and/or the EPA in the vicinity of the site. For those actions already taken at the site, please see the Background section of this Public Health Assessment. The purpose of the PHAP is to ensure that this health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included, is a commitment on the part of the ATSDR and the CT DPHAS to follow up on this plan to ensure that there is implementation. The public health actions to be implemented by the ATSDR, the CT DPHAS, and the CT DEP are as follows:

1. The CT DEP and the CT DPHAS will continue to review monitoring reports from those private wells identified as contaminated from the Linemaster Switch and the Woodstock Public School sites.

2. The CT DPHAS will provide environmental health education for local public health officials, the local medical community and local citizens to assist the community in assessing possible adverse health outcomes associated with exposures to toxic substances.

3. The CT DPHAS will attempt to coordinate a well survey of the Town of Woodstock to investigate the extent of naturally occurring arsenic contamination in the private wells. In addition, the CT DPHAS will investigate and make recommendations regarding the appropriate filters for treating wells with arsenic contamination.

CERTIFICATION

The public health assessment for the Linemaster Switch site was prepared by the Connecticut Department of Public Health and Addition Services 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 public health assessment was initiated.

Gregory V. Ulirsch

Technical Project Officer, SPS, SSAB, DHAC

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

Richard Gillig

for Division Director, DHAC, ATSDR

PREPARERS OF REPORT

Gary D. Perlman, MPH
Epidemiologist
Environmental Epidemiology and
Occupational Health Connecticut
Department of Public Health and Addiction Services

Edith M. Pestana, MS, MPH
Epidemiologist
Division of Environmental Epidemiology and
Occupational Health Connecticut
Department of Public Health and Addiction Services

Kenny Foscue, MPH
Epidemiologist
Environmental Epidemiology and
Occupational Health Connecticut
Department of Public Health and Addiction Services

ATSDR Regional Representative:

Louise House
EPA Region I

ATSDR Technical Project Officer:

Gregory Ulirsch
Environmental Health Engineer
Superfund Site Assessment Branch
Division of Health Assessment and
Consultation Agency for Toxic Substances and Disease Registry

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PUBLIC COMMENTS

The Public Comment section for the Linemaster Switch site contains the public comments received during the public comment period in February 1995 and their respective response.

PUBLIC COMMENTS RECEIVED FROM THE CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION.

COMMENT NO. 1.

p. iv List of Tables. The titles for Tables 8 and 9 are switched.

RESPONSE TO COMMENT NO. 1.

This suggestion was incorporated as stated.

COMMENT NO. 2.

p. 1. paragraph 2. Sixth sentence. Add a comma after "shed", delete "is", add comma after "facility", delete "that".

RESPONSE TO COMMENT NO. 2.

This suggestion was incorporated as stated.

COMMENT NO. 3.

p. 1. paragraph 2. Last sentence. Figure number is 2-1 in Appendix C-1.

RESPONSE TO COMMENT NO. 3.

This suggestion was incorporated as stated.

COMMENT NO. 4.

p. 2. paragraph 1. Last sentence. Change "residence" to **residential.**

RESPONSE TO COMMENT NO. 4.

This suggestion was incorporated as stated.

COMMENT NO. 5.

p. 2. paragraph 2. Third, fourth and fifth sentence. In order to clearly describe actions taken to remove VOCs from the groundwater, the following is suggested: **In 1989, an air stripping tower and carbon polishing filter were installed to remove VOCs from the on-site well water supply. This tower and filter are located in the southern portion of the factory building. In 1992, a groundwater collection and treatment system, (the Interim Removal Treatment System (IRTS)) was installed to prevent the migration of VOCs off-site. Contaminated groundwater is pumped from six bedrock extraction wells to the treatment system which consists of an air stripper and carbon polishing filters. The treatment system is located in a small building to the east of the**

manufacturing building. Since initiation of the IRTS, approximately 448 pounds of VOCs (407 pounds of TCE) have been removed from the groundwater (Source-Second Annual Monitoring Report, Interim Removal Action, Linemaster Switch Corporation, dated January 1995, prepared by Fuss & O'Neill, Inc.)

RESPONSE TO COMMENT NO. 5.
This suggestion was incorporated as stated.

COMMENT NO. 6.
p. 2. paragraph 6. First sentence. Change "not site related" to **not related to the Linemaster site.**

RESPONSE TO COMMENT NO. 6.
This suggestion was incorporated as stated.

COMMENT NO. 7.
p. 3. Section B2. This section identifies public health actions implemented by the CT DPHAS. As written, (1) and (2) identify the same actions; the only difference is that (2) identifies the recipient of the site specific information. Either (1) should be deleted or a different recipient should be identified.

RESPONSE TO COMMENT NO. 7.
The first action was deleted, and the second action was left unchanged.

COMMENT NO. 8.
p. 4. Second bullet. Last sentence. Change "solvent" to **solvent-based.**

RESPONSE TO COMMENT NO. 8.
This suggestion was incorporated as stated.

COMMENT NO. 9.
p. 4. Fourth bullet. Last line. Change "south" to **east.**

RESPONSE TO COMMENT NO. 9.
This suggestion was incorporated as stated.

COMMENT NO. 10.
p. 5. Second paragraph. Next to last line. The only map in the Appendices that covers distances up to three miles from the Linemaster site is the Site Location Map in Appendix A. Appendix C2 identifies the location of off-site residential wells.

RESPONSE TO COMMENT NO. 10.
This suggestion was incorporated as stated.

COMMENT NO. 11.

p. 5. Fifth sentence. Beginning with "There is...", text should read **There are monitoring programs for the Interim Removal Treatment System wells, on-site monitoring wells, and on-site and off-site domestic water supply wells. Forty six domestic supply wells are monitored; five wells are monitored bi-monthly, twenty wells are monitored quarterly, nineteen wells are monitored semi-annually, and two wells are monitored annually.**

RESPONSE TO COMMENT NO. 11.

This suggestion was incorporated as stated.

COMMENT NO. 12.

p. 6. paragraph 1. Second sentence. The Town of Woodstock plans to install sewer service **along Routes 169 and 171, just outside the eastern and southern boundaries of the linemaster property. Construction is expected to begin by the summer of 1995.**

RESPONSE TO COMMENT NO. 12.

This suggestion was incorporated as stated.

COMMENT NO. 13.

p. 9. paragraph 5. Opening sentence should begin **In June of 1992.**

RESPONSE TO COMMENT NO. 13.

This suggestion was incorporated as stated.

COMMENT NO. 14.

p. 9. paragraph 5. Second sentence. While data that was available after six months of operation of the IRTS may indicate that levels of VOCs in till and shallow bedrock wells remained unchanged, the system has now been in operation for almost three years. The latest IRTS report indicates that levels in some of the overburden and shallow bedrock wells have decreased. This report is already out of date since it does not include 1994 analyses for samples taken from these wells.

