2024

WICKES MANUFACTURING TRICHLOROETHYLENE (TCE) PLUME

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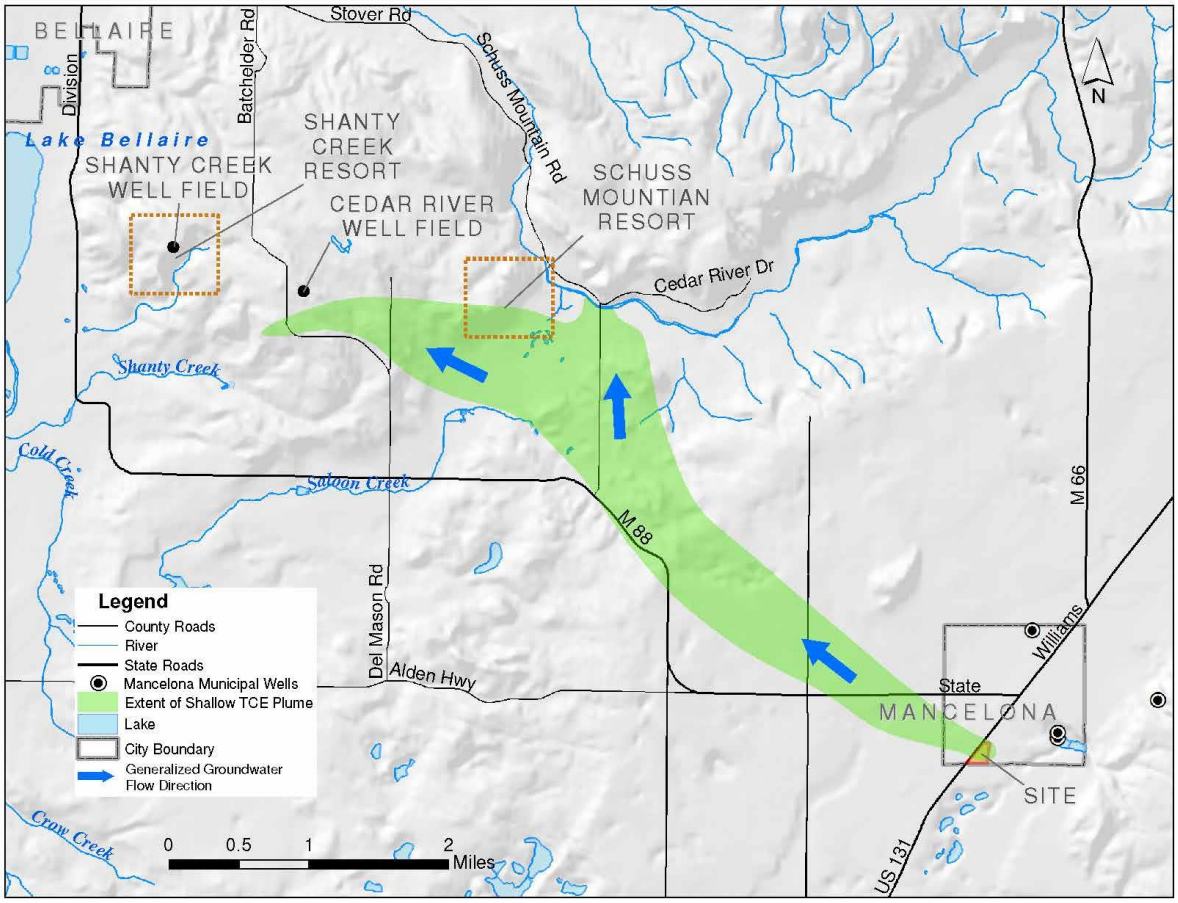

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HEALTH DEPARTMENT of Northwest Michigan

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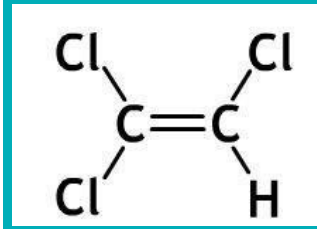
FACT SHEET 1 - TRICHLOROETHYLENE

WHAT IS TCE?

TCE is a manmade substance that was first produced in the U.S. in about 1925. TCE was once used as an anesthetic for surgery and was used as a dry-cleaning solvent until the 1950s. TCE was widely used as a metal parts degreaser and as an industrial cleaner.



TCE is composed of carbon (C), chloride (Cl) and hydrogen (H). It is a colorless liquid that evaporates quickly in the air and dissolves in groundwater. TCE quickly dissipates to the air when it reaches surface water such as a stream, wetland or lake.

If there is a release of TCE into the air, soil, or groundwater, the rate it dissipates varies. When TCE is released into the air, it breaks down quickly. When TCE is released into soil or groundwater, it breaks down slowly. Once TCE enters groundwater, it may remain for a long time, since it cannot readily evaporate. TCE does not build up or bio-accumulate significantly in plants or animals.

WHAT ARE THE HUMAN HEALTH RISKS OF TCE?

TCE is a known human cancer-causing agent. Long term exposure can adversely affect liver, kidney, immune system and/or central nervous system function. Effects of TCE can result from low-level exposure over long periods of time (many years) or over short time frames at high concentrations.

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HOW DOES EXPOSURE OCCUR?

Exposure to TCE occurs when:

- TCE contaminates drinking water supplies,
- TCE vents to surface water, and/or
- TCE vapors enter buildings.

These exposure routes are called pathways. When looking at exposure to humans and/or the environment, all pathways are investigated to determine which are complete. A complete pathway means TCE has contaminated the water and/or air and there is the potential for exposure to the TCE. A pathway is not complete if there is a physical or other barrier that prevents exposure.

WHAT LEVELS OF TCE ARE SAFE?

Toxicology studies have established levels of TCE that are protective to humans and the environment. These studies are based on levels measured in parts per billion (ppb). For instance, 1 ppb is equal to 1 gallon of TCE dissolved in 1 billion gallons of water. Based on these scientific studies, the following maximum safe, allowable levels have been established for groundwater:

- TCE in drinking water is safe below 5 ppb.
- TCE in groundwater below 200 ppb can safely flow into or vent to surface water, such as rivers, lakes or wetlands.
- TCE dissolved in groundwater at levels as low as 0.07 ppb to 6.1 ppb at the water table are used to assess whether additional investigation of the vapor exposure pathway is warranted.

The primary pathway of unacceptable exposure risks from the TCE release at the former Wickes Manufacturing Plant are drinking water and soil vapors. There are no known exposure risks related to TCE at the resorts in the area (e.g., snow making, irrigation water, etc.).

