

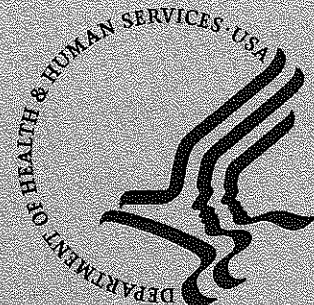
Public Health Assessment for

GRAND TRAVERSE OVERALL SUPPLY COMPANY
GREILICKVILLE, LEELANAU COUNTY, MICHIGAN

CERCLIS NO. MID017418559

JANUARY 21, 1994

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry



THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104 (i) (6) (F) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risks assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, this Health Assessment has been conducted using available data. Additional Health Assessments may be conducted for this site as more information becomes available.

The conclusions and recommendations presented in this Health Assessment are the result of site specific analyses and are not to be cited or quoted for other evaluations or Health Assessments.

PUBLIC HEALTH ASSESSMENT

**GRAND TRAVERSE OVERALL SUPPLY COMPANY
GREILICKVILLE, LEELANAU COUNTY, MICHIGAN**

CERCLIS NO. MID017418559

Prepared by

**Michigan Department of Public Health (MDPH)
Under a Cooperative Agreement with
Agency for Toxic Substances and Disease Registry (ATSDR)**

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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ATSDR and its Public Health Assessment

ATSDR is the Agency for Toxic Substances and Disease Registry, a federal public health agency. ATSDR is part of the Public Health Service in the U.S. Department of Health and Human Services. ATSDR is not a regulatory agency. Created by Superfund legislation in 1980, ATSDR's mission is to prevent or mitigate adverse human health effects and diminished quality of life resulting from exposure to hazardous substances in the environment.

The Superfund legislation directs ATSDR to undertake actions related to public health. One of these actions is to prepare public health assessments for all sites on or proposed for the Environmental Protection Agency's National Priorities List, including sites owned or operated by the federal government.

During ATSDR assessment process the author reviews available information on

- the levels (or concentrations) of the contaminants,
- how people are or might be exposed to the contaminants, and
- how exposure to the contaminants might affect people's health

to decide whether working or living nearby might affect peoples' health, and whether there are physical dangers to people, such as abandoned mine shafts, unsafe buildings, or other hazards.

Four types of information are used in an ATSDR assessment.

- 1) **environmental data**; information on the contaminants and how people could come in contact with them
- 2) **demographic data**; information on the ethnicity, socioeconomic status, age, and gender of people living around the site,
- 3) **community health concerns**; reports from the public about how the site affects their health or quality of life
- 4) **health data**; information on community-wide rates of illness, disease, and death compared with national and state rates

The sources of this information include the Environmental Protection Agency (EPA) and other federal agencies, state, and local environmental and health agencies, other institutions, organizations, or individuals, and people living around and working at the site and their representatives.

ATSDR health assessors visit the site to see what it is like, how it is used, whether people can walk onto the site, and who lives around the site. Throughout the assessment process, ATSDR health assessors meet with people working at and living around the site to discuss with them their health concerns or symptoms.

A team of ATSDR staff recommend actions based on the information available that will protect the health of the people living around the site. When actions are recommended, ATSDR works with other federal and state agencies to carry out those actions.

A public health action plan is part of the assessment. This plan describes the actions ATSDR and others will take at and around the site to prevent or stop exposure to site contaminants that could harm peoples' health. ATSDR may recommend public health actions that include these:

- restricting access to the site,
- monitoring,
- surveillance, registries, or health studies,
- environmental health education, and
- applied substance-specific research.

ATSDR shares its initial release of the assessment with EPA, other federal departments and agencies, and the state health department to ensure that it is clear, complete, and accurate. After addressing the comments on that release, ATSDR releases the assessment to the general public. ATSDR notifies the public through the media that the assessment is available at nearby libraries, the city hall, or another convenient place. Based on comments from the public, ATSDR may revise the assessment. ATSDR then releases the final assessment. That release includes in an appendix ATSDR's written response to the public's comments.

If conditions change at the site, or if new information or data become available after the assessment is completed, ATSDR will review the new information and determine what, if any, other public health action is needed.

For more information about ATSDR's assessment process and related programs please write to:

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SUMMARY

The United States Environmental Protection Agency (U.S. EPA) placed the Grand Traverse Overall Supply site on the National Priorities List (NPL) on September 8, 1983. The Grand Traverse Overall Supply Company (GTOS) is an industrial laundry service located in Greilickville, Michigan, a short distance northwest of Traverse City. From 1953 through 1977, GTOS disposed of waste water from the process in a dry well and four lagoons on their property. Since 1977, they have used the township sewer system. From 1968 to 1987, GTOS performed dry cleaning as well as conventional laundry services.

In 1978, tetrachloroethylene (also known as perchloroethylene or PCE) and trichloroethylene (TCE) were found in the water in wells serving a school adjacent to GTOS and several nearby residences. PCE is a solvent used in dry cleaning, and TCE can be formed when PCE breaks down in the environment. The PCE and TCE contamination was traced to GTOS, where the chemicals were also found in the soil around the dry well, in sludges, sediment, and water in the lagoons, and in waste water streams. The soil around the dry well was excavated and taken off-site for disposal. The lagoons were filled in, and covered with gravel or grass. The school and residents with contaminated wells used bottled water until their wells could be replaced by deeper wells drilled into an uncontaminated aquifer.

A contractor for the U.S. EPA carried out a Remedial Investigation at the site between 1988 and 1991. No significant contamination was found. It is presumed that the contamination in the soil and groundwater was flushed out of the area and into Grand Traverse Bay, 1,000 feet east of the site, over the time since the closure of the lagoons. The U.S. EPA proposes no further actions at the site.

The site currently poses no apparent public health hazard. Trace amounts of PCE in well water have been detected in the most recent testing, however, the amounts are below the level of public health concern. The site posed a public health hazard in the past due from exposure to PCE and TCE at levels of health concern in residential wells near the site. These exposures have been stopped by replacement of the wells. The Agency for Toxic Substances and Disease Registry's Health Activities Recommendation Panel concurred with the Michigan Department of Public Health that community health education should continue to address community health concerns. No other health follow-up actions are indicated at this time. We also are recommending additional sampling to confirm that significant contamination is no longer present in the shallow aquifer.

BACKGROUND

The United States Environmental Protection Agency (U.S. EPA) placed the Grand Traverse Overall Supply site on the National Priorities List (NPL) on September 8, 1983.

A. Site Description and History

The Grand Traverse Overall Supply Company (GTOS) is a commercial laundering facility, located at 10725 Cherry Bend Road, Greilickville, Michigan. The GTOS property covers approximately 3.9 acres on the north side of Cherry Bend Road, and extends to Cedar Creek, approximately 500 feet west of Michigan State Highway M-22. It is approximately 1.5 mile north of the northwest city limits of Traverse City, Michigan, in Elmwood Township, Leelanau County. See Figures 1 and 2 (Weston 1991, Figure 2-1) in Appendix A for the general site location. Figure 3 in Appendix A (Weston 1991, Figure 2-2) shows the site vicinity and nearby features. The site includes the GTOS property (marked by the dashed lines in Figure 3) and a lagoon used by GTOS on neighboring property to the west (Lagoon 1 in Figure 3).

GTOS constructed its building and began operations as a commercial laundry in 1953. Dry cleaning machines were installed in 1968 and were used until 1987. A dry well was used to collect waste water until 1955, when a seepage lagoon was constructed for that purpose. Other lagoons were constructed in 1961 and 1968. Non-contact cooling water from the dry cleaning machines was discharged into Cedar Creek, which empties into Grand Traverse Bay.

In 1976, GTOS requested a permit under the National Pollution Discharge Elimination System (NPDES) to discharge treated waste water from their plant into the ground and cooling water into Cedar Creek. Residents of the area wrote many letters to the MDNR in opposition to the permit, citing perceived degradation of the local environment — odors, bad taste in the groundwater, lowered quality of the surface water, and impact on the vegetation — attributed to past GTOS releases, which would be continued under the permit. The permit was not granted. The following year, the Township sanitary sewer system was completed into the area. The GTOS operators ceased using the lagoons and creek discharge and began discharging plant waste, including cooling water, to the Township sanitary sewer system.

In April 1978 the Michigan Department of Natural Resources (MDNR) discovered that groundwater in the area was contaminated with tetrachloroethylene (also known as perchloroethylene or PCE) and trichloroethylene (TCE). At least 10 private wells were found to be contaminated, including a well used by an elementary school adjacent to the facility. The school system immediately began trucking drinking water to the school from another school, and, in September 1978, a new well was drilled for the school into a deeper confined aquifer. A health advisory was issued by the Michigan Department of Public Health (MDPH) warning residents not to drink or cook with water from the contaminated wells. On-site lagoon sediments, dry-cleaning waste sludges, soil from the company dry

well, and wastewater and cooling water discharges all showed contamination with PCE. The lagoons were drained and filled with gravel in November 1979; however, it is unclear whether the lagoon sediments were excavated prior to filling. Three of the lagoons were converted to a gravel parking lot, the fourth was covered with soil and grass. Contaminated soils around the dry well were removed from the site as were barrels of waste sludge. Contaminated wells were capped and new wells were drilled into a deeper confined aquifer. The two households whose wells had the highest concentrations of contaminants had new, deeper, wells drilled in January and April 1980.