The Public Health Assessment should either contain an evaluation of the most recent data or clearly indicate that the study only evaluated data available through December 1992 and that more recent data not included in the study may show other trends in contaminant levels.

RESPONSE TO COMMENT NO. 14.

We have altered the wording to the following: However, when the data (through December of 1992) was evaluated, the levels of VOCs in till and shallow bedrock wells had remained

relatively unchanged after six months of operation of the IRTS.

COMMENT NO. 15.

p. 12. Paragraph 1. There are currently two water supply wells on the Linemaster site that provide drinking water. GW-08, which is treated by an air stripper and carbon polishing unit, provides water for the manufacturing facility and the ____ Residence. GW-12 formerly served the ____ residence; this well was taken out of service after the IRTS went on line. GW-09 provided water for the Bald Hill Restaurant (no longer in operation) and the ____ Residence (currently vacant).

It should be noted that he maximum reported concentration of TCE (10,327 ppb) as identified in Table 3 was found in GW12, a supply well that is no longer in use. This concentration of TCE was never confirmed as the next highest reported concentration in this well for this period of January, 1987 through November, 1994 was 6897 ppb.

RESPONSE TO COMMENT NO. 15.

We incorporated your suggestion, and have added the following: The concentration of TCE was detected in a supply well that is not currently being used.

COMMENT NO. 16.

p. 17. First paragraph. Last line should read **Figures 2-1 and 2-2 in Appendix C.**

RESPONSE TO COMMENT NO. 16.

This suggestion was incorporated as stated.

COMMENT NO. 17.

p. 17. Second paragraph. Last sentence should be moved to become the second sentence and should read "These wells are located northeast on Route 169 and southeast on Route 171".

RESPONSE TO COMMENT NO. 17.

This suggestion was incorporated as stated.

COMMENT NO. 18.

p. 17. Fourth paragraph. Last sentence. Delete "with site related compounds".

RESPONSE TO COMMENT NO. 18.

This suggestion was incorporated as stated.

COMMENT NO. 19.

p. 18. First line below table 7. **IRTS** instead of IRST.

RESPONSE TO COMMENT NO. 19.
This suggestion was incorporated as stated.

COMMENT NO. 20.
p. 20 Ground Water - Private Well Pathway.. This section should clearly indicate that while past exposures to VOCs may have occurred for the period of 1969 through approximately 1986 (when TCE was first used at the facility until the pollution was identified and bottled water/treatment units provided), present and/or future exposures are not expected for the following reasons: 1) monitoring of on-site and off-site supply wells continues, 2) all on-site wells used as supply wells are treated by air stripping and/or GAC to remove the VOCs, 3) the IRTS was installed to prevent the migration of contaminated groundwater off-site, 4)GAC has been provided to treat off-site supply wells as needed.

RESPONSE TO COMMENT NO. 20.
The paragraph you are referring to has been moved to the Potential Exposure Pathways Section.

COMMENT NO. 21.
p. 20. Table 8. Linemaster Switch property should be identified as **On-site**.

RESPONSE TO COMMENT NO. 21.
This suggestion was incorporated as stated.

COMMENT NO. 22.
p. 20. Second paragraph. First, second and third sentences. Add **may have** before "received".

RESPONSE TO COMMENT NO. 22.
We do not share you uncertainty with regard to the exposed populations.

COMMENT NO. 23.
p. 21. Second paragraph. Last sentence. Add **However** before "Because".

RESPONSE TO COMMENT NO. 23.
This suggestion was incorporated as stated.

COMMENT NO. 24.
p. 21. First and third paragraph. The third paragraph addresses exposure to water contaminated with benzene and MTBE. It states that present and future exposures are unlikely since GAC treatment devices are installed and monitoring is being conducted. This same statement should be made regarding present and future exposures to other VOCs.

RESPONSE TO COMMENT NO. 24.
This suggestion was incorporated as stated.

COMMENT NO. 25.
p. 21. Third paragraph. Third sentence. Change sentence to read **However, if individual filters fail** to ...

RESPONSE TO COMMENT NO. 25.
This suggestion was incorporated as stated.

COMMENT NO. 26.
p. 21. Fourth paragraph. Last sentence. Substitute **prior to 1992** for "between 1988 and 1992". The contamination was first identified in 1988, however it is possible that exposures occurred prior to that date.

RESPONSE TO COMMENT NO. 26.
This suggestion was incorporated as stated.

COMMENT NO. 27.
p. 23. Trichloroethylene (TCE). As noted in comment #15, the maximum reported concentration of TCE (10,327 ppb) was measured in April, 1987 at GW-12, an on-site supply well that is no longer in use. Use of this concentration to evaluate health effects is extremely conservative. It is unreasonable to assume that any children or adults were exposed to this concentration of TCE for any period of time, given that this concentration was not confirmed or duplicated in all of the monitoring that occurred from January 1987 through November 1994; the next highest reported concentration of TCE in this supply well was 6897 ppb. For the monitoring period of January 1987 through June 1989 (prior to operation of IRTS), the average concentration of TCE in GW-12DB was 5222 ppb. The concentration of TCE in all other on-site and off-site supply wells was and continues to be significantly lower.

If the maximum reported TCE concentration of 10,327 ppb is to be used in the final health assessment, if should also be clearly noted that there is no date to indicate that any child or adult was actually exposed to this concentration for 19 years.

RESPONSE TO COMMENT NO. 27.
The discussion of TCE has been altered; incorporating your concerns. Specifically, the discussion has been stratified into on-site maximum TCE concentration, and off-site maximum TCE concentration.

COMMENT NO. 28.
p. 40. First paragraph. The first sentence states "... ATSDR has concluded that this site is a public health hazard". This

paragraph should be expanded to clarify that while past exposures over an unknown period of time may have resulted in increased health risks to some residents in the vicinity of Linemaster Switch Corporation, the residential well monitoring program, installation of GAC filter systems, and implementation of the IRTS have eliminated further exposures. Therefore, there are no ongoing or other activities that are or could create a public health hazard.

RESPONSE TO COMMENT NO. 28.

The conclusion now incorporates the following wording: Based on the information reviewed, the ATSDR has concluded that this site is a public health hazard **based upon past exposure to VOCs.**

COMMENT NO. 29.

First paragraph. Second sentence. Sentence should be edited to clarify which residents may have received exposures; "Residents **in the vicinity of Linemaster Switch Corporation may have** received....";

RESPONSE TO COMMENT NO. 29.

We have included the following clarification: Residents in the vicinity of Linemaster Switch Corporation.

COMMENT NO. 30.

p. 40. Second paragraph. Last sentence. The statement that "one well was found to have levels of TCE that could increase the risk of developing cancer in persons who drank from this well" is misleading. As noted on page 24 of the Public Health Assessment, "..children and adults who drank and bathed in water containing TCE at the maximal concentration of 10,327 ppb for 19 years, have a moderate increase risk of developing cancer". There is no evidence that any population was exposed to this concentration for a 19 year period. Additional information indicating that the maximum concentration of TCE in the on-site supply wells was used to calculate cancer risk and that this concentration is not representative of monitoring data for other on-site or off-site wells should be provided.