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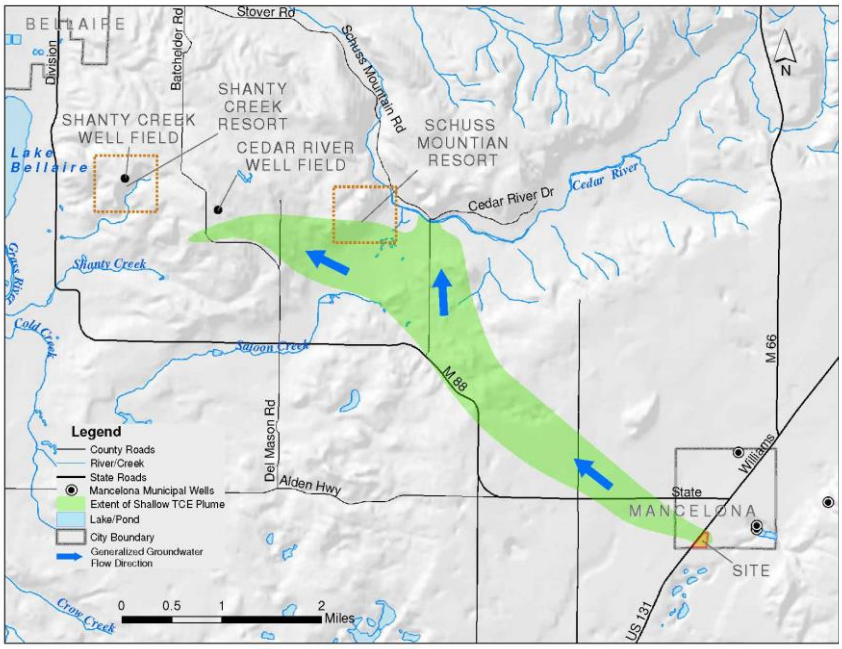
FACT SHEET 2 – TCE IN GROUNDWATER IN ANTRIM COUNTY

HISTORY

Mount Clemens Industries, Inc., later known as Wickes Manufacturing, used TCE in vapor degreasers as part of the manufacturing of auto parts in Mancelona from 1947 to 1967. Waste containing TCE was discarded on the ground and in lagoons, where it seeped through the soil and became dissolved into the groundwater. Both companies went out of business many years ago. As a result, EGLE funds have been allocated to address the TCE in groundwater.



EARLY RESPONSE

In order to prevent exposure to TCE in residential wells in the Mancelona area, EGLE worked with the community to found and fund the Mancelona Area Water and Sewer Authority (MAWSA). MAWSA operates the public water system that now provides safe drinking water to residences affected by TCE.

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WHAT WE KNOW

There is residual TCE left in the soil, soil vapors and groundwater at the former Wickes Manufacturing Plant.

TCE moves from the former Wickes Manufacturing Plant in Mancelona through two townships, under Schuss Mountain Resort, and is now moving toward Shanty Creek Resort and Lake Bellaire. Some TCE also enters the Cedar River.

TCE in groundwater extends approximately 6.5 miles and is up to 1.5 miles wide. TCE has been detected in groundwater in some locations as deep as 500 feet below the ground. The exact depth of TCE in groundwater at any given location depends on the local ground topography (hills and valleys).

TCE in groundwater has affected over 500 shallow residential drinking water wells and some former shallow community drinking water supply wells that served Schuss Mountain Resort.

The drinking water wells used by MAWSA today are regularly tested and provide safe drinking water to area residents that is free of TCE.

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FACT SHEET 3 - KNOWING THE EXTENT

GROUNDWATER MONITORING

A total of 142 permanent monitoring wells have been installed between the former Wickes Manufacturing Plant in Mancelona and now into Shanty Creek Resort. Monitoring wells are used to determine the rate and direction of groundwater flow, where TCE occurs (Shallow, Intermediate, and Deep Zones), and how TCE levels in groundwater change over time. The data gathered from the monitoring wells are then used to assess the current extent of TCE in groundwater, where TCE may be found in the future, and identify where additional investigation may be needed.

Monitoring well data collected over the last 25 years show that the natural flow of groundwater below the former Wickes Manufacturing Plant is to the west, away from the public supply wells.

ONGOING RISK EVALUATION

- Each year, during the spring and fall, EGLE collects groundwater samples from select monitoring wells and sends them for laboratory analysis. Since 2004, 1,920 monitoring well samples have been collected and analyzed. Monitoring well sampling of the groundwater is critical to providing "early warning" of TCE movement in groundwater.
- EGLE contracts the Health Department of Northwest Michigan to collect water from residential drinking water wells. On average, 45 residential drinking water wells are sampled each year. This residential drinking water well sampling helps us ensure no one is exposed to TCE.
- Each year, during spring or fall, water from the Cedar River, Saloon and Shanty Creek, and surrounding wetlands is collected and analyzed in a laboratory. This water sampling ensures that TCE levels in groundwater entering the river, creeks and wetlands are below levels determined to be safe to the environment.

HOW HAVE WE INVESTIGATED GROUNDWATER?

The occurrence of TCE in groundwater has been defined by numerous subsurface investigations. In addition to recurring monitoring well and residential well sampling activities that are performed each year, additional investigations performed include:

- Soil samples are used to define soil characteristics, soil layers, and the vertical position of the water bearing zones.
- Groundwater samples collected at relatively close spaced intervals from temporary bore holes have been used to define the occurrence of TCE in Shallow, Intermediate, and Deep Zones. This technique is called vertical aquifer sampling (VAS). Since 2004, a total of 383 VAS groundwater samples have been collected to investigate the extent of TCE in groundwater.
- Geophysical investigations assess soil layering "indirectly". Seismic surveys, which measure the soil response to ground vibration, have helped to establish the thickness and continuity of soil layers. Nearly 40,000 linear feet of seismic surveying has been completed.
- Pumping tests, which monitor the effect of pumping at existing supply wells like the Cedar River Well Field on surrounding monitoring wells, are used to determine how or if water moves vertically between the Shallow, Intermediate, and Deep Zones. Test results have been used in 3-D models to identify ways to minimize risk of exposure to TCE in groundwater.

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FACT SHEET 4 - HOW DOES TCE MOVE IN GROUNDWATER?

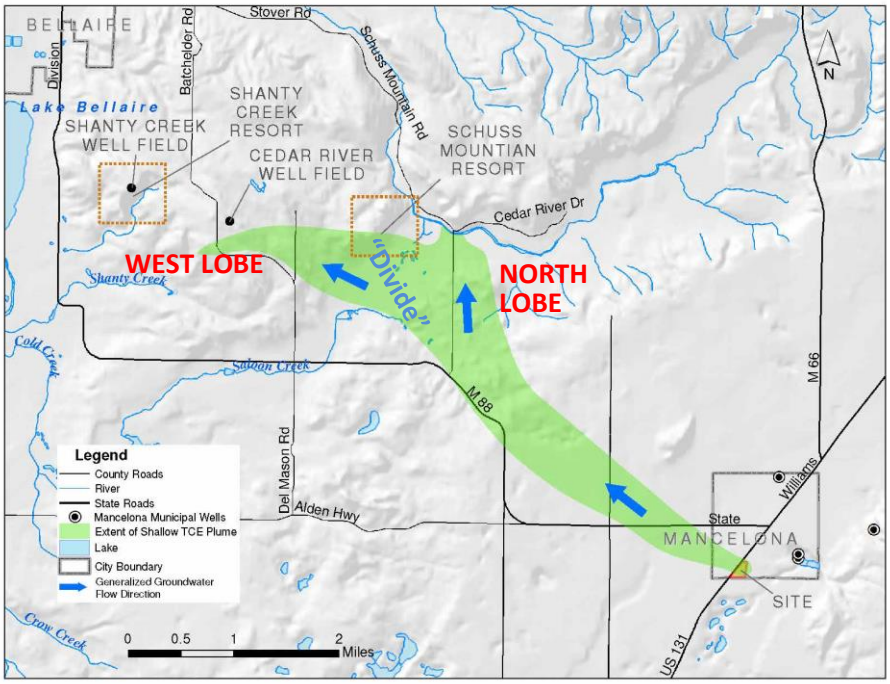
TCE MOVEMENT

TCE is dissolved in groundwater at the former Wickes Manufacturing Plant. Because it is dissolved, it moves or flows with groundwater. Groundwater flows "downhill" from areas of high groundwater in Mancelona, to areas of low groundwater to the west-northwest (towards the Cedar River and Lake Bellaire).