The MDNR performed a hydrogeologic investigation of the site in 1979 and 1980, including sampling of 35 private wells on and near the site, drilling 21 test wells to determine the groundwater flow direction, and sampling of soil from the dry well area and sediments from the lagoons and Cedar Creek (MDNR 1981). A contractor for the site owner sampled 4 nearby private wells and 15 test wells from the MDNR study in 1986 (G&M 1987). A contractor for the U.S. EPA began a Remedial Investigation/Feasibility Study (RI/FS) of the site in the summer of 1988. The final Remedial Investigation Report was issued in August 1991 (Weston 1991). On February 3, 1992, the U.S. EPA issued a Record of Decision that called for no further action at the site (EPA 1992).

The MDPH, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), released a Preliminary Health Assessment for the site on March 10, 1989 (MDPH 1989). The assessment concluded that the site was of potential public health concern due to possible past exposure to TCE and PCE through the groundwater. The assessment recommended that monitoring of area wells be continued and that water and sediment of Cedar Lake Outlet and Grand Traverse Bay be studied to establish whether they are contaminated. No health effects studies were recommended at that time.

The geology of the site area consists of 500 to 600 feet of glacial drift atop shale bedrock. The surface soil is sandy. Sand, with gravel lenses interbedded, underlies the surface to a depth of 50 and 60 feet below ground level. Below the sand is a 40 to 90-foot-thick layer of clay and clayey sand, and below this more sand and gravel. There are wells in the area at depths of 110 to 162 feet, without reaching the bottom of the lower sand layer. The deeper geology of the area is not completely known, though it is presumed to be further sand and clay layers down to the bedrock.

There are two aquifers of interest in the site area. The upper, unconfined aquifer is found at the water table, 10 feet below the surface at the site. The clay layer at 50 to 60 feet below the surface appears to act as an aquiclude, inhibiting vertical flow of groundwater and separating the water-table aquifer from a lower, confined aquifer in the lower sand layer, 110 feet or more below the surface. Deeper aquifers, if any, in the glacial drift are not used as a source of potable water. Neither are bedrock aquifers used in this area, because of the depth needed to drill. Beneath the 500 to 600 feet of glacial drift, there is at least 70 feet of shale above any potentially water-bearing bedrock.

B. Site Visit

Chuck Campbell and Brendan Boyle of the MDPH visited the site in July 1988 and observed the following: Behind the building, the site was flat, sparsely vegetated, with an unpaved employee parking lot where the lagoons had been located. There were no physical hazards observed. There is no fence around the site. There were some woods on the site border to the east and north. No waste storage areas were obvious. The area was not heavily populated, but some residences, Norris Elementary School, and other industries were observed near the site.

John Filpus of the MDPH visited the site on May 30, 1992. Filpus observed the site from Cherry Bend Road, and noted the proximity of the school building next to the site and the residences adjacent to the site on the west. Residences were also noted along M-22 highway to the north.

C. Demographics, Land Use, and Natural Resource Use

Based on data from the 1990 U.S. Census, approximately 11,200 people live within a 3-mile radius of the GTOS site. Summing the population in all census blocks that are more than one-half inside the 3-mile circle yields a total of 11,247 people. The majority of this population resides in Traverse City, as only 2,272 people live within the portion of the 3-mile circle in Leelanau County. The Leelanau-Grand Traverse County Line is approximately 1.5 miles south of the GTOS site. Elmwood Township has a population of 3,427, Traverse City 15,155 (also 1990 Census). The center of Traverse City is approximately 2 miles southeast of the site. The population in the area is more than 98 percent white, with 0.8 percent Native American, 0.5 percent Asian/Pacific Islander, 0.2 percent African American, and 0.2 percent other. The median age of the population residing within a 3-mile radius of the site is 35 years, that of the population in the two Census Block Groups adjacent to the site is 37 years. Approximately 27 percent of the population in the area is under 20 years of age, and 18 percent is over 60.

The nearest residence is approximately 250 feet south of the facility. The Norris Elementary School is located adjacent to the site to the east-southeast. The Elmwood Township Hall and Volunteer Fire Department are located directly across Cherry Bend Road from the GTOS property. The West Bay Covenant Church is approximately 400 feet southeast of the site. A dental office is located within 0.5 mile to the south of the site.

Cedar Creek, also called the Cedar Lake Outlet, flows west to east along the north boundary of the site. Cedar Lake is approximately 500 feet northwest of the site. The West Arm of Grand Traverse Bay is approximately 1,500 feet east of the site. Cedar Lake and Grand Traverse Bay are used for swimming, boating, fishing, and other recreational activities. A marina and restaurants are located approximately 1,000 feet to the southeast.

Because Greilickville has no municipal water system, all residences in the site area rely on private wells. The RI listed 37 private wells in the site area (shown on Figure 4 [Figure 2-10 from Weston 1991]). The GTOS facility has three wells, two shallow and one deep, between 100 and 300 feet south of the lagoons. The Norris Elementary School, whose property borders the GTOS property on the east, had two wells that showed contamination, and which were replaced by a deep well, all between 300 and 500 feet southeast of the lagoons. The nearest residential well is approximately 200 feet southwest (upgradient) of the lagoons, while the nearest downgradient residential well is approximately 600 feet southeast of the lagoons. The Traverse City municipal water supply uses water from Lake Michigan, with an intake on the East Arm of Grand Traverse Bay, approximately 5 miles southeast of the site. The Traverse City municipal water system is currently available to properties along M-22 south of Carter Road, approximately 1 mile south of the GTOS site.

D. Health Outcome Data

Staff of the local health department were asked whether they had received reports of an increase in illnesses in the area of the GTOS site. There have been no reports of illness from anyone associated with drinking the contaminated water. State and local health departments have not conducted health studies of the area or collected health information associated with the site because there have been no reports of illness that might be associated with the site. No health outcome databases were evaluated for this assessment.

COMMUNITY HEALTH CONCERNS

As described above in the Background section, residents of the area were very vocal in their opposition to the 1976 GTOS application for a discharge permit under the NPDES, because of the perceived threat to the environment and aesthetics of the area. Complaints about the taste and odor of water at the school adjacent to the GTOS site led to the investigation that resulted in the discovery of the contamination in the school's water supply and subsequent remedial actions at the GTOS site (described above in the Background section). In 1978, two families living near the site filed lawsuits against the owners and operators of GTOS over the contamination of their private wells. One of the suits also named the local school board as a defendant. The suits were settled in March 1981, with GTOS providing the two families with deeper wells drilled into the uncontaminated lower aquifer.

Complaints from the community about GTOS operations surfaced in 1988:

1. At a U.S. EPA-sponsored public meeting in 1988, several residents voiced complaints about odors arising from the GTOS property.
2. Also in 1988, staff at the Norris Elementary School reported that some of their students were occasionally suffering burning eyes and sore throats due to fumes apparently coming from the GTOS facility.

The other community concerns expressed did not explicitly refer to any potential health effect. Rather, the citizens sought to halt current or future exposure to the chemicals and to protect the aesthetics of the area from the odors from the site.

Local health department personnel report that there is currently little expressed community concern with the site.

A draft of this public health assessment for the Grand Traverse Overall Supply site was released for public comment on March 17, 1993. The public comment period lasted until April 16, 1993. No comments were received by the MDPH in this period. Additional comments and new information on the site will be considered by MDPH and ATSDR for future assessments of, or consultations on, the site.

ENVIRONMENTAL CONTAMINANTS AND OTHER HAZARDS

To identify facilities which might contribute to the environmental contamination in the area of the Grand Traverse Overall Supply site, the MDPH searched the Toxic Chemical Release Inventory (TRI) data base for 1987, 1988, 1989, and 1990. The U.S. EPA compiles the TRI from reports provided by industries. There were no entries for the GTOS in the TRI. The TRI contained entries for four other facilities with the same postal zip code (49684) as the GTOS site. Based upon their addresses, the facilities listed appear to be located three miles or more to the south or southeast from the GTOS site. The releases from these facilities are not likely to contribute to environmental contamination in the vicinity of the GTOS site.

Contaminants of concern at this site were selected from those chemicals for which the concentration in at least one environmental medium exceeded a health-based comparison value. Lifetime exposure to chemical concentrations at or below the appropriate comparison values for a chemical should not result in more than 1 case of cancer in 1 million people exposed or any increase in non-cancer health effects. Comparison values used in this assessment include:

ATSDR Environmental Media Exposure Guides (EMEGs)

ATSDR Cancer Risk Evaluation Guides (CREGs)

Concentrations computed from the U.S. EPA Reference Dose (RfD) for chronic exposure of a child, assuming pica behavior for soil ingestion

U.S. EPA Drinking Water Health Advisories (Lifetime)

U.S. EPA Safe Drinking Water Act Maximum Contaminant Levels

Pica behavior is an abnormal consumption of non-food materials, such as soil, most often seen in children under 5 years of age. If no comparison values for a chemical in a medium exist, or there is no CREG available for a carcinogen, the chemical is retained as a contaminant of concern.