RESPONSE TO COMMENT NO. 30.

We included the following clarification, based on your suggestion: **The maximum concentration of TCE detected in drinking water wells located on-site was 10,327 ppb. The maximum concentration of TCE detected in off-site drinking water wells was 220 ppb. The cancer risk estimates were calculated separately for on-site and off-site well contamination. Residents exposed to the maximally detected off-site concentration of TCE (220 ppb) have a low increased risk for developing cancer. Those exposed to the TCE detected in the on-site wells (10,327 ppb) have a moderate increased**

risk for developing cancer. The actual concentration children or adults may have been exposed to may have been lower.

COMMENT NO. 31.

p. 41. Recommendations. First paragraph. The monitoring program for private well water supplies in the vicinity of Linemaster Switch Corporation was implemented at the request of DEP. Monitoring locations were selected based on technical considerations, including available sampling data and hydrogeologic characteristics of the site. The program has been modified as needed and all data generated is reviewed by the DEP. This program is sufficient to evaluate the extent of groundwater pollution in the vicinity of Linemaster Switch Corporation and assure residents in the area that they have a safe water supply. There is no technical justification for expanding the monitoring to include all wells within 1/2 mile of the site.

This recommendation should state "The private water quality monitoring program **currently in place should be continued**".

RESPONSE TO COMMENT NO. 31.

The recommendation has been changed, and includes the following wording: **The current well water quality monitoring program should continue. We understand that the current monitoring program has utilized various criteria for selecting wells for periodic sampling. Further, we understand that if wells previously not contaminated become contaminated confirmatory re-sampling will be conducted, and if the contamination is above established drinking water criteria, treatment systems will be installed. Additionally, we understand that once previously uncontaminated wells become contaminated, the monitoring program will be expanded to include wells located downgradient from the Linemaster Switch site.**

PUBLIC COMMENTS RECEIVED FROM THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

GENERAL COMMENTS:

The document is well written and provides valuable historical past-exposure pathway information. However, EPA does not completely agree with the conclusions of this Public Health Assessment. EPA is extremely concerned that no current data (that obtained from mid 1993-1995) was used for risk calculations and/or conclusions.

The 1992 Remedial Investigation/Feasibility Study, prepared by Fuss & O'Neill Inc. for the Linemaster Switch Corporation (Linemaster) was the primary document used by EPA in writing the Proposed Plan and the Record of Decision for the Linemaster Switch Corporation Superfund site. The ROD was signed by the EPA Regional Administrator July 21, 1993.

Since February 1992, Linemaster has been operating an Interim Removal Treatment System (IRTS). The purpose of this IRTS is to contain the contamination from Linemaster Switch on-site and away from all residential homes. Meanwhile, a design is being prepared to construct the Remedial Action that shall remediate the site to remove most of the contamination to levels that are not in risk of endangering human health or the environment. Though the IRTS has been in operation for nearly three years, this Public Health Assessment does not use any the current data generated from the IRTS evaluations.

EPA would like CT DPHAS to evaluate two documents prepared by Fuss & O'Neill for Linemaster prior to issuing the final Public Health Assessment. These are: 1) "Annual Monitoring Report, Interim Removal Action, Linemaster Switch Corporation, Woodstock, CT," dated November 1993 (this document contains data from the start-up through August 1993); and 2) "Second Annual Monitoring Report, Interim Removal Action, Linemaster Switch Corporation, Woodstock, CT," dated January 1995 (this document contains data from April 1992 - November 1994).

Historically, prior to the initiation of the IRTS, Trichloroethylene (TCE) was detected in several off-site residential water-supply wells including: an apartment complex, four residences, the Woodstock Town Hall, and a bookstore. All of the TCE detections were less than 5 ug/l (the Maximum Contaminant Level for TCE) except at the Town Hall. Granulated Activated Carbon (GAC) treatment systems were installed at all these locations. Since June 1992, TCE has been detected in one additional residence during two sampling events. Both of these concentrations, 0.8 ug/l (2/19/93) and 0.5 ug/l (8/10/93) were also well below the MCL of 5 ug/l, and TCE has not been detected at this location since August 1993. At the apartment complex, TCE was detected during September and December 1993 (0.60 ug/l), also below the MCL. At the Town Hall, TCE was detected at 0.60 ug/l during

September 1993, but since that event quarterly sampling has occurred without further detections.

Historical data does have value in demonstrating the magnitude of the past contamination at Linemaster. However, EPA does not feel that historical numbers derived from studies completed over four years ago are representative of current conditions. In addition, using the highest detected levels for all risk calculations in an effort to be ultra-conservative may not always be for the best. Specifically, the highest detected level of TCE in residential water-supply wells was selected from a water-supply well that is no longer in use (e.g., GW-12).

Residents were possibly exposed for nineteen years to contamination attributable to the Linemaster Switch Corporation. The historical analysis of past exposure pathways is quite valid. However, future risk scenarios should be made by using the most currently available data.

EPA does not support the conclusion that the well water quality monitoring program should be expanded to include all residential water-supply wells within 1/2 mile of the site. Both CT DEP and EPA have developed, with Linemaster, an extensive on-site and off-site sampling plan to ensure that both residents and Linemaster employees are protected from this risk of using contaminated well water. Forty-six domestic water-supply wells are monitored: five wells are monitored bi-monthly; twenty wells are monitored quarterly; nineteen wells are monitored semi-annually, and two wells are monitored annually. This sampling program was derived by several engineers and scientists based on past and current information.

RESPONSE TO GENERAL COMMENT:

The public health assessment examined data through December of 1992. The data used for the risk calculations and conclusions was based on past exposures. We will examine subsequent data in a future addendum.

We have altered our discussion of the exposure scenarios for TCE from contaminated wells. Please see the CT DPHAS **RESPONSE TO COMMENT NO. 27** (from the CT DEP), and the CT DPHAS **RESPONSE TO COMMENT NO. 30** (from the CT DEP).

See also the CT DPHAS **RESPONSE TO COMMENT NO. 31** (from the CT DEP) regarding the recommendation for the well water monitoring program.

SPECIFIC COMMENTS:

COMMENT NO. 1

p.iv List of Tables: Table 8 & Table 9 have their titles reversed.

RESPONSE TO COMMENT NO. 1.
This suggestion was incorporated as stated.

COMMENT NO. 2
p.1, paragraph 2: the paint shed no longer exists.

RESPONSE TO COMMENT NO. 2.
This suggestion was incorporated as stated.

COMMENT NO. 3
p.1, paragraph 2: Appendix B is the CT DPHAS drop in session memorandum. Please refer to figure 2 as being located Appendix C1.

RESPONSE TO COMMENT NO. 3.
This suggestion was incorporated as stated.