HOW DOES TCE MOVEMENT AFFECT TCE LEVELS?

Groundwater conditions sometimes promote the breakdown of TCE into less harmful chemicals. Under certain conditions, the amount of TCE in groundwater then decreases over time.

TCE breakdown does not occur significantly in the groundwater under this portion of Antrim County; however. The levels of TCE in groundwater decrease only as the TCE moves and spreads out over time, or when TCE gets temporarily stuck or adsorbed onto silt or clay in the soil.



WHERE IS THE TCE GOING?

Much like hills that separate one river from another, groundwater that flows over a broad area in soil sometimes separates at a groundwater divide - beyond this point, some groundwater flows to one low spot or another.

West Lobe is a term used to describe the TCE in groundwater moving below Schuss Mountain Resort toward Shanty Creek and Lake Bellaire. TCE moving in this direction is heavily influenced by the headwaters of Shanty Creek, which is located to the south of Shanty Creek Resort. The TCE in groundwater is not likely to reach Lake Bellaire for many years and is not expected to flow beyond Lake Bellaire. The TCE in groundwater that may enter Lake Bellaire or Shanty Creek in the future is predicted to be at concentrations below levels determined to be safe for the environment.

North Lobe is a term used to describe the TCE in groundwater that flows into or vents to the Cedar River. TCE has been detected in the Cedar River but it quickly evaporates from the river. It has not been detected in the river downstream of the venting area, nor has it been detected in groundwater north of the river.

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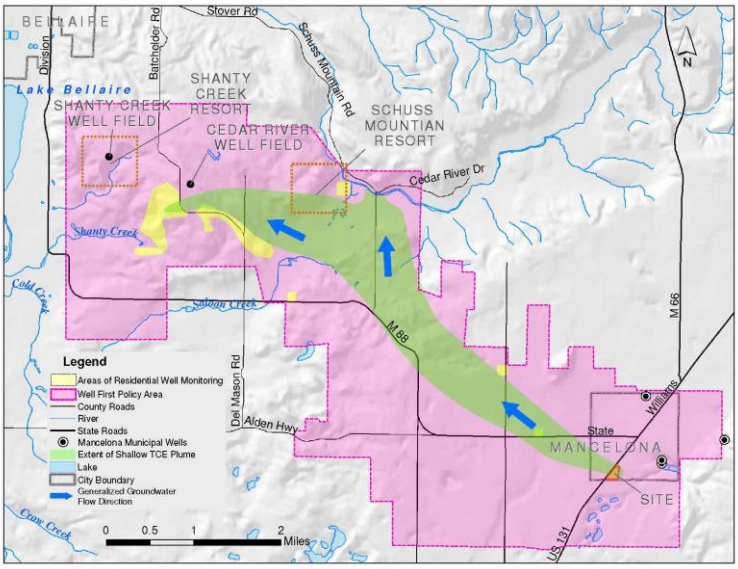
WICKES MANUFACTURING TRICHLOROETHYLENE (TCE) PLUME

FACT SHEET 5 - WHAT IS BEING DONE?

CURRENT ACTIONS

EGLE monitors TCE levels in groundwater to understand where and when potential exposures might occur. At-risk residential wells are sampled regularly by the Health Department of Northwest Michigan (HDNW). If TCE is detected in a residential well. The residence is placed on bottled water, that well is abandoned, and the home is hooked up to the public water supply. The HDNW implements the Well First Policy to ensure new wells are not exposed to TCE (See Fact Sheet 8, Well First Policy).



DID YOU KNOW?

EGLE has invested approximately $15 million in the community to fund the Mancelona Water and Sewer Authority (MAWSA).

EGLE has also invested nearly $12 million to:

- **Extend water mains to new areas,**
- **Hook up homes to new/existing water mains if TCE is detected in the residential well,**
- **Provide funding to the HDNW to sample residential wells near the edges of TCE impacted groundwater,**
- **Provide bottled water to residents until they are hooked up to the public water system when TCE is identified in their well water at a detectable level (even if less than 5 parts per billion),**
- **Expand the current monitoring well network and collect groundwater samples twice a year to monitor the location of TCE in groundwater,**
- **Monitor the effect of pumping on the groundwater system to identify engineering alternatives,**
- **Sample groundwater and surface water at the Cedar River where TCE in groundwater vents to it,**
- **Sample soil vapor near the former manufacturing site and areas where TCE is detected in shallow groundwater to monitor and, if necessary, mitigate potential exposure,**
- **Annually update technical reports.**

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CLEANUP OPTIONS

Options for cleaning up the estimated 13 trillion gallons of groundwater contaminated with TCE were studied in 2008 (EGLE), in 2014 (University of Detroit Mercy), and in 2015 (Michigan Technological University). Options included pumping and treating the groundwater, methods to destroy TCE (such as injecting or recirculating chemicals or adding biologic treatments to the groundwater) or extending public water to ensure safe drinking water.

The cost for active remediation ranged from $22 million to $99 million, with none of the technologies guaranteeing complete cleanup of the TCE and all required a minimum of 20+ years of operation and maintenance costs.

All studies to date show the safest, most viable and cost-effective means to assure no unacceptable exposure to TCE is to provide public water.

EGLE remains committed to considering new and emerging technologies.

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FACT SHEET 6 - WHAT'S NEXT?

ONGOING ACTIVITIES

EGLE continues to work with the Mancelona Area Water and Sewer Authority, its consultant, and area stakeholders. Recent steps include:

- Collaborative efforts to fund and construct additional storage at the Cedar River Well Field (CRWF) to allow use of these existing wells, piping, and pumps to continue.
- Connection of a high-pressure water main from the Mancelona supply wells to the CRWF.
- Expanded public water supply along Shanty Creek, Deskin Road and Windy Hill Drive.
- Ongoing EGLE funded monitoring of existing residential wells by the Health Department of Northwest Michigan (HDNW).
- Ongoing EGLE monitoring to track the movement of TCE in groundwater.
- Ongoing EGLE sampling to evaluate vapor intrusion risk.
- Installation of monitoring wells to ensure that an adequate "early warning" detection system is in place as the TCE in groundwater moves west.
- The HDNW implements the Well First Policy to ensure new wells are not installed where TCE is present (See Fact Sheet 8, the Well First Policy.)
- Performance of additional investigations such as the Shanty Creek headwaters hydrologic study to quantify volume of groundwater discharging to the Creek.
- Continued evaluation of soil vapor intrusion pathway in Mancelona and Schuss Mountain Area.