Contaminants of concern at this site include boron, cis- and trans-1,2-dichloroethylene (1,2-DCE), tetrachloroethylene (PCE), and trichloroethylene (TCE).

Unless cited otherwise, environmental data in this section are taken from the RI report (Weston 1991). Another data source used (G&M 1986) listed 1,2-dichloroethylene concentrations without distinguishing between the two isomers.

A. On-Site Contamination

Groundwater

The GTOS facility has had 3 private wells on the site, of depths 52 feet, 140 feet, and 144 feet (RW-05, RW-04, and RW-06, respectively, on Figure 4). The MDNR installed 4 monitoring wells on the GTOS property for the 1979 site investigation (TW-08, TW-09, TW-10, and TW-14 on Figure 5 [Figure 2-9 from Weston 1991]). These wells were all in the shallow aquifer, screened 5 feet below the water table. The RI contractors added 1 more monitoring well, screened near the bottom of the shallow aquifer, on the GTOS site (MW-003 on Figure 5). The maximum concentrations of contaminants of concern found in groundwater from on-site monitoring wells or from on-site water supply wells are listed in Table 1. RW-05 and RW-06 were sampled twice, with analysis for TCE and PCE, in May 1978, and RW-05 contained both PCE and TCE in both samplings, and RW-06 TCE only in both samplings. All three private wells and the MDNR monitoring wells were sampled in May 1979. RW-05 contained PCE, TCE, and a low level of boron, while RW-04 and RW-06 contained neither organic chemical and RW-04 contained a low level of boron. TW-9, TW-10, and TW-14 contained PCE, TW-10 and TW-14 also contained TCE, and all the monitoring wells contained boron (MDNR 1981). The PRP's contractor sampled TW-8, TW-9, and TW-10 in 1986 for analysis for VOCs (TW-14 was inaccessible). Only TW-10 contained any VOCs (G&M 1986). The RI contractors sampled the RW-04, TW-08, TW-09, TW-10, and MW-002 in 1990. RW-04 contained PCE and TW-10 contained TCE and both cis- and trans-1,2-DCE. The concentrations of TCE and PCE have dropped sharply since the first sampling, with maximum values of 390 and 11 ppb, respectively, to the latest, with maximum values of 1.7 and 0.08 ppb, again respectively.

The MDNR has expressed the opinion that the RI sampling of the groundwater was inadequate to delineate the extent of the contaminant plume. The MDNR particularly noted the absence of samples to evaluate possible vertical stratification of contamination within the aquifer (Eagle 1991).

Surface Water

In May 1978, the MDPH collected water samples from the non-contact cooling water and waste water streams from the GTOS plant. The cooling water streams contained up to 250,000 ppb PCE and 420 ppb TCE. The waste water stream to the sewer contained 14,000 ppb PCE and no detectable TCE (detection limit 3 ppb). Since the cooling water streams were supposedly non-contact, the MDPH informed the GTOS that one of their dry-cleaning machines apparently needed repair or adjustment. The MDNR collected a sample from the sanitary discharge on June 7, 1978, and found an estimated 10,000 ppb of PCE and 50 ppb TCE (MDPH 1978). Another sample from the discharge to the sanitary sewer collected on November 14, 1978, contained 300 ppb PCE and no detectable TCE (limit 1 ppb) (MDNR 1979).

The MDNR collected water samples from the lagoons in June 1978, and found up to 6,100 ppb PCE and no detectable TCE (limit 3 ppb) (MDPH 1978).

Sediment

The MDNR collected sediment samples from the lagoons on the GTOS site on November 14, 1978. Samples were collected at four locations in the lagoons, from the surface level and from 2 foot and 3 foot depths. The sampling method is not described in the available reference. An unquantified trace of PCE was found in one surface sample, no PCE in any other, and no TCE in any sample (detection limit 50 ppb) (MDNR 1979).

Soil

The MDNR collected 4 soil samples from the dry well on the GTOS site on May 22, 1979. Two samples contained over 10,000 ppb PCE (exact value not quantified), while none contained any detectable TCE (detection limit 500 ppb) (MDNR 1979).

No samples of surface soil (less than 3 inches deep) were collected for analysis during the RI. Since the lagoons had been filled and covered with either gravel or grass more than 10 years before the RI, it was thought to be unlikely that any surface soil contamination remained. During the RI investigation beginning in 1988, contractors collected 66 sub-surface soil samples (none shallower than 2 feet below the surface) from their monitoring well borings and from a series of borings into and around the old lagoon area and the dry well. Analysis of the samples found traces of PCE in 8 samples, but no chemicals at concentrations above comparison values for ingestion of soil (Table 2). The highest PCE concentration (3,500 ppb) was in a sample collected from a 2 to 3.5 foot depth in one of the lagoons. Only one sample from the area of the dry well contained any detectable PCE, an estimated 2 ppb in the shallowest sample, 7 to 9 feet deep.

The MDNR has expressed the opinion that the sampling of the lagoon area done during the RI was insufficient to adequately delineate the extent of contamination (Eagle 1991).

Air

After several citizens voiced complaints about odors from the GTOS property at a 1988 public meeting, the U.S. EPA sampled the air on the site for site-related chemicals. None were found.

B. Off-Site Contamination

Groundwater

In April and May 1978, water from the two wells (RW-08 and RW-09 in Figure 4) supplying the school immediately east of GTOS contained as much as 900 parts per billion (ppb) of TCE and 860 ppb of PCE. Water from the well serving the residence immediately to the east of the school (RW-10) contained as much as 740 ppb PCE and 600 ppb TCE (MDNR 1981).

Approximately 35 private wells near the site, serving residences, businesses, or public facilities, were sampled by the MDPH, MDNR, or the local health department between May and August 1978. Eighteen showed some contamination with PCE or TCE on at least one sampling, though only 10 showed contamination on return sampling. Thirty-two private wells near the site were sampled by the MDNR in May 1979, and four (RW-10, RW-34, and two which are not marked on Figure 4) contained TCE, RW-10, RW-34 and one of the others also contained PCE, and nine of the thirty-two contained low levels of boron (MDNR 1981). The PRP's contractor sampled four private wells in the deep aquifer near the site (RW-07, RW-11, RW-13, and RW-33) in 1986. RW-07 and RW-33 contained PCE (G&M 1986). The RI contractors sampled 27 private wells near the site in 1989 and 1990. According to available depth information (Appendix C in Weston 1991 and MDPH records), 8 of these were in the shallow aquifer, 6 were in the deep, and the depths of the others were unknown. The assignment of residential wells to the aquifers in Figure 4 is not consistent with the available depth information. Of the residential wells sampled, RW-23, RW-24, RW-30, RW-33 (deep), and RW-35 (shallow) contained PCE, and RW-30 also contained TCE and cis-1,2-DCE. Maximum concentrations of contaminants of concern found in water from residential wells near the site are listed in Table 3.

The MDNR drilled 17 monitoring wells into the shallow aquifer between the site and Grand Traverse Bay in 1979 (marked as TW-# in Figure 5), and sampled 10 of them (TW-01 through TW-07 and TW-11 through TW-13) for chemical analysis. All 10 contained some PCE and boron, though only TW-13 contained any TCE. There is no information on any analysis for 1,2-DCE (MDNR 1981). The PRP's contractor sampled 12 of the 17 wells (TW-11, TW-13, TW-15, TW-16, and TW-19 were inaccessible) in 1986 for analysis for VOCs. Seven (TW-1, TW-6, TW-7, TW-12, TW-18, TW-20, and TW-21) contained PCE, and four (TW-6, TW-7, TW-12, and TW-21) also contained TCE and 1,2-DCE (G&M 1986). The RI contractors drilled 8 additional monitoring wells into the shallow aquifer near the site (MW-# in Figure 5), including 2 upgradient (MW-001 and MW-002), and sampled 10 of the

MDNR wells (TW-01, TW-02, TW-03, TW-04, TW-05, TW-07, TW-12, TW-17, TW-18, and TW-20). MW-002, TW-07, and TW-12 contained TCE, TW-12 and MW-008 contained PCE, and MW-002 also contained cis-1,2-DCE. Maximum concentrations of contaminants of concern found in water from off-site monitoring wells are listed in Table 4.

Most of the MDNR monitoring wells, on- or off-site, were drilled to the top of the unconfined aquifer, with TW-03, TW-05, and TW-17 deeper by 5 feet. The RI monitoring wells, on- or off-site, were generally drilled to the bottom of the unconfined aquifer, with MW-002 at the top.