COMMENT NO. 4
p.2, paragraph 1, last sentence: Please change to read: "...Town Hall well, and three residential water supply wells have....."

RESPONSE TO COMMENT NO. 4.
This suggestion was incorporated as stated.

COMMENT NO. 5
p.2, paragraph 2: Please explain the IRTS as explained in the January 1995 "Second Annual Monitoring Report," as referenced above in the **General Comments**. Please use the current data to demonstrate the removal rates achieved to date.

RESPONSE TO COMMENT NO. 5.
This suggestion was incorporated as stated.

COMMENT NO. 6
p.2, paragraph 6: Please change to read: "CT DEP has identified another source of groundwater contamination that is not related to the Linemaster site..."

RESPONSE TO COMMENT NO. 6.
Wording that was similar to your suggestion was used.

COMMENT NO. 7
p.4, Third bullet: FYI: In June 1989, pursuant to a CT DEP Abatement Order, Linemaster removed the dry well. At that time, approximately, 1,000 gallons of hazardous liquid were removed from the well and disposed at a licensed hazardous waste storage facility. After the Removal Action, Linemaster filled the area with clean soils, placed a plastic barrier

over the soils in the Zone 1 area, and have spread bark mulch over the area.

RESPONSE TO COMMENT NO. 7.
The site description was based on observations made during the site visit on March 30, 1993. Thank you for the additional information.

COMMENT NO. 8
p.4, Fourth bullet: The air stripper is located due east of the manufacturing facility.

RESPONSE TO COMMENT NO. 8.
This suggestion was incorporated as stated.

COMMENT NO. 9
p.5, paragraph 2: Please check all references to the Appendices.

RESPONSE TO COMMENT NO. 9.
This suggestion was incorporated as stated.

COMMENT NO. 10
p.5, paragraph 2, reference to private residential wells: Please see EPA's **General Comments** above. An extensive monitoring program currently exists for these residents.

RESPONSE TO COMMENT NO. 10.
The monitoring program described above is now discussed in detail in the same page.

COMMENT NO. 11
p.6, paragraph 1: Please change to read: "...plans to begin installing sewer service in the vicinity of the site during the summer and fall of 1995.

RESPONSE TO COMMENT NO. 11.
Wording similar to your suggestion was incorporated into the document.

COMMENT NO. 12
p.9, paragraph 5: The IRTS was initiated on June 2, 1992. In addition, the current data from the 1995 IRTS report shows that some of the water levels in some till and shallow bedrock wells have decreased. Please review this report.

RESPONSE TO COMMENT NO. 12.

The public health assessment examined data through December of 1992. The June date was added to the document. We will examine subsequent data in a future addendum.

COMMENT NO. 13

p.12, paragraph 1: The ____ residence received their water from GW-12 only until 1992 when the IRTS was initiated. Currently, the ____ residence shares a treated water-supply well with the manufacturing facility (GW-08).

RESPONSE TO COMMENT NO. 13.

We have incorporated the suggested wording.

COMMENT NO. 14

p.17, paragraph 4: This paragraph is confusing. "site-related" in the last sentence refers to the Woodstock Public School site? Please clarify.

RESPONSE TO COMMENT NO. 14.

Your suggestion was incorporated into the following: All the wells that have been identified as contaminated were initially provided with bottled water and subsequently with granulated activated carbon filters.

COMMENT NO. 15

p.18, below Table 7: Please correct IRST to "IRTS."

RESPONSE TO COMMENT NO. 15.

This suggestion was incorporated as stated.

COMMENT NO. 16

p.20-22 Private Well Pathway: As mentioned above in the **General Comments**, please update the present and future exposure pathways by using the most current data available. Also, please use the word "may" when discussing past exposure pathways, for example: people may have been exposed, exposures may have occurred, homes may have received etc...

RESPONSE TO COMMENT NO. 16.

We have removed the present and future exposure scenarios from the completed exposure pathways section and included these exposures in the potential exposure pathways section.

The past exposure description remains unchanged. The wells were known to have been contaminated in the past. If people used any water from a contaminated well, then they were exposed to the contaminants. There is no uncertainty with regard to exposure status post utilization of water from a contaminated well.

COMMENT NO. 17
p.20, Table 8: Linemaster Switch is "On-site."

RESPONSE TO COMMENT NO. 17.
This suggestion was incorporated as stated.

COMMENT NO. 18
p.23, TCE - paragraph 1 (long): EPA does not agree with CT DPHAS and ATSDR using the value of 10,327 ug/l as the maximum concentration detected in residential water-supply wells. This number is not a reasonable number to use for a future exposure scenario. Not only has GW-12 not been in operation since 1992, but while it was in operation no off-site residents were ever exposed to this pathway. Please choose a different value that more accurately represents off-site conditions.

RESPONSE TO COMMENT NO. 18.
Please se the CT DPHAS **RESPONSE TO COMMENT NO. 27** (from the CT DEP).

COMMENT NO. 19
p.24, last paragraph: same as comment 18) above.

RESPONSE TO COMMENT NO. 19.
See RESPONSE TO COMMENT NO. 18.

COMMENT NO. 20
p.40, Conclusions, first paragraph: EPA agrees with the paragraph regarding past exposures, yet the sentence should reflect that only the residents who had contaminants in their well water were "the residents" who may have received exposures. It should also be explained that current pathways have been eliminated through the continued use of: 1) the IRTS; 2) the on-going residential water-supply well sampling program; 3) GAC filter systems, and; 4) on-going remediation efforts at the site. The Remedial Action to construct and begin operating the remedy shall begin July 1995.

RESPONSE TO COMMENT NO. 20.
We have incorporated much of your suggestion in the conclusion. However, the elimination of current and future pathways entails a conclusion with certainty that there will be no filter system failure. Since we are unable to provide this assurance, present and future exposures are not discussed.

COMMENT NO. 21
p.41, Recommendation #1: As mentioned earlier, EPA does not agree with this recommendation. There is no technical basis for this conclusion. However, there is a great deal of

technical analysis and deliberation that went into developing the existing monitoring program. Please re-consider this recommendation to reflect that the current and future monitoring programs are adequate.

RESPONSE TO COMMENT NO. 21.

Wording incorporating your suggestion was used instead of the original first recommendation.

PUBLIC COMMENTS RECEIVED FROM LINEMASTER SWITCH CORPORATION.

GENERAL COMMENTS

COMMENTS TO JANUARY 12, 1995 PUBLIC HEALTH ASSESSMENT

Linemaster Switch Corporation ("Linemaster") has reviewed the January 12, 1995 Public Health Assessment (the "Assessment"). While Linemaster is pleased to learn that cancer rate for the area are below the state average, it is troubled by flaws in a number of assumptions in the Assessment and with some of the recommendations and/or conclusions made in the Assessment. Significantly, the Assessment is based upon old data that does not reflect the effectiveness of the remedial action undertaken by Linemaster. As a result, the recommendation that the existing off-site groundwater monitoring plan be extended indefinitely and to all wells within one half mile of the Linemaster site is without justification. Linemaster questions the reliability of data used and the methodology of processing this data, as well as the scope of the Assessment.