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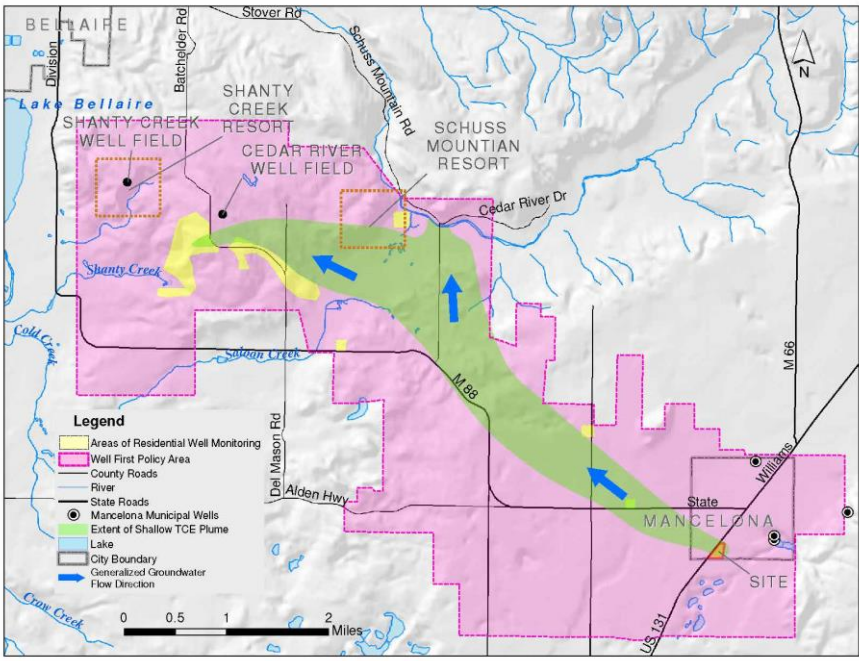

WHAT WELLS ARE AT RISK?

TCE in the groundwater is moving toward the location of the CRWF and residential wells near Deskin Road and Windy Hill Drive.

- **CRWF wells withdraw public supply water from <u>below</u> the Shallow and Intermediate Zones of groundwater that contain TCE. Silts and clays, which help to limit vertical movement of groundwater, are present near these wells and may keep the TCE in the Shallow and Intermediate Zones from entering the public supply.**
- **The Shanty Creek Well Field wells supply community drinking water to the resort. Some of the Shanty Creek well screens withdraw water from the same depth interval where TCE is found in the Shallow Zone. However, much more groundwater flows into Shanty Creek, located to the south of the resort, than is withdrawn from this well field. TCE in groundwater appears to be migrating toward the creek, not toward this well field.**
- **Residential Wells typically draw water from similar depths where Shallow Zone TCE is known to occur in groundwater. Depending on the well depth, residential wells may be vulnerable to impact as TCE moves in groundwater toward them. Wells west of Shanty Creek Road near the area of Deskin Road will continue to be monitored into the future.**

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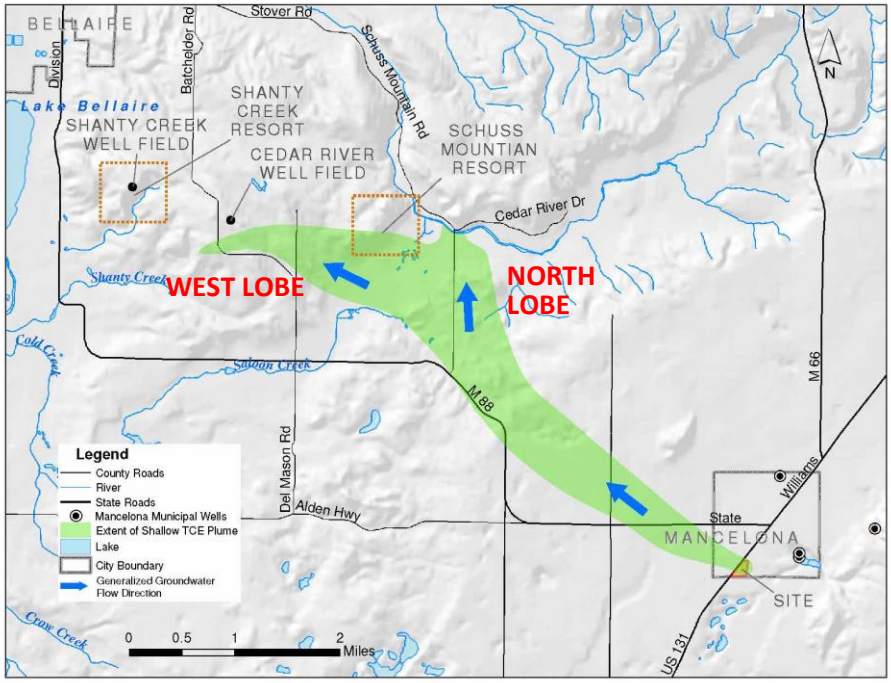
FORMER WICKES MANUFACTURING TRICHLOROETHYLENE (TCE) PLUME

FACT SHEET 7 - HOW FAST IS TCE MOVING TO THE WEST?

TCE IN THE WEST LOBE

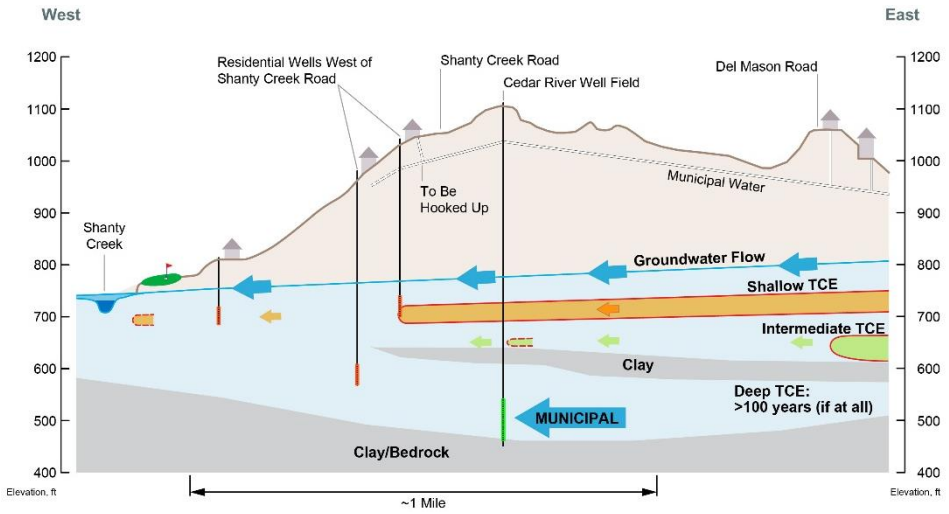
TCE extends vertically within the groundwater in three different zones; the Shallow, Intermediate, and Deep Zones.

Groundwater generally moves to the northwest in all three zones toward Lake Bellaire, but it locally flows into the Cedar River and Shanty Creek. In the North Lobe area TCE will continue to move with groundwater toward and vent to the Cedar River. In the West Lobe TCE in groundwater will continue to move toward Shanty Creek in the Shallow and Intermediate Zones, and it will pass near, but above, the location of the Cedar River Well Field.



EGLE continues to work with the community to expand the public water system to ensure safe drinking water is available as the West Lobe turns and moves toward Shanty Creek.

RATE OF MOVEMENT



Groundwater (and thus, TCE) moves at different rates at different depths:

- **Shallow Zone:** TCE moves at a rate of 330 to 525 feet per year.
- **Intermediate Zone:** TCE moves at a rate of approximately 100 feet per year.
- **Deep Zone:** TCE levels have been declining and TCE has not been found to spread from one well to another in the Deep Zone. Based on groundwater flow rates, TCE likely moves at a rate of less than 50 feet per year.

The assumptions we use to determine TCE groundwater flow rates and timelines are based on the extensive investigations and long-term monitoring that have been performed to date.