There has been a dramatic reduction in PCE and TCE concentrations from the early samplings. The extent of the contamination plume in the shallow aquifer also appears to have decreased dramatically. The 1979 and 1986 surveys found a broad plume of PCE extending from the site east-southeastward to and across M-22. The RI sampling found only scattered detections of PCE. The only PCE contamination found in monitoring wells during the RI in 1990 was in two neighboring wells in the southwest corner of M-22 and Cedar Bend Road, approximately 800 feet southeast of the lagoons (MW-008 and TW-12). One shallow residential well (RW-35), directly south of the GTOS site, also contained a trace of PCE, though a shallow well located between the three wells (RW-34) that contained PCE did not contain any. The 1979 survey found TCE in only 3 of 14 monitoring wells, two on-site and one as far downgradient as they sampled. In 1986, TCE and 1,2-DCE were found in many of the same monitoring wells that contained PCE. During the RI, only one monitoring well, TW-10, on the site, contained TCE, cis-1,2-DCE, and trans-1,2-DCE in both sampling rounds. An upgradient well (MW-002) contained both TCE and cis-1,2-DCE in one round of sampling, but neither in the second. TW-07 and TW-12 contained TCE in the second round only.

PCE has been detected sporadically at low levels in residential wells, including ones identified as reaching the deeper aquifer. RW-06, a deep well on the GTOS site, contained traces of PCE in 1978, neither RW-04 nor RW-06 did in 1979, and RW-04 did in 1990. The new deep well at the Norris school, RW-07, contained 1.5 ppb PCE in the 1986 sampling, and the deep well at a nearby church, RW-33, contained traces of PCE in both 1986 and 1990. Three other residential wells, RW-23, RW-24, and RW-30, whose depths are not known, also contained traces of PCE in 1990. Because RW-23 and RW-24 were located north of Cedar Creek and west of M-22, the contamination in those wells may not be related to the others. RW-30 contained the highest PCE concentration and the only detectable TCE or cis-1,2-DCE found in any residential well in 1990 and trace concentrations (none above comparison values) of a large number of other volatile organic chemicals which were not found in groundwater elsewhere in the site vicinity. This suggests that there may be a separate and localized source for at least some of the contamination in this well.

The MDNR has expressed the opinion that the RI sampling of the groundwater was inadequate to delineate the extent of the contaminant plume. The MDNR particularly noted

the absence of samples to evaluate possible vertical stratification of contamination within the aquifer (Eagle 1991).

Surface Water

The RI contractors sampled surface water from Cedar Creek upstream, adjacent to, and downstream from the GTOS site. Analysis of the samples for volatile organic chemicals found none of the contaminants of concern and no other chemicals at concentrations above comparison values.

Water from Grand Traverse Bay in the site area has not been sampled for site-related contamination. At this late date, though, it is unlikely that any site-related contaminants could be found in the Bay, since none are detectable in the groundwater or Cedar Creek. Volatilization and dilution would have reduced the concentrations of the major contaminants from the site below any level of detection.

Sediments

The MDNR collected sediment samples from Cedar Creek upstream from, adjacent to, and downstream from the GTOS site on November 2 and November 14, 1978. The first set of samples was tested for toxicity by exposing mayfly larvae collected from the Creek upstream of the site to the sediment samples. There was some apparent increase in mortality of mayflies exposed to the downstream samples, but there was also a high mortality in those exposed to the upstream samples, rendering the test inconclusive (MDNR 1978). The sediment samples collected on November 14, 1978, were analyzed for TCE and PCE, and none was found at or above a detection limit of 50 ppb (MDNR 1979).

The RI contractors collected samples of sediment from Cedar Creek locations upstream from, adjacent to, and downstream from the GTOS site. Analysis of the samples for volatile organic chemicals found none of the contaminants of concern. All samples, upstream and down, contained toluene, with a maximum concentration of 1.2 ppm (comparison value 400 ppm).

Sediment from nearby areas of Grand Traverse Bay has not been sampled for site-related contamination. At this late date, though, it is unlikely that any site-related contaminants could be found in the Bay, since none are detectable in the groundwater or Cedar Creek. Dilution would have reduced the concentrations of the major contaminants from the site below any level of detection.

C. Quality Assurance and Quality Control

In preparing this public health assessment, the MDPH relied on the information provided in the referenced documents and assumed that adequate quality assurance and quality control measures were followed with regard to chain-of-custody, laboratory procedures, and data

reporting. The validity of the analysis and conclusions drawn for this public health assessment is determined by the reliability of the referenced information.

Any quality assurance/quality control information reported with the data cited in this assessment are discussed with the data. The MDNR commented that much of the RI data had unfavorable quality assurance codes attached (Walker 1991). They specifically mention that mercury, silver, and vanadium were found at concentrations (with qualifications) potentially threatening public or environmental health, by MDNR standards. None of the levels of these metals cited, even if valid, exceed comparison values.

D. Physical and Other Hazards

No physical hazards exist and access to the site is not restricted.

PATHWAYS ANALYSES

To determine whether nearby residents are exposed to contaminants migrating from the site, ATSDR evaluates the environmental and human components that lead to human exposure. An exposure pathway contains five major elements: a source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and an exposed population.

An exposure pathway is considered a completed pathway if there is evidence that all five of these elements are or have in the past been present. A pathway is considered a potential pathway if one or more of these elements is not known to be or have been present, but could be or have been. An exposure pathway can be eliminated from consideration if one of the elements is not present and could never be present. The following sections discuss the most important exposure pathways at this site.

A. Completed Exposure Pathways

Records indicate that between 1968 and 1977, waste water containing PCE was discharged into the lagoons and dry well on the site. Sediment and sludges in the lagoons and dry well could have retained some of the PCE as the water seeped through them. Soil in the dry well area was removed in late 1979. It is not known whether sediments in the lagoons were removed when the lagoons were filled in late 1979. Recent sampling of subsurface soil in the lagoon area has found traces of PCE. Water percolating through the sediments could transport PCE into the groundwater in the shallow aquifer. Recent sampling of monitoring and residential wells near the site has found no significant contamination related to the site.

The GTOS management maintains that only PCE was used in their plant. The contamination found in on-site subsurface soils was primarily PCE with much lower concentrations of TCE. The TCE concentration in on-site wells was consistently higher than PCE, while downstream

wells showed TCE levels comparable to the PCE concentration. TCE and 1,2-DCE are common trace contaminants in commercial-grade PCE. Environmental degradation of PCE can produce TCE and 1,2-DCE. However, it is not clear that natural degradation or differences in groundwater mobility could have produced the change of relative concentrations seen in the site area.

People who have used wells drilled into the shallow aquifer east of the site for their household water supply after 1968 were exposed to the PCE, TCE, and 1,2-DCE in the groundwater through inhalation when the chemicals volatilized during household use of the water, through ingestion, and through dermal contact. When the contamination was identified in 1978, the residents were advised against further use of the groundwater. Eventually, all contaminated shallow residential wells were replaced with deeper wells.

Pupils, teachers, and staff at the elementary school east of the site between 1968 and 1978 were exposed to the contaminants in the groundwater by ingestion and dermal contact. This exposure was stopped soon after the contamination was discovered. The school temporarily switched to a bottled water supply and subsequently had a new well drilled into a deeper, uncontaminated aquifer.

B. Potential Exposure Pathways

Surface Water and Sediment

At the GTOS site, the shallow groundwater discharges into Cedar Creek or Grand Traverse Bay. PCE and degradation products in the groundwater could mix with the water of the Creek or Bay or settle into the sediments. People using the Creek or Bay for recreation may have been exposed to these chemicals by incidental ingestion or dermal contact. However, recent sampling failed to detect any of these chemicals at levels of health concern in the groundwater, the surface water or sediments of Cedar Creek. Through dilution and volatilization, the concentrations of the chemicals in the water of the Bay are expected to have been reduced to insignificant levels.

The water intake for the Traverse City's municipal water supply is located in the East Arm of Grand Traverse Bay, 5 miles on a straight line southeast of the GTOS site. However, this direct line crosses the base of the Old Mission Peninsula, which separates the two Arms of the Bay. The two Arms of the Bay are connected at the north end of the Old Mission Peninsula, approximately 20 miles north of both GTOS and the Municipal Water System intake. Hence, the site and intake are approximately 40 miles apart via water, and it is impossible for any contamination of the intake to be attributable to the site.

Groundwater — Deep Aquifer

When it is necessary to drill a well through a contaminated aquifer into a deeper, uncontaminated one, as was done for the replacement wells at this site, proper design

requires a casing on the well at least to the confining layer between the contaminated and uncontaminated aquifers and grouting to seal the hole where the well passes through the confining layer. The casing is to prevent contaminated water from being drawn into the well, while the grouting is to prevent migration of contaminated groundwater into the deeper aquifer. The records indicate that this was done properly at this site (MDNR 1981) but casings and grout can crack, resulting in contamination of the well and of the deeper aquifer. There are no indications that this has happened at this site. As mentioned earlier, recent sampling at the GTOS site has failed to locate continuing contamination of the shallow groundwater aquifer, so future cross-contamination should not occur.

Air

During the period of 1968 through 1977, when dry cleaning wastes had been discharged to the dry well and lagoons, volatilization of PCE and related contaminants may have resulted in off-site inhalation exposures at nearby residences or the adjacent school. No air monitoring was conducted until 1988, when citizens expressed concerns at a public meeting about odors associated with the site. Although no measurable levels of air contaminants were detected at that time, there is no way to evaluate prior conditions.