RESPONSE TO INTRODUCTORY COMMENT

The CT DPHAS and the ATSDR have reviewed the assumptions used throughout this Public Health Assessment, and have classified the assumptions as based on valid scientific reasoning. Past exposures have been used throughout this document. This is not an assumption, but rather an incorporation of a known fact.

The conclusions drawn for this health assessment are determined by the availability and reliability of the referenced information and it is assumed that adequate quality assurance and quality control measures were followed with regard to chain of custody, laboratory procedures, and data reporting.

The scope of the work required for the Public Health Assessment is specified in CERCLA as amended in 1986:

"The 1986 Superfund Amendments and Reauthorization Act (SARA) to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) directs the Agency for Toxic Substances and Disease Registry (ATSDR) to perform specific public health activities associated with actual or potential exposure to hazardous substances released into the environment. Among these activities, ATSDR was mandated to perform a health assessment by December 10, 1988, for each facility listed or proposed to be listed on the National Priorities List (NPL). ATSDR must conduct health assessments on all sites added to the NPL since October 17, 1986, within one year of being listed (or proposed for listing)."

(Source: U.S. Department of Health and Human Services Public Health Service Agency for Toxic Substances and Disease Registry. Public Health Assessment Guidance Manual. Boca Raton: Lewis Publishers. 1992.)

GENERAL COMMENT NO 1.

The Use of Old Data Misrepresents Current Conditions and Current Health Risks.

In general, the data that have been used to perform the assessment and upon which conclusions have been drawn are approximately three years out of date. Figures 7 and 8 from the attached Second Annual Monitoring Report for the Interim Removal Action ("IRA", the groundwater extraction and treatment system) demonstrate that the treatment system, during the more than two years that it has been operating, has successfully contained contaminant migration.

Figure 7 shows the inferred extent of TCE impact prior to the initiation of the IRA. Figure 8 shows the inferred extent based upon sampling conducted through August, 1994. Although the spatial distribution of TCE in the bedrock aquifer has retained its original shape, the concentration of TCE in most of the wells has been reduced as result of IRA operation.

The 100 ug/1 TCE contour initially extended south of the facility well, GW-08db, but by August, 1994 the contour had receded approximately 7600 feet toward the facility. To the northeast, the 100 ug/1 TCE concentration previously crossed Route 169, but at present even the 10 ug/1 contour is within the property boundary. Based upon a comparison with the extent of TCE present prior to IRA operation and current conditions, the data demonstrates that the remediation system is mitigating contaminant migration from the Linemaster site.

RESPONSE TO GENERAL COMMENT NO. 1

The CT DPHAS agrees that more recent data was not included in the Public Health Assessment before it went out for Public comment. However, this data does not change our assessment and conclusions of the site that it is a public health hazard. This conclusion is based on past exposures to VOC contaminated drinking water.

We will review more recent data in an addendum.

GENERAL COMMENT NO 2.

Current Monitoring Programs and Institutional Controls are Sufficient to Evaluate Contaminant Migration.

Since 1991, Linemaster has conducted an extensive program of off-site, domestic water-supply well monitoring. This program has been approved by both the Connecticut Department of

Environmental Protection ("DEP") and the United States Environmental Protection Agency ("EPA").

Linemaster currently monitors 47 off-site wells at frequencies ranging from bi-monthly to annually depending on location and analytical history. Periodically, at the request of individual homeowners, Linemaster has voluntarily sampled and analyzed wells not part of the regular program. Linemaster also has been responsive to providing information and, in some instances, special sampling events to facilitate property transfers. The success of the IRA supports a reduction in the frequency of sampling rather than an expansion of the extent of the monitoring area. Review of the data from the attached figures supports this conclusion.

Beyond remediation, Linemaster has taken affirmative steps to reduce the likelihood of any future exposures to the site. The Assessment should note that access to the Linemaster site is restricted by a fence surrounding the property and that the site is subject to various Institutional Controls and Deed Restrictions. Under a consent decree entered with the EPA, Linemaster is obligated to communicate with local agencies to evaluate any off-site activities which might affect the remedial action. Deed restrictions prohibit the use of untreated groundwater on-site for drinking water. Considering both the current remediation and Linemaster's affirmative steps, no further monitoring is necessary.

RESPONSE TO GENERAL COMMENT NO. 2

Please see RESPONSE TO COMMENT NO. 31 from the CT DEP.

GENERAL COMMENT NO 3.

The Assessment Reports on Risks Unrelated to the Linemaster Site.

Titling the Assessment "Linemaster Switch" is misleading because the report is not limited to the Linemaster site. Rather, the report goes well beyond the scope of any contamination that may be present at the site. Three of the four conclusions contained in the Assessment at page 40 do not concern Linemaster.

The Assessment addresses naturally occurring soil and groundwater contaminants which are not a result of any activities of Linemaster Switch.

For example, arsenic is discussed throughout the Assessment. The Assessment addresses historic soil or groundwater contamination which, although not naturally occurring, is traceable to other sources. For example, the MTBE and benzene contamination at the Woodstock public school is addressed. The Assessment also considers lead contamination caused by lead pipes in local homes. Again, this contamination is totally unrelated to the Linemaster Site in any way. Because

the Assessment goes well beyond the Linemaster site in terms of the types, sources, and location of contamination, the Assessment would more appropriately be entitled, "Public Health Assessment, Town of Woodstock."

RESPONSE TO GENERAL COMMENT NO. 3

As part of the health assessment process all sources of exposure that are identified during our investigation of Superfund sites in a specific town are presented in this document. As a rule the CT DPHAS does not withhold information from the public.

GENERAL COMMENT NO 4.

Conclusions in the Assessment are Internally Inconsistent.

Linemaster is puzzled by the Assessment's conclusion that certain historic pathways may be regarded as "complete" when a 1990 preliminary health assessment performed by the ATSDR concluded that "there was no evidence of current exposure and no ability to ascertain past exposures to TCE." Assessment at p.2. The fifth criteria of the pathway analysis (an exposed population) is not met because there is no evidence of actual exposure. Thus, the groundwater pathway, like the soil and indoor air pathways, should be regarded only as a potential pathway because there is no evidence of a population that was actually exposed. In light of this statement, the conclusion in the Assessment's summary on page V that "the site is a public health hazard" should be qualified in the summary noting the extensive assumptions used to reach that result, and the inherent limitations of such conclusion.

Further, throughout the pathways analysis, (pages 20-34), all references that persons "received" exposures should be changed to "may have received" to reflect the fact that past exposures can not be confirmed.

RESPONSE TO GENERAL COMMENT NO. 4

This document has incorporated additional information since the 1990 Preliminary Health Assessment. Please see RESPONSE TO GENERAL COMMENT NO. 1 and RESPONSE TO COMMENT NO. 16 (from the CT DEP).