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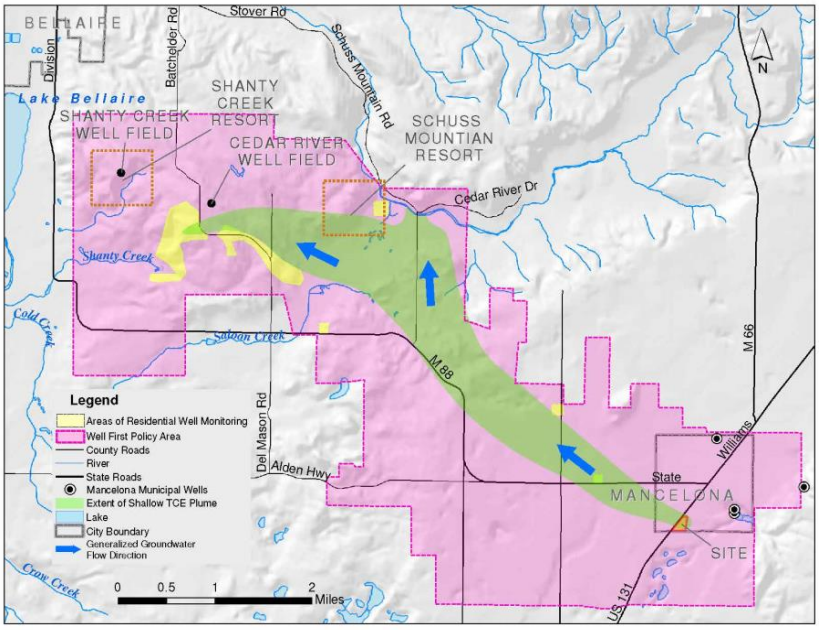
FACT SHEET 8 - WHAT IS THE WELL FIRST POLICY?



HOW WELL FIRST POLICY WORKS

The Well First Policy prevents the installation of new wells where public water is available. Connection to public water is required when it becomes available. Where public water is not available, the policy outlines well construction and sampling requirements, including:

- **Targeted Well Depth – working with EGLE and well drillers to target screen depths accounting for regional and site-specific geology and using the most current information available regarding known groundwater quality.**
- **Drilling Technique – mud rotary drilling methods must be used, and the well must be grouted (or sealed) along the entire length of the well casing. The well is developed by pumping and surging (prohibiting well development by air).**
- **Water Quality Sampling – groundwater is collected and analyzed at a laboratory for volatile organic compounds (which includes TCE) before use.**
- **Final Inspection – HDNW final inspection prior to use.**
- **Connection to Public Water – property must connect if public water becomes available.**
- **Well Abandonment – all existing approved or unapproved wells must be properly abandoned once connected to public water.**

WELL FIRST POLICY

The Health Department of Northwest Michigan (HDNW) implemented the Well First Policy in 2005 to assure that any water supply well installed outside the public water system service area was safe for use in accordance with Part 127 of Act 369, P.A. 1978 and Act 399, P.A. 1976, to protect the public health and prevent the unintended consumption of contaminated drinking water.

This policy is designed to be an institutional control to prevent exposure to TCE in groundwater. The area affected by the Well First Policy is regularly reviewed and modified as TCE in groundwater moves and information about the location and nature of the TCE in groundwater is updated.

EGLE and HDNW work together to monitor existing residential wells and share information with the community to allow the Well First Policy area to be expanded based on TCE in groundwater data.

The latest expansion of the Well First Policy was approved by the HDNW in February 19, 2018.

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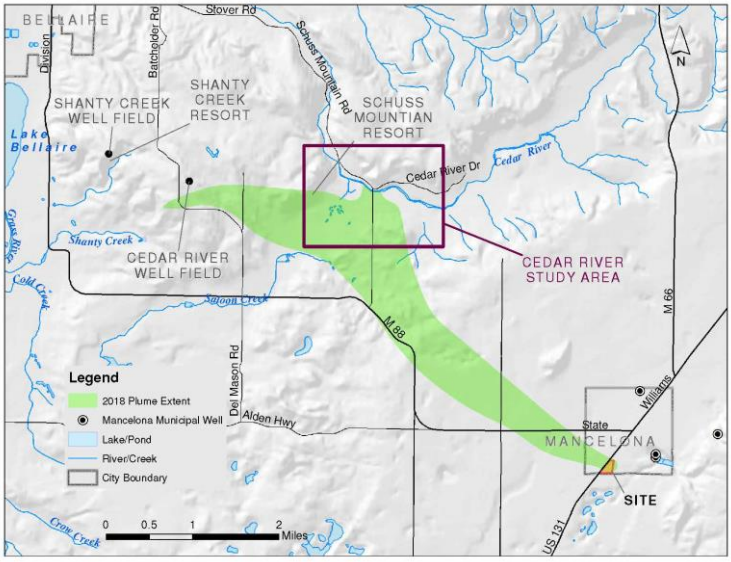
FACT SHEET 9 - TCE AND THE CEDAR RIVER

TCE IN SURFACE WATER

Water Quality Standards have established levels of TCE that are protective to surface water and the organisms that live in them. Based upon these scientific studies:

- The maximum allowable level of TCE in groundwater that can safely enter surface water, such as rivers or wetlands, is 200 parts per billion (ppb).
- The maximum allowable level of TCE in surface water like the Cedar River and nearby springs in its floodplain for aquatic life is 1,800 ppb. For human health it is 370 ppb, when not used as a drinking water source.



WHAT HAPPENS TO TCE?

Two things happen as TCE in groundwater moves toward and enters the river:

- Some TCE begins to break down in groundwater near the river. This decreases TCE levels entering the river.
- Once in the river, TCE readily evaporates into the air. There is no evidence based on annual sampling that TCE remains in the waters of the Cedar River for a significant time.

ARE TCE LEVELS UNSAFE?

- **TCE levels in groundwater collected annually near the south bank of the Cedar River are less than 100 ppb; well below maximum allowable level (200 ppb).**
- **TCE levels detected in the Cedar River have not been above 30 ppb – also well below the maximum allowable levels.**
- **TCE is detected in the river where groundwater vents to it but has not been detected further downstream because TCE evaporates readily once it enters the river.**

Studies of aquatic life conducted where TCE vents to the Cedar River in 1991 and 2013 scored the aquatic health of the river as "good" to "excellent." No adverse effects related to TCE have been detected in the river to date.

DOES TCE ENTER THE RIVER?

The North Lobe of TCE in groundwater does flow into, or vents, to the Cedar River. Here's how we know this:

- Measurements show that groundwater enters the river from both the north and south sides of the river. TCE would have to move against the flow of groundwater to move past and north of the river.
- Measured gradients show that the vertical flow of groundwater is directed upward near (and into) the river. This occurs with a measurable increase in the volume of water in the Cedar River in this area. These data indicate that groundwater flows into the river.
- The Cedar River and groundwater entering it are sampled every year to monitor TCE levels. TCE has been detected in the Cedar River where TCE is present in the groundwater to the south, but TCE has not been detected in groundwater north of the river.

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FACT SHEET 10 – WEST LOBE SURFACE WATER

WHICH SURFACE WATER FEATURES?

Groundwater and surface water in the area of the West Lobe ultimately drain west toward Lake Bellaire and the Grass River. Groundwater movement is significantly influenced by:

- Shanty Creek, whose headwaters are located to the south of Shanty Creek Resort.
- Saloon Creek, with its headwaters located to the south of Schuss Mountain.