Surface soil

Contaminated soils from the dry well area were removed in 1979. Any contaminated materials remaining in the lagoons on the site are buried under the gravel used to fill the lagoons after they were abandoned, also in 1979. None of the exposure pathways relating to surface material — direct contact, incidental ingestion, inhalation of volatilized chemicals, fugitive dust — are currently possible.

PUBLIC HEALTH IMPLICATIONS

A. Toxicological Evaluation

Estimated exposure doses used for this assessment for residents using the contaminated groundwater at the site were computed based on an adult weighing 70 kilograms (154 pounds) and consuming 2 liters (2 quarts) of water per day, and a child weighing 10 kilograms (22 pounds) and consuming 1 liter (1 quart) of water per day. To evaluate the effects of inhalation of volatilized contaminants secondary to use, we have assumed 1 10-minute shower per day, with concentrations in air calculated from the normalized concentration for the reference shower modeled in Little 1992, Figure 5a, curve "A".¹

¹ Reference shower conditions: Shower volume 2,800 L, Bathroom volume 8,100 L, Water flow rate 13.7 L/min, Water temperature 40° C, Air exchange rate, for the shower 2.4 volumes per hr, for the bathroom 0.28 volumes per hr.

Students at the elementary school were assumed to weigh 30 kilograms (66 pounds), and to consume 0.25 liters (1 cup) per day of water at the school, attending 180 days per year. Adult teachers and staff were assumed to consume 0.5 liters (2 cups) per day of water at the school, over the same 180 days per year.

Minimal Risk Levels (MRLs), Reference Doses (RfDs), and Reference Concentrations (RfCs) are exposure levels below which it is not likely that any non-cancer adverse health effects will occur. MRLs are developed by the ATSDR, and RfDs and RfCs are developed by the U.S. EPA, based on data relating exposure to the chemicals to health effects in humans or laboratory animals. The derivation of MRLs, RfDs, and RfCs from the observed threshold exposures includes several safety factors, to allow for different responses between species and between individuals. These values may not be protective for individuals who are hypersensitive to chemical exposures, including the very young, the very old, individuals whose bodies are under stress from illness, and individuals who have an allergic response to the chemical.

Residents, both adults and children, who used the most contaminated residential well near the site could have ingested enough tetrachloroethylene (also known as perchloroethylene or PCE) to exceed the RfD. The estimated PCE concentration in the air in their showers might also have exceeded the MRL for inhalation on acute exposure. However, the residential exposures through ingestion or inhalation were not likely to exceed the doses at which health effects have been reported in the literature from studies on laboratory animals or workers. Individuals who are especially sensitive to the chemical may have experienced some effects, however. Only one residential well had documented PCE concentrations in excess of the health guidelines. Neither students nor teachers at the school were likely to have ingested enough PCE from the water to exceed the RfD, based on the highest concentration on record.

Inhalation of PCE at high concentrations for short periods of time may result in temporary sleepiness, dizziness, and lack of coordination. Longer-term exposure to PCE, either by inhalation or ingestion, has caused liver and kidney damage in some laboratory animals. Some laboratory animals who were exposed to PCE by inhalation or ingestion contracted liver cancer. The U.S. Department of Health and Human Services has determined that PCE may be reasonably anticipated to be a carcinogen. The available information on the chemical is not sufficient to predict whether the exposures at the site may cause cancer in the people exposed (ATSDR 1991a).

The most recent analysis of subsurface soil at the site found traces of PCE, but the concentrations found do not exceed comparison values for ingestion. Residential wells, including several in the deep aquifer, near the site have contained traces of PCE in recent samples. The levels found are much lower than those discussed above, and exposure is therefore unlikely to result in adverse non-cancer health effects.

MRLs and RfDs for trichloroethylene (TCE) are currently under extensive review. The exposures at the site did not exceed the doses at which health effects have been reported, however, individuals who are especially sensitive to the chemical may have experienced some transient effects. Inhalation of TCE at high concentrations for short periods of time may result in temporary sleepiness, dizziness, and lack of coordination. Longer-term exposure to TCE, either by inhalation or ingestion, has caused liver and kidney damage in some laboratory animals. Some laboratory animals who were exposed to this chemical by inhalation or ingestion contracted liver cancer. The U.S. EPA had classified trichloroethylene as a probable human carcinogen (U.S. EPA Class B2), but has withdrawn the classification pending further review (ATSDR 1991b).

Boron and 1,2-dichloroethylene, though present in the groundwater above comparison values, were not found in samples from residential wells or the school's well at levels of health concern.

B. Health Outcome Data Evaluation

Staff of the local health department have no reports or records of increased incidence of illness in the site area (Stanton 1992).

C. Community Health Concerns Evaluation

The site remediation and replacement of the contaminated wells has apparently addressed the citizen concerns. There have been no citizen concerns expressed about site-related groundwater contamination since then.

The 1988 complaints about odors and airborne contamination were addressed as follows:

1. **At a U.S. EPA-sponsored public meeting in 1988, several residents voiced complaints about odors arising from the GTOS property.**

The U.S. EPA responded by arranging for air monitoring and no measurable levels of air contaminants were detected. It is not possible to ascertain how much of the concern about the odors was due to aesthetic concerns or to concerns that the chemicals causing the odors might be unhealthy to inhale.

2. **Also in 1988, staff at the Norris Elementary School reported that some of their students were occasionally suffering burning eyes and sore throats due to fumes apparently coming from the GTOS facility.**

The Air Quality Division of the MDNR investigated the GTOS facility in response to these complaints. The MDNR investigation identified certain actions and materials used in the facility that might have contributed to the eye and throat irritation at the school. The company agreed to alter their operations to minimize the occurrence of these effects.

CONCLUSIONS

1. Presently, the Grand Traverse Overall Supply site poses no apparent public health hazard. Residents may be exposed to trace amounts of PCE in well water and potentially in Cedar Creek and Grand Traverse Bay, however, the amounts are below the level of public health concern. Exposure to contaminated groundwater via ingestion, dermal contact, and inhalation of volatilized organic compounds was the completed exposure pathway. Due to the remedial actions that have been carried out at the site and the replacement of shallow aquifer wells with deep aquifer wells, exposure to contamination at levels of concern has ceased.
2. The site posed a public health hazard in the past to residents who used water from the contaminated shallow aquifer. As noted in the Environmental Contamination and Other Hazards and Pathways Analysis sections above, human exposure to PCE and TCE occurred in the past for a period of unknown duration via ingestion, dermal contact, and inhalation from use of contaminated groundwater.
3. If information or data from subsequent investigations of the site become available which indicates a change from the current situation, MDPH and ATSDR will reconsider the public health implications of the site to the community.

RECOMMENDATIONS

1. Additional monitoring of the shallow aquifer is needed to confirm that contaminants are no longer present. This should include sampling at varying depths within the aquifer to evaluate possible stratification.

HEALTH ACTIVITIES RECOMMENDATION PANEL STATEMENT

A Health Activities Recommendation Panel convened by ATSDR and MDPH have evaluated the data and information developed for the Grand Traverse Overall Supply Public Health Assessment with respect to appropriate follow-up health activities. The panel determined that, although there are indications that human exposure to on-site and off-site contaminants has previously occurred, it may not be possible to accurately evaluate long-term health effects due to the small number of people who were exposed and to the unknown duration of exposure. The panel does not believe that follow-up health actions are warranted at this time. We recommend that the informational and educational activities included in the normal health assessment process should be continued at this site to address community health concerns.

PUBLIC HEALTH ACTIONS

The Public Health Action Plan (PHAP) for the Grand Traverse Overall Supply site contains a description of actions to be taken by ATSDR and/or the Michigan Department of Public Health (MDPH) at and in the vicinity of the site subsequent to the completion of this Public Health Assessment. The purpose of the PHAP is to ensure that this Public Health Assessment not only identifies public health hazards, but also 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 ATSDR and MDPH to follow up on this plan to ensure that it is implemented.

ATSDR will reevaluate and expand the Public Health Action Plan when needed. New environmental, toxicological, or health outcome data, or the results of implementing the above proposed actions and recommendations may determine the need for additional actions at this site.

Health Actions Planned

As mentioned earlier, no public health actions, other than the normal health assessment informational and educational activities, have been identified as necessary at this site at this time.

ATSDR and MDPH will cooperate with the appropriate state and federal agencies to pursue the implementation of the recommendations outlined in this public health assessment.

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CERTIFICATION

The Grand Traverse Overall Supply Company Public Health Assessment was prepared by the Michigan Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health assessment was initiated.


Technical Project Officer, SPS, RPB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health assessment and concurs with its findings.


Director, DHAC, ATSDR

REFERENCES

ATSDR. 1991a. Agency for Toxic Substances and Disease Registry, Toxicological Profile for Tetrachloroethylene, Update, Draft for Public Comment, October 1991.

ATSDR. 1991b. Agency for Toxic Substances and Disease Registry, Toxicological Profile for Trichloroethylene, Update, Draft for Public Comment, October 1991.