SPECIFIC COMMENTS

SPECIFIC COMMENT NO. 1

Page v, 3rd paragraph: Fuss & O'Neill does not maintain the activated carbon filters.

RESPONSE TO SPECIFIC COMMENT NO. 1

This suggestion was incorporated.

SPECIFIC COMMENT NO. 2

Page 2, 2nd paragraph: As of August, 1994, 448 pounds of VOCs ("contaminants") have been removed.

RESPONSE TO SPECIFIC COMMENT NO. 2.

This suggestion was incorporated.

SPECIFIC COMMENT NO. 3

Page 5, 1st paragraph: The nearest off-site private residences are at least 50 feet from the Linemaster property line, not 25 feet.

RESPONSE TO SPECIFIC COMMENT NO. 3.

The closest residence, as depicted in figure 1-2 from Fuss & O'Neil (1992), is approximately 25 feet.

SPECIFIC COMMENT NO. 4

Page 12, 1st paragraph: There are only two on-site residential wells. GW 12 formerly served the _____ residence but was removed from service in 1991. In addition, water from GW-12 was not available to the general public. No public health risk existed due to the presence of TCE in that well. GW-09 served both the Linemaster owned residence at the corner of Route 169 and 171, and the former Restaurant at Bald Hill. The restaurant has been closed since October, 1994. The only detection of TCE in GW-09 above the Drinking Water Standard (5.0 ug/1) occurred in December, 1987 (7.2 ug/1). This detection was not confirmed by subsequent analyses.

RESPONSE TO SPECIFIC COMMENT NO. 4.

There are three on-site residential wells, GW-09, GW-10, and GW-36 (7). The public health assessment only examined data through December of 1992. We will examine subsequent data in a future addendum.

SPECIFIC COMMENT NO. 5

Page 21, 1st paragraph: The detection of GW-44 was the result of an elevated detection limit. This detection was not confirmed by subsequent analyses.

RESPONSE TO SPECIFIC COMMENT NO. 5.

We will examine subsequent data in a future addendum.

SPECIFIC COMMENT NO. 6

Page 22, Indoor Air Pathways: There is no inhalation exposure to VOC exposure to VOC vapors (sic) possible because the Linemaster facility does not have a basement. Also, since the initiation of the groundwater extraction and treatment system, there have been no new detections of TCE in off-site wells. In addition, as discussed above, the extent and magnitude of

the concentration of TCE in off-site wells has decreased to Not Detected in all but two wells.

RESPONSE TO SPECIFIC COMMENT NO. 6.

The Indoor Air Pathway section no longer discusses present or future exposures to VOC vapors in the facility's non-existent basement.

SPECIFIC COMMENT NO. 7

Page 23, TCE: The assumption used in the Assessment for the potential for adverse health effects result in misleading conclusions. The concentration of TCE selected (10,327 ug/L) was detected in GW-12 in December, 1987. Analyses conducted over the entire seven year period of monitoring yield an average concentration of 5,600 ug/L. The next highest concentration detected was 6,897 ug/L in October, 1988.

The Assessment used a child's body eight (sic) of 10 kg (22 pounds). The EPA's default value is 15 kg (33 pounds). Recalculation of the exposure using the average TCE concentration yields 0.56 mg/kg/day which is below the MRL of 0.7 mg/kg/day. Use of the 15 kg child's weight with a TCE concentration of 10,327 ug/L, yields an exposure value of 0.69 mg/kg/day which also is below the MRL. Consequently, the health risks to children are overstated with the assumptions used.

RESPONSE TO SPECIFIC COMMENT NO. 7.

The ATSDR default child weight is 10 kg. Therefore, the 10 kg body weight was used.

SPECIFIC COMMENT NO. 8

Page 24, last paragraph: The Connecticut DPHAS recognizes that the carcinogenic classification of TCE was withdrawn by the EPA on July 1, 1994 and is under review by an EPA work group. It is likely that TCE will be downgraded from Class B2 (probable human carcinogen, inadequately supported by human health data) to Class C (possible human carcinogen). Both the oral RfD (August 1, 1992) and the inhalation RfC values are also under review by EPA. Risk, if any, calculated for exposure to TCE is based upon outdated, and possibly incorrect, toxicological data.

Linemaster appreciated the opportunity to comment on the ATSDR report for the Woodstock area.

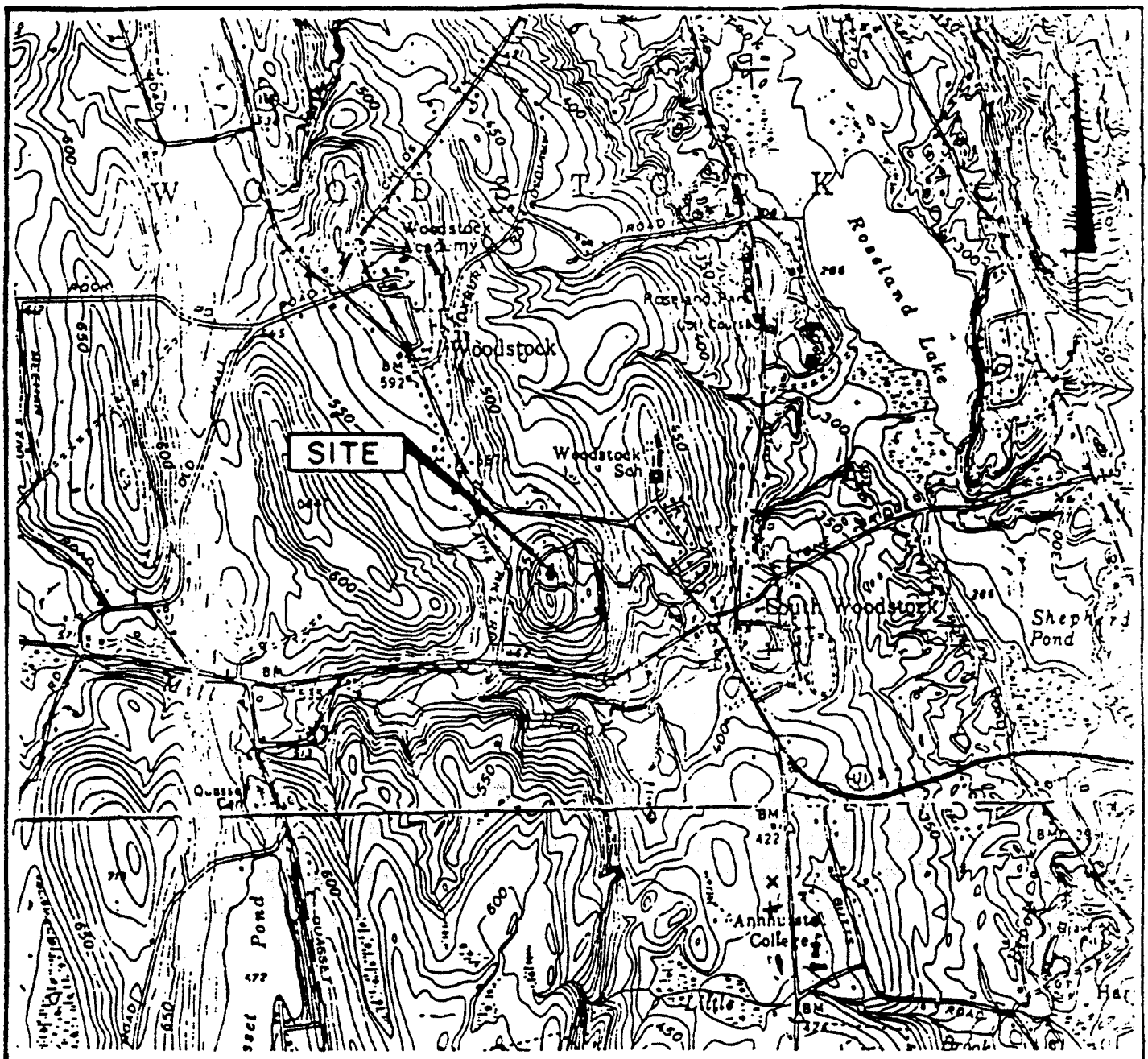
RESPONSE TO SPECIFIC COMMENT NO. 8.