The movement of groundwater to these creeks influences the movement of TCE in the West Lobe, just as the Cedar River influences the movement TCE in the North Lobe.

HOW MUCH INFLUENCE CAN THESE CREEKS HAVE?

By measuring the width and depth of a creek and how fast water flows through its profile, the amount of water that is moving through the stream over time (discharge) can be determined. By comparing seasonal discharge at multiple profile locations, EGLE has assessed the rate that groundwater moves into Shanty Creek.

Near the source of Shanty Creek, the amount of water increases quickly due to a nearly 3,200 gallon per minute (gpm) continuous influx of groundwater. For comparison - large-scale pumping wells in the area will typically operate at up to 1,000 gpm but only for short periods (1 to 2-hour cycles).

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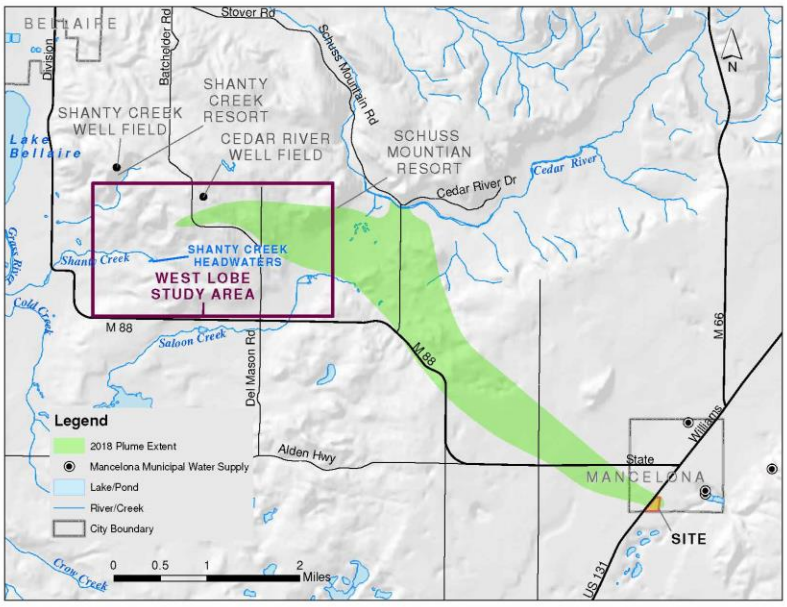

DOES TCE ENTER THE CREEKS?

TCE has not been detected in surface water samples collected from Saloon Creek.

- No TCE has been detected in samples collected from surface water and shallow groundwater near the headwaters. Samples are now collected annually to monitor water quality emanating from its headwaters.
- In this area, TCE has been detected typically at depths of 50 to 200 feet below the water table and continues to move past Saloon Creek in the West Lobe.
- The movement of groundwater toward Saloon Creek's headwaters exerts enough influence to help divert some groundwater (and TCE) away from the Cedar River to form the West Lobe.

Shanty Creek exerts a significant influence on the movement of TCE in groundwater.

- Near Del Mason Road, the West Lobe begins to bend away from a northwest-directed trajectory (i.e., toward the Cedar River Well Field and the Shanty Creek Resort's well field). The West Lobe begins to move to the west and even to the west-southwest.
- TCE has not yet been detected in sentinel monitoring wells between the West Lobe and Shanty Creek.

For additional information please see the Mancelona Township Library, the Bellaire Public Library, or the Antrim County Building in Bellaire.

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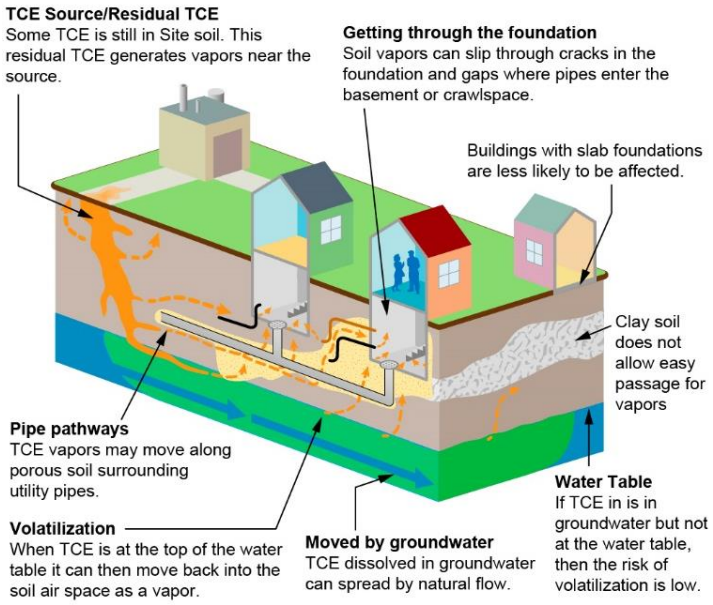
WICKES MANUFACTURING TRICHLOROETHYLENE (TCE) PLUME

FACT SHEET 11 – VAPOR INTRUSION

WHAT IS VOLATILIZATION?

TCE is a volatile organic compound, meaning that it readily changes from a liquid to a vapor. This characteristic causes TCE to move from surface water bodies, like the Cedar River, to the air. This same property works underground; TCE dissolved in groundwater, or TCE that is "stuck" on to the soil, can become a vapor and move into the air space between soil grains.

TCE in soil below the former manufacturing area has low levels of TCE in it. This "residual" TCE moves slowly into the air space below the former manufacturing building. When TCE is dissolved in the groundwater at the water table, it can also move back into the soil air space as a vapor. Soil vapors that contain TCE are referred to as the "vapor cloud".



WHAT IS VAPOR INTRUSION?

Vapor intrusion occurs when vapors move from the soil air space into structures. TCE vapors mix with the atmosphere if they migrate through the soil to the open air. However, if TCE vapors migrate into a building, they can then accumulate in the building to levels that can be harmful.

Vapors, including those that contain TCE, move from areas of higher pressure to areas of lower pressure. Seasonal pressure and temperature changes cause the below ground TCE vapor cloud to expand (summer) or contract (winter).

Soil that has a lot of connected air space, like sand and gravel, allow vapors to move more freely in response to pressure differences in the ground. Sand backfill around underground pipes and near basements may allow vapors to move more readily into and through the backfill material.

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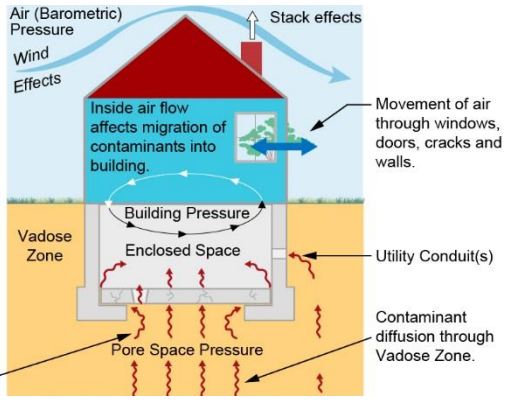
WILL TCE ENTER MY BUILDING?

When the air pressure in a building is lower than the air pressure in the soil pore space, vapors may then move into the building.



A sealed concrete slab does not allow vapors to move readily through it. Cracks or sumps in floors, unfinished crawl spaces or basements, and utility conduits may allow vapors to enter a building.

- Air conditioners increase a building's air pressure to help prevent soil vapors from moving into the building from the subsurface.
- Heated indoor air rises and moves out of a building. The warm air lost is replaced by outside air or vapors from soil below the building.
- Wind blowing over a building changes pressure differences between soil, the atmosphere and a building and, thus, influences vapor movement.