Eagle, D. 1991. Eagle, D., MDNR, letter to Valentin, P., U.S. EPA, June 21, 1991.

EPA. 1992. U.S. Environmental Protection Agency, Declaration for the Record of Decision, Grand Traverse Overall Supply Site, February 3, 1992.

G&M. 1987. Geraghty & Miller, Inc., Summary of Groundwater Investigations, Grand Traverse Overall Supply Company, February 14, 1987.

Little, JC. 1992. Applying the Two-Resistance Theory to Contaminant Volatilization in Showers, Environmental Science and Technology, 26(7), 1341-1349, July 1992.

MDNR. 1978. Michigan Department of Natural Resources, memo from R.C. Waybrant to E. Evans, Sediment toxicity evaluation, Cedar Lake Outlet, vicinity of Grand Traverse Overall Supply Co., December 8, 1978.

MDNR. 1979. Michigan Department of Natural Resources, Water Quality Division, A Biological Evaluation of the Cedar Lake Outlet near Traverse City, Michigan, February, 1979.

MDNR. 1981. Michigan Department of Natural Resources, Hydrologic Investigation at Grand Traverse Overall Supply Company, February, 1981.

MDPH. 1978. Michigan Department of Public Health, Notice of Unlicensed Activity, re: Grand Traverse Overall Supply, June 21, 1978.

MDPH. 1989. Michigan Department of Public Health, for ATSDR, Preliminary Health Assessment for Grand Traverse Overall Supply, March 10, 1989.

Stanton, M. 1992. Stanton, M., Grand Traverse County Health Department, telephone conversation, July 23, 1992.

Warner, BR. 1991. Warner, B.R., MDNR, memo to Eagle, D., MDNR, July 12, 1991.

Weston. 1991. Roy F. Weston, Inc., for U.S. EPA, Remedial Investigation Report, Grand Traverse Overall Supply Co., Greilickville, Michigan, August 1991.

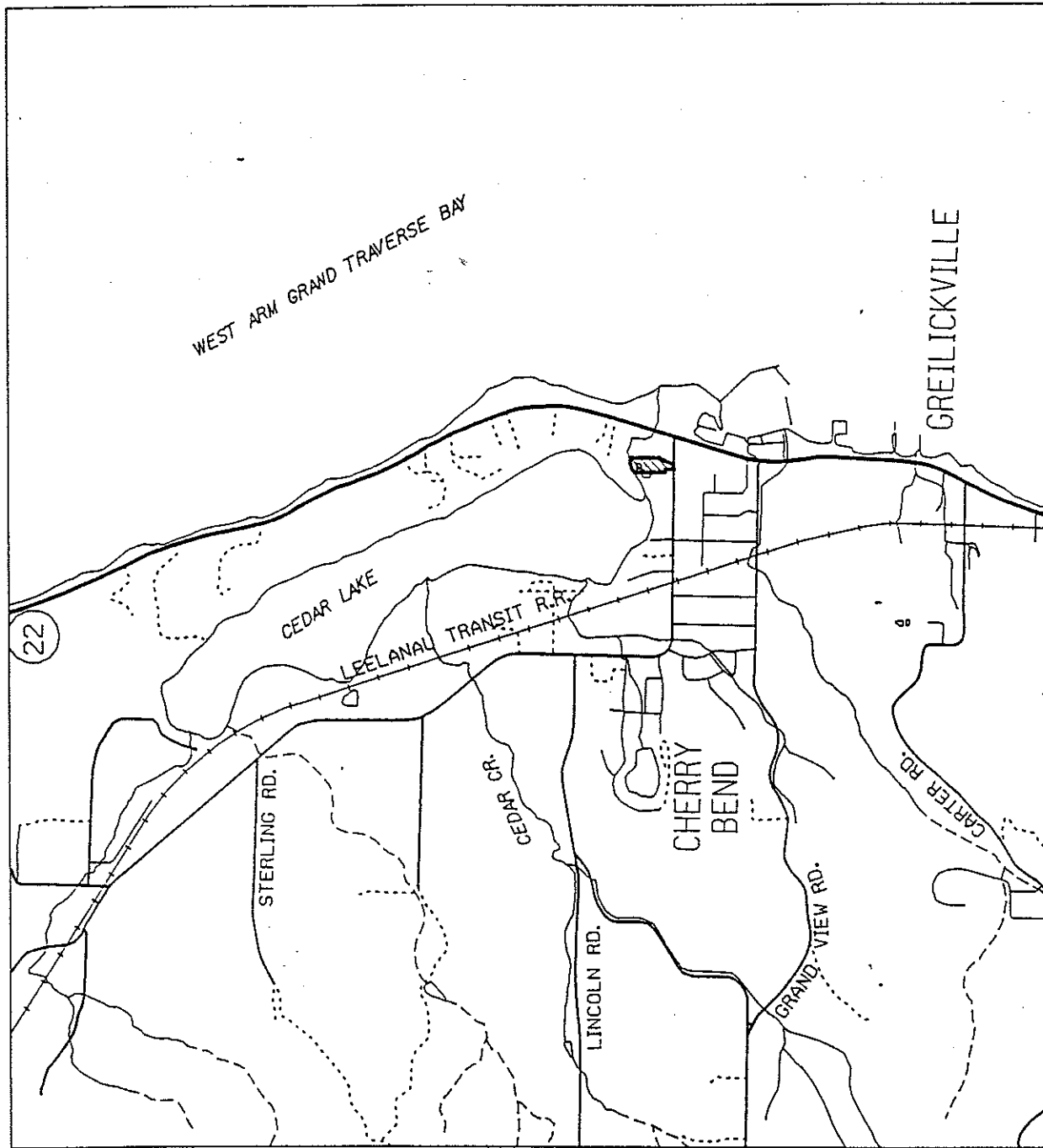
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FIGURES

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Figure 1.



GRAND TRAVERSE OVERALL SUPPLY



SITE LOCATION

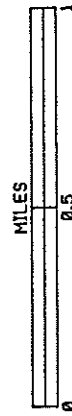
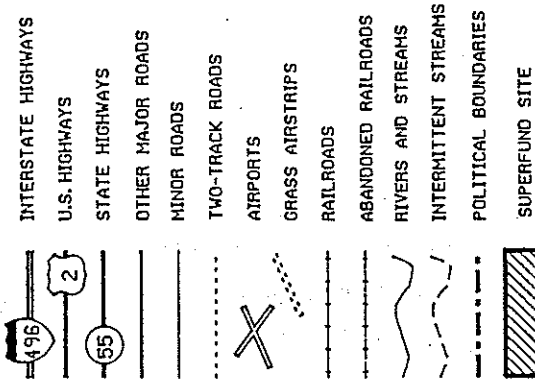


Figure 2.