Although the values you are referring to were removed from the EPA's Integrated Risk Information System (IRIS), the calculations for non-cancerous health effects were based on data supplied from the ATSDR. Additionally, the Superfund Technical Support Center, Environmental Criteria and

Assessment Office (ECAO) of the EPA provided quantitative risk estimation parameters for TCE (37).

The CT DPHAS and the ATSDR thank you for submitting comments on the Linemaster Public Health Assessment.

Appendix A: Site Location Map



MAP SOURCE :
UNITED STATES GEOLOGICAL SURVEY TOPOGRAPHICAL MAP, PUTNAM QUADRANGLE, CONNECTICUT, 7.5 MINUTE SERIES, 1955. PHOTOREVISED 1970.

FIGURE NO. 1

FUSS&O'NEILL
MANCHESTER, CONNECTICUT

SITE LOCATION

LINEMASTER SWITCH CORP.
WOODSTOCK, CT.

PROJ. NO. 86-88 DATE: 2/20/90 SCALE: 1" = 2000'

APPENDIX B: State of Connecticut Department of Public Health and Addiction Services Memorandum to Residents and Concerned Citizens Living Near the Linemaster Switch Corporation Superfund Site.

STATE OF CONNECTICUT

DEPARTMENT OF HEALTH SERVICES

MEMO TO: Residents and Concerned Citizens Living Near the Linemaster Switch Corporation Superfund site.

FROM: Edith Pestana and Kenny Foscue, Epidemiologists
CT Department of Health Services, Division of Environmental Epidemiology and Occupational Health

DATE: April 14, 1993

The U.S. Environmental Protection Agency (EPA) and the Connecticut Department of Health Services have been investigating environmental contamination relating to the Linemaster Switch Corporation site in Woodstock. Citizens around the site have expressed concern about potential adverse health effects from this contamination. Our department is now working on a Public Health Assessment for this area as part of a cooperative agreement with the Agency for Toxic Substances and Disease Registry. The attached factsheet outlines what a Health Assessment is.

As the factsheet states, the community plays a key role in the Health Assessment process. Throughout this process we will ask you to share your health related concerns. The Health Assessment will address all of your health concerns in the context of what is known about the site.

We will be holding a drop-in session to provide you with an opportunity to talk one-on-one with a health assessor about your health concerns. All information is kept confidential.

DROP-IN SESSION

WHEN: Tuesday, April 27, 1993
WHERE: WOODSTOCK TOWN HALL
RT 169
WOODSTOCK, CT
TIME: 3:30 pm to 7:30 pm

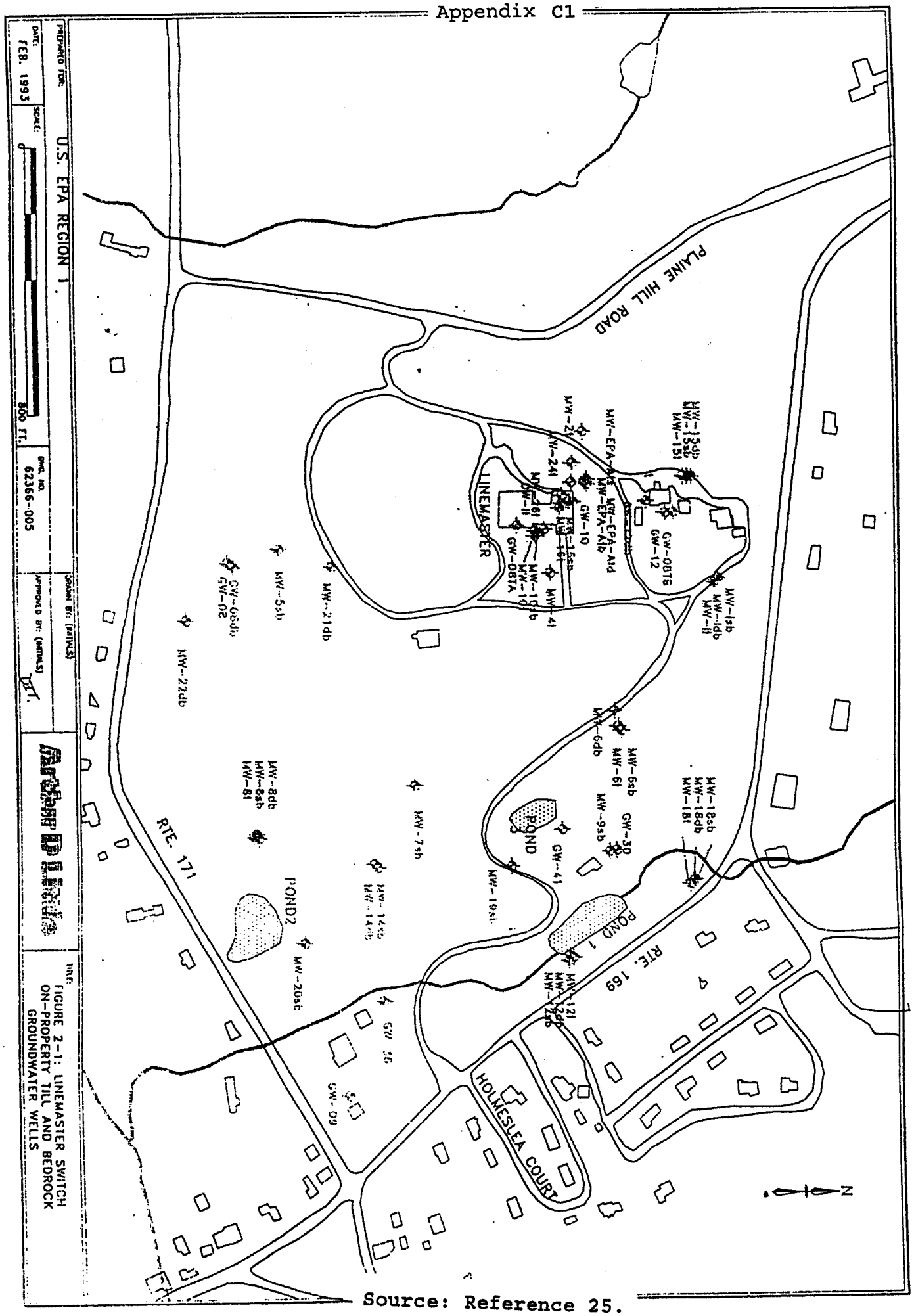
If you cannot attend this drop-in session and have concerns or questions, please call us at 566-8167. Comments can also be submitted to us in writing. Send them to:

CT Department of Health Services
EEOH
150 Washington St.
Hartford, CT 06106

You will also have an opportunity to comment after the Health Assessment is drafted. Each comment received will be addressed in the final document.

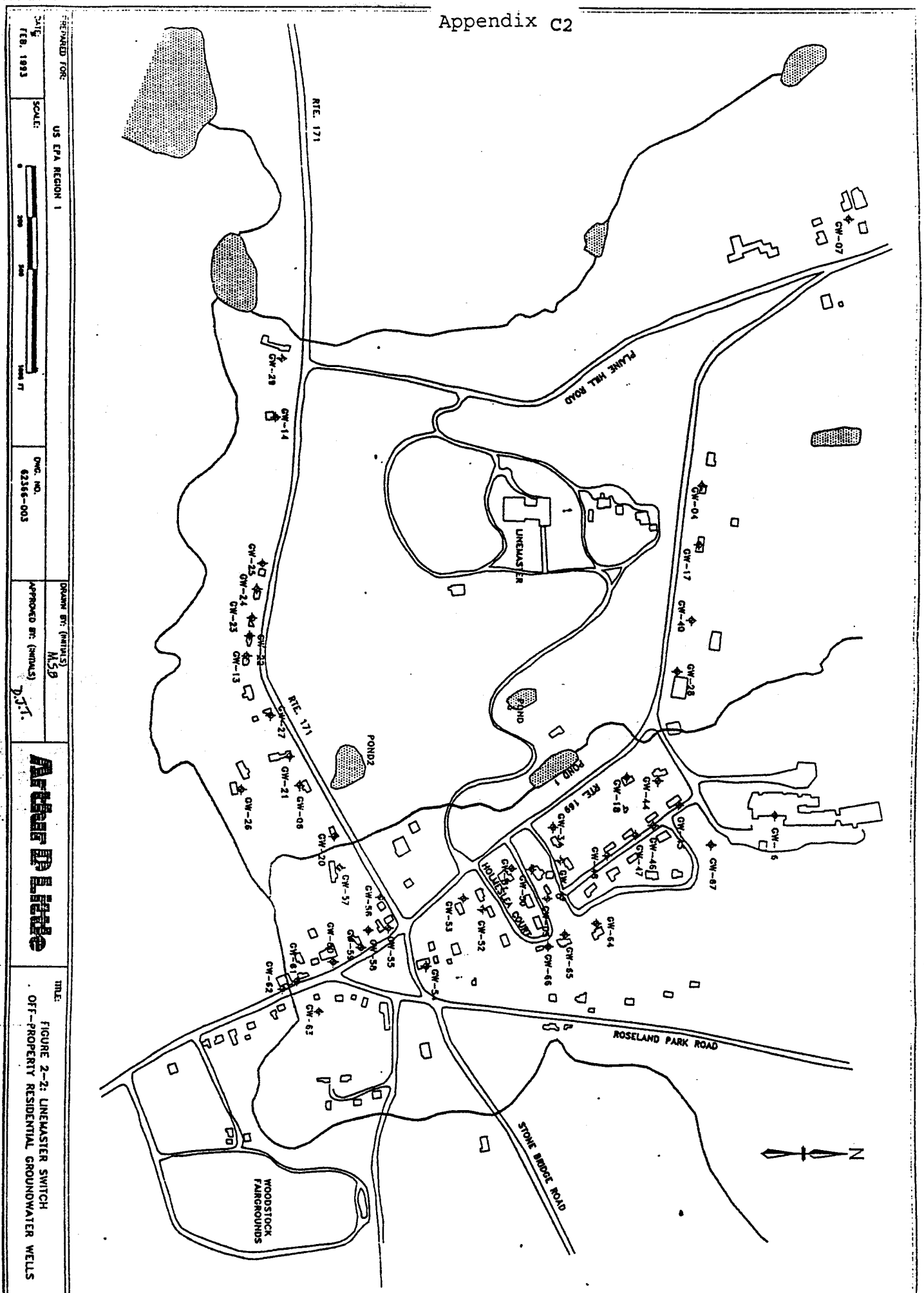
Phone:
150 Washington Street — Hartford, Connecticut 06106
An Equal Opportunity Employer

APPENDIX C1: On-Site Well Location Map



Source: Reference 25.

APPENDIX C2: Off-site Well Location Map



Source: Reference 25.

APPENDIX D: List of Acronyms Used in This Document

Appendix D - List of Acronyms used in this document

Acronym	Full Name
1,1-DCE	1,1-Dichloroethylene
95% CI	95% Confidence Interval
ATSDR	Agency for Toxic Substances and Disease Registry
BDCM	Bromodichloromethane
CNS	Central Nervous System
CREG	Cancer Risk Evaluation Guide
CT	Connecticut
DEP	Department of Environmental Protection
DNA	Deoxyribonucleic Acid
DPHAS	Department of Public Health and Addiction Services
EMEG	Environmental Media Evaluation Guide
EPA	United States Environmental Protection Agency
GAC	Granulated Activated Carbon
HARP	Health Activities Recommendation Panel
I.Q.	Intelligence Quotient
IRTS	Interim Removal Treatment System
kg	kilogram
LOAEL	Lowest Observed Adverse Effect Level
LTHA	Lifetime Health Advisory
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg	milligram
MRL	Minimal Risk Level
MTBE	Methyl Tertiary Butyl Ether
ND	None Detected
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
PCE	Tetrachloroethylene
PHAP	Public Health Action Plan
ppb	parts per billion
ppm	parts per million

Appendix D - List of Acronyms used in this document

Acronym	Full Name
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
RMEG	Reference Dose Media Evaluation Guide
RMEG-C	Reference Dose Media Evaluation Guide for Children
SIR	Standard Incidence Ratio
SVOC	Semivolatile Organic Compound
TCE	Trichloroethylene
TRI	Toxic Release Inventory
ug/M^3	Microgram per cubic meter
VOC	Volatile Organic Compound