For additional information please see the Mancelona Township Library, the Bellaire Public Library, or the Antrim County Building in Bellaire.

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WICKES MANUFACTURING TRICHLOROETHYLENE (TCE) PLUME

FACT SHEET 12 – HOW DO WE ASSESS VAPOR INTRUSION?

IS VAPOR INTRUSION A CONCERN?

Long-term inhalation of TCE is a human health concern. When TCE vapors move from the ground into the air, the TCE vapors mix with the air and/or are broken down and this is not a risk to public health at this Site. But if TCE vapors enter a structure, less mixing occurs and levels of TCE in the indoor air can accumulate to levels that can be harmful.

HOW HAVE WE INVESTIGATED VAPOR INTRUSION?

The occurrence of TCE in soil and groundwater has been defined by numerous subsurface investigations. Additional monitoring wells were installed in from 2020 to 2024 to allow samples to be collected from the top of the water table. Since 2017 soil vapor monitoring probes have been installed in the Mancelona area and near Schuss Mountain Resort residential areas, including probes installed through floors, to directly collect and analyze soil vapor samples for TCE. Soil vapor and groundwater sample results are then compared to vapor intrusion screening levels.

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WHO DETERMINES WHAT LEVELS ARE SAFE?

The Michigan Department of Health and Human Services (MDHHS) establishes safe guidelines for indoor air levels for TCE. The indoor air screening level for TCE varies from 2 to 12 micrograms per cubic meter (µg/m^3), depending on a building's use.

In 2020, generic TCE vapor intrusion screening levels were established for soil, soil vapor and groundwater to be protective of the MDHHS-established indoor air screening levels:

Media	Residential	Nonresidential
Soil (µg/kg)	100	100
Groundwater (µg/L)	10	10
Soil Vapor (µg/m^3)	67	67

These screening levels assume some leaking into buildings occurs to ensure they are protective of human health. If TCE is detected above an appropriate screening level, it does not necessarily mean that unsafe vapor intrusion is occurring:

When TCE levels measured in groundwater collected from the water table are above screening levels, the next step is to assess TCE levels in soil vapor. Unless groundwater is directly in contact with a building, TCE must first move from the groundwater into the soil vapor space before it can move into a building.

If TCE is detected in soil vapor above an appropriate screening level, it must still be able to get into the building. The next step, then, is to collect samples of indoor air to assess whether TCE accumulates at levels that are harmful. Indoor air sample collection has only been necessary at five buildings located near the old manufacturing building.

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WICKES MANUFACTURING TRICHLOROETHYLENE (TCE) PLUME

FACT SHEET 13 – SOURCE AREA VAPORS

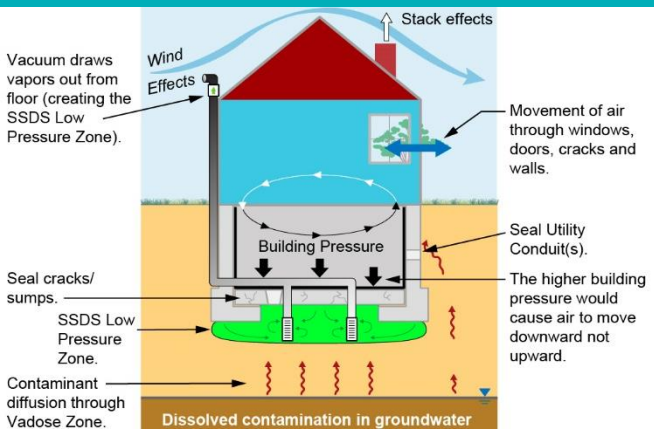
WHAT HAVE WE DONE?

A source area vapor investigation was conducted at the former manufacturing plant in 2017 and 2018 that included:

- A geophysical survey over the demolished plant. *No new sources were identified*.
- Collection of 40 soil samples from 28 locations. TCE was not detected above the safe direct contact level but *TCE was detected above vapor intrusion screening levels in 14 samples*.
- Monitoring well data tells us that the groundwater table has risen by nearly 8 feet since 2013. *TCE levels at the water table at the former plant have increased and are above vapor intrusion screening levels.*
- Over 132 soil vapor samples were collected from 54 permanent and 16 temporary monitoring points. *TCE vapors are highest below the former plant building and TCE levels typically increase near the water table*.

WHAT DO WE KNOW?

- **TCE levels in shallow soil vapor below the former plant exceed vapor intrusion screening levels year-round.**
- **TCE levels in shallow soil vapor seasonally exceed vapor intrusion screening levels on properties to the west of the former plant.**



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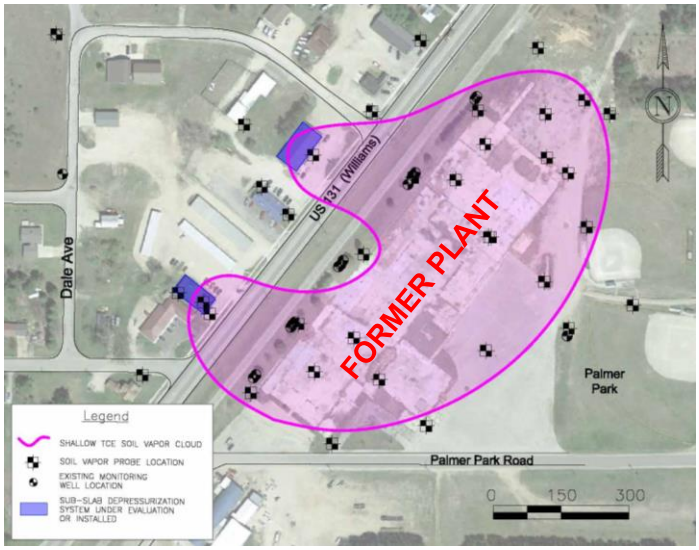

WHAT IS BEING DONE?

TCE levels are continuing to be measured seasonally in soil vapor to assess the vapor intrusion risk at occupied buildings.

When TCE in soil vapor exceeds vapor intrusion screening levels near a building:

- A specially designed, non-leaking, vapor monitoring point is installed through the floor of the building to assess TCE levels in “sub-slab” soil vapor.
- Seasonal sub-slab soil vapor and indoor air samples are collected to assess TCE levels in and below the structure.
- A sub-slab depressurization (SSD) system can be installed below floors to prevent soil vapors from moving into a building. Cracks in floors, foundations, and utility conduits are typically sealed when SSD systems are installed.
- SSD systems can use a vacuum to maintain a low-pressure zone below the floor that prevents soil vapors from moving into the building.
- SSD systems, vapor barriers and other engineering controls will be needed for future development of the former plant property.

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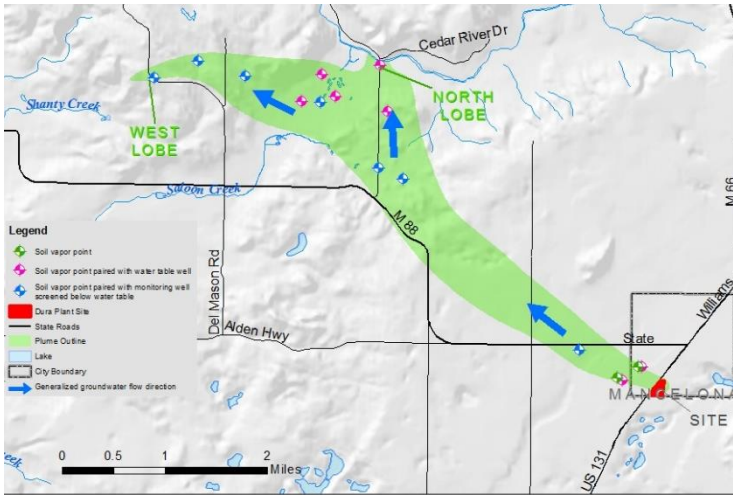
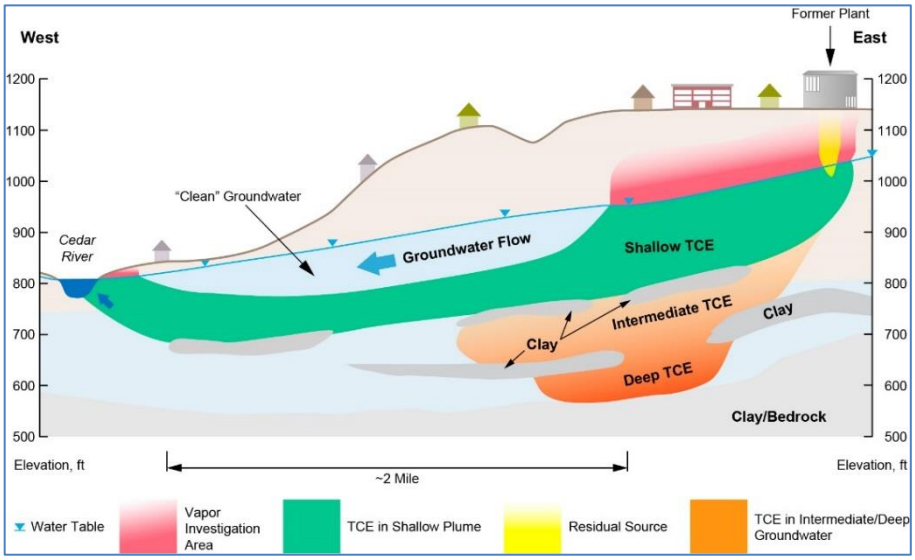
WICKES MANUFACTURING TRICHLOROETHYLENE (TCE) PLUME

FACT SHEET 14 – DOWNGRADIENT VAPORS

IS TCE IN THE GROUNDWATER A CONCERN FOR HOMES?



Unlike water, which moves from high areas to low areas (i.e., "downhill"), air in the ground tends moves up and down in response to above ground seasonal changes in pressure and temperature. Because TCE is a volatile organic compound, it readily changes from a liquid to a vapor. Underground, TCE dissolved in groundwater can become a vapor and move into the soil air space. When TCE is present at the water table it can move into the soil air space and, under the right conditions, may move into a home. Long term inhalation of TCE is a human health concern.



WHEN IS THIS A CONCERN?

If TCE exceeds the groundwater vapor intrusion screening levels, it does not necessarily mean that TCE vapors are moving into homes.

The groundwater table is typically 50 feet to as much as 250 feet below the ground surface where the Wickes-related TCE occurs in groundwater.

In most areas, for TCE to move from groundwater into a home as a vapor, it must first move from the water table into the overlying soil air space.

Over most of the area where TCE occurs in shallow groundwater, TCE is not detected until 20 or more feet *below* the water table. Testing has shown that TCE is not likely to be present in soil vapor above clean groundwater lens.

When TCE levels in groundwater exceed the vapor intrusion screening levels, it does not mean that vapor intrusion is happening but additional investigations to measure TCE in soil vapor may be warranted. TCE in soil vapor continues to be monitored where TCE is detected in groundwater at the water table and in areas of very shallow groundwater near the base of Schuss Mountain.

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WICKES MANUFACTURING TRICHLOROETHYLENE (TCE) PLUME

FACT SHEET 15 - WHO IS INVOLVED

ROLES AND RESPONSIBILITIES

The Michigan Department of Environment, Great Lakes, and Energy (EGLE), conducts the investigation and management of the TCE in groundwater. EGLE:

- Collects groundwater and surface water samples for laboratory analysis to monitor for TCE,
- Funds the collection and laboratory analysis of water samples from residential wells by the Health Department of Northwest Michigan (HDNW),
- Publishes and makes available the results of laboratory analyses and other investigative activities,
- Arranges for bottled water if TCE is found in residential wells and public water is not yet available, and
- Funds Mancelona Area Water and Sewer Authority (MAWSA) to extend the public water supply in response to TCE movement.

WHO DO I CONTACT TO HAVE MY WELL SAMPLED?

Residential well sampling priorities are determined annually based on the location of a residential well to the known extent of and location of the TCE in groundwater. The HDNW should be called to discuss adding your well to this sampling program. EGLE's interactive website can help you understand the proximity of TCE in groundwater to your property and to view the historical extent of TCE in groundwater:

https://ifrastructure.amecfw.com/wickes/

If your well is not in a priority area where it is deemed to be threatened by TCE impacts, you can contract one of several area laboratories to have your water tested for TCE.

OTHER RESOURCES

Copies of all technical reports prepared by/for EGLE are available at the Mancelona Township Library, the Bellaire Public Library, or the Antrim County Building in Bellaire.

OTHER PARTNERS

Antrim County United Through Ecology (ACUTE): A community stakeholders group developed in response to the TCE in groundwater.

Antrim County, Custer Township, Kearney Township, Mancelona Township and all area residents: Active support throughout project implementation and participants in public meetings.

AMEC Engineering & Consulting of Michigan (AMEC): Environmental contractor working for EGLE since 2003 on the former Wickes Manufacturing Plant.

EGLE Drinking Water Laboratory: Provides drinking water analytical testing.

EGLE Environmental Laboratory: Provides soil and groundwater analytical services.

EGLE Drinking Water and Environmental Health Division: Provides funding and support for MAWSA infrastructure expansion.

HDNW: Conducts residential well sampling, implements the Well First Policy to prevent unintended exposure to TCE contaminated drinking water.

MAWSA: Maintains the public supply system in the area. MAWSA operates the Mancelona Supply Wells and the Cedar River Well Field.

Schuss Mountain and Shanty Creek Resorts, surrounding home owners' associations and local real estate agencies: Active support throughout project implementation and participants in public meetings.

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WICKES MANUFACTURING TRICHLOROETHYLENE (TCE) PLUME

FACT SHEET 16 – TCE AND PROPERTY

TCE IN GROUNDWATER BENEATH MY PROPERTY

The potential for exposure to TCE in groundwater can occur when a drinking water well tests positive for TCE. Drinking water wells that are in the path of TCE have water tested annually by the Health Department of Northwest Michigan (HDNW).

If ***ANY*** TCE is detected in a residential well, bottled water is supplied until the residence can be hooked up to the public water supply and the private drinking water well is properly abandoned to prevent exposure to the TCE in groundwater. The cost for hookup to the public water supply as well as the abandonment of private water wells is paid for by the Michigan Department of Environment, Great Lakes, and Energy (EGLE). For areas where the public water supply is not available, the HDNW's Well First Policy outlines well construction and sampling requirements. Refer to Fact Sheet 8, What is the Well First Policy?

LAWS AND DISCLOSURE

The Sellers Disclosure Act, Act 92 of 1993, requires certain disclosures in connection with transfers of residential property