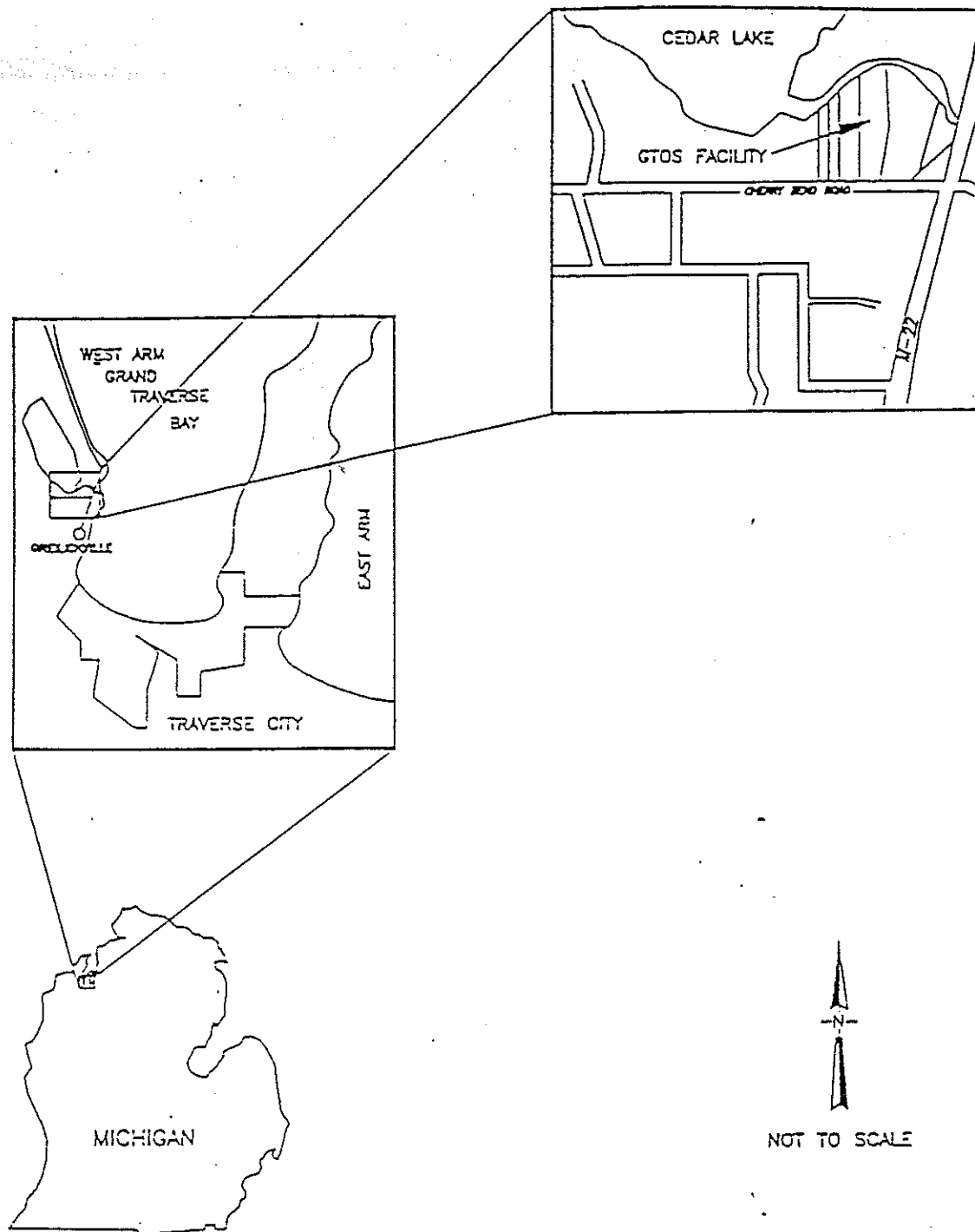
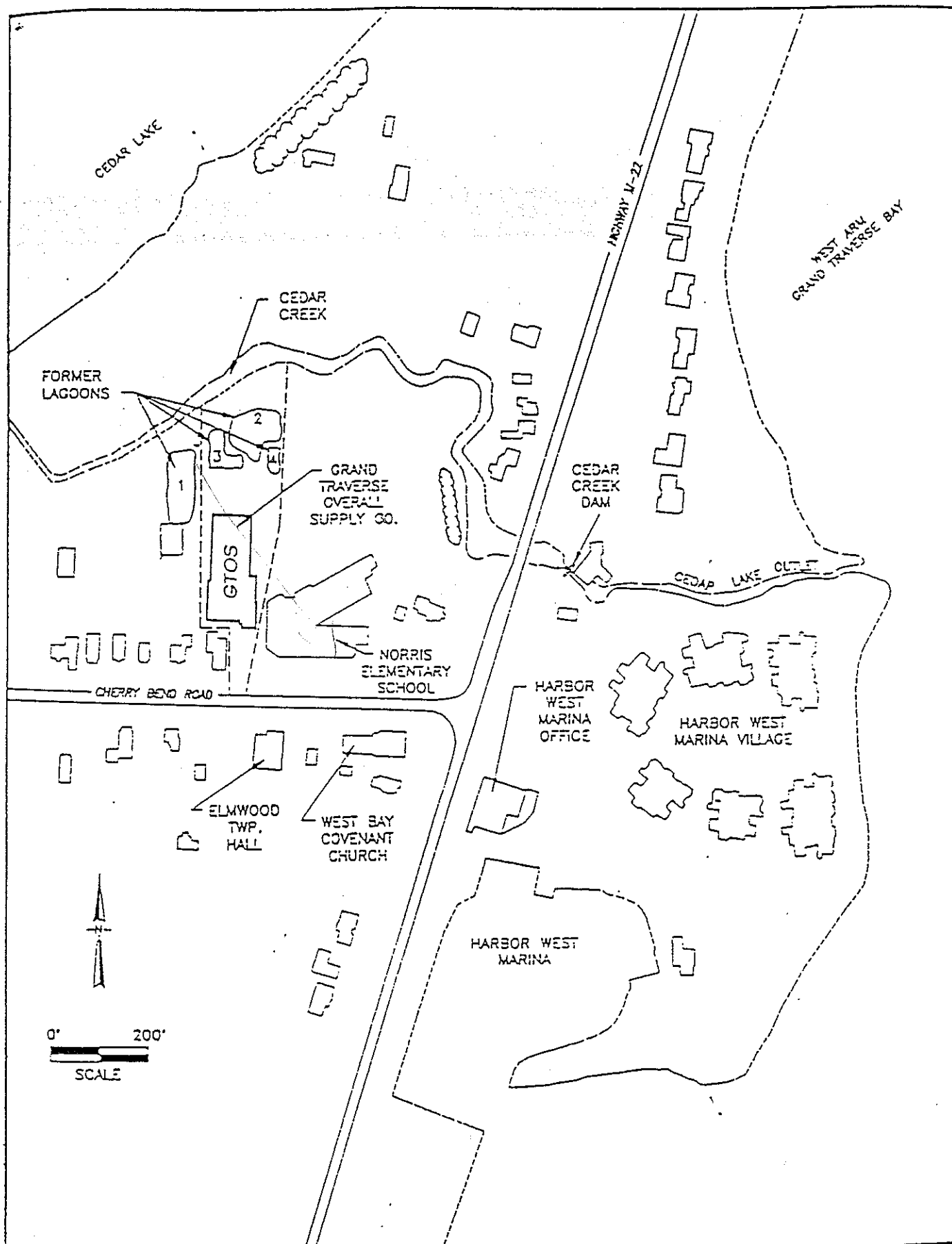


Figure 3.



ALTERNATIVE REMEDIAL CONTRACTING STRATEGY

U.S. EPA CONTRACT No. 58-W8-0089

WORK ASSIGNMENT No. 001-5L3G

DOCUMENT CONTROL No. 4500-01-ABMY

A-5

SITE LOCATION MAP

GRAND TRAVERSE OVERALL SUPPLY
Greilickville, Michigan

Figure 4.

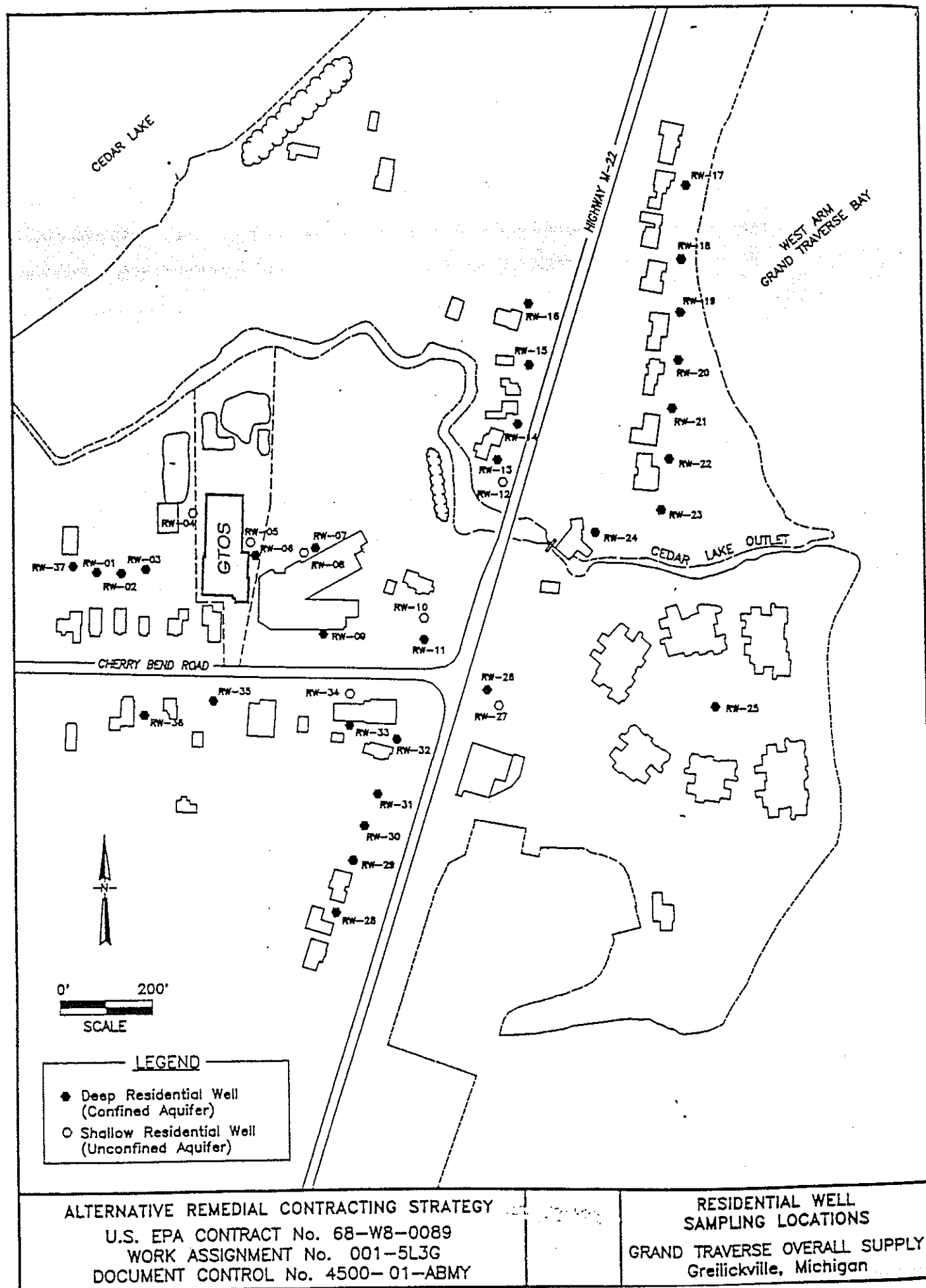
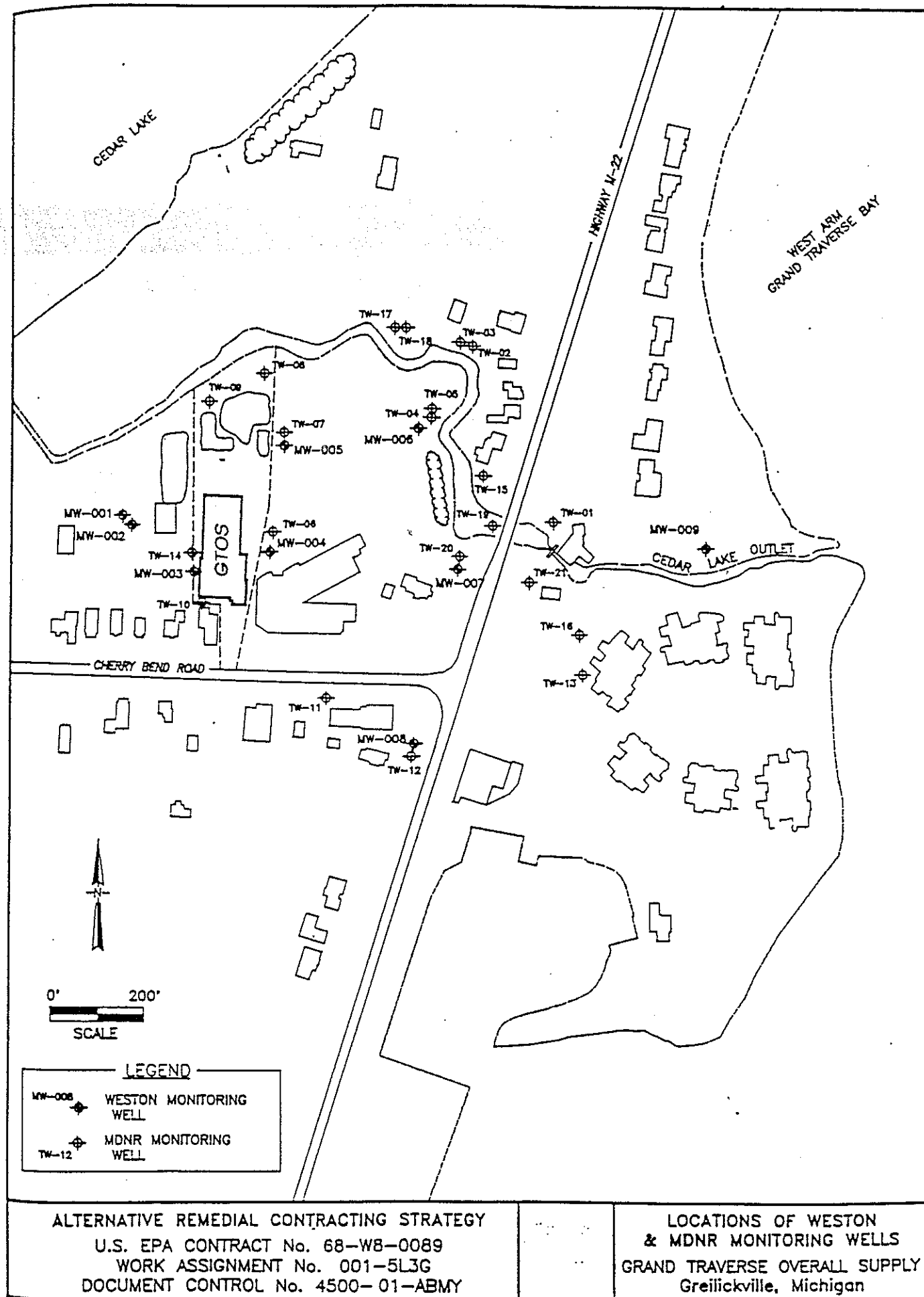


Figure 5.



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Table 1. Maximum concentrations of contaminants of concern found in water from on-site monitoring and supply wells at the GTOS site (MDPH 1981, G&M 1987, Weston 1991)

<u>Chemical</u>	<u>Maximum Concentration</u> (ppb)				<u>Comparison Value</u> (ppb)
	1978	1979	1986	1990	
TCE	390	90	18.2	1.7	5 ^M
PCE	11	5	5.5	0.08	100 ^R , NA ^C
1,2-DCE (total)	NR	NR	0.7	7.1 (c) 1.4 (t)	70 ^A (c) 200 ^R (t)
boron	NR	600	NR	NR	900 ^R

(c) — cis-1,2-DCE
(t) — trans-1,2-DCE

J — Estimated Value
NR — Not Analyzed For

Comparison Value Bases:

R — Concentration computed from U.S. EPA Reference Dose (chronic) by ingestion, assuming child consumption
A — U.S. EPA Drinking Water Health Advisory (Lifetime)
M — U.S. EPA Safe Drinking Water Act Maximum Contaminant Level
NA^C — Carcinogen (possible, probable, or proven), no Cancer Risk Evaluation Guide available

Table 2. Maximum concentrations of contaminants of concern found in sub-surface soil samples from on-site monitoring well borings and soil borings at the GTOS site (Weston 1991)

<u>Chemical</u>	<u>Maximum Concentration</u> (ppm)	<u>Comparison Value</u> (ppm)
TCE	ND	NA
PCE	3.5	20 ^R , NA ^C
1,2-DCE (total)	ND	NA (c) 40 ^R (t)
boron	NR	180 ^R

(c) — cis-1,2-DCE

(t) — trans-1,2-DCE

J — Estimated Value

ND — Not Detected

NA — None Available

NR — Not Analyzed For

Comparison Value Bases:

R — Concentration computed from U.S. EPA Reference Dose (chronic) by ingestion, assuming child consumption

A — U.S. EPA Drinking Water Health Advisory (Lifetime)

M — U.S. EPA Safe Drinking Water Act Maximum Contaminant Level

NA^C — Carcinogen (possible, probable, or proven), no Cancer Risk Evaluation Guide available

Table 3. Maximum concentrations of contaminants of concern found in water from residential wells near the GTOS site (MDPH 1981, G&M 1987, Weston 1991)

Chemical	Maximum Concentration (ppb)				Comparison Value (ppb)
	1978*	1979	1986	1990	
TCE	600	160	ND	0.14J	5 ^M
PCE	740	160	1.5	0.24J	100 ^R , NA ^C
1,2-DCE (total)	NR	NR	ND	0.07 (c) ND (t)	70 ^A (c) 200 ^R (t)
boron	NR	150	NR	NR	900 ^R

* Data from 1978 includes residential wells only. Norris Elementary School private wells contained up to 900 ppb TCE and 860 ppb PCE.

(c) — cis-1,2-DCE
(t) — trans-1,2-DCE

J — Estimated Value
NR — Not Analyzed For
ND — Not Detected

Comparison Value Bases:

R — Concentration computed from U.S. EPA Reference Dose (chronic) by ingestion, assuming child consumption
A — U.S. EPA Drinking Water Health Advisory (Lifetime)
M — U.S. EPA Safe Drinking Water Act Maximum Contaminant Level
NA^C — Carcinogen (possible, probable, or proven), no Cancer Risk Evaluation Guide available

Table 4. Maximum concentrations of contaminants of concern found in water from off-site monitoring wells near the GTOS site (MDPH 1981, G&M 1987, Weston 1991)

<u>Chemical</u>	<u>Maximum Concentration</u> (ppb)			<u>Comparison Value</u> (ppb)
	1979	1986	1990	
TCE	1	24.8	3.J	5 ^M
PCE	4	30.8	3.3	100 ^R , NA ^C
1,2-DCE (total)	NR	85.2	2. (c) ND (t)	70 ^A (c) 200 ^R (t)
boron	1,750	NR	NR	900 ^R

(c) — cis-1,2-DCE

(t) — trans-1,2-DCE

J — Estimated Value

NR — Not Analyzed For

Comparison Value Bases:

R — Concentration computed from U.S. EPA Reference Dose (chronic) by ingestion, assuming child consumption

A — U.S. EPA Drinking Water Health Advisory (Lifetime)

M — U.S. EPA Safe Drinking Water Act Maximum Contaminant Level

NA^C — Carcinogen (possible, probable, or proven), no Cancer Risk Evaluation Guide available

RESPONSIVENESS SUMMARY

A draft of this public health assessment for the Grand Traverse Overall Supply site was released for public comment on March 17, 1993. The public comment period lasted until April 16, 1993. No comments were received by the MDPH in this period. Additional comments and new information on the site will be considered by MDPH and ATSDR for future assessments of, or consultations on, the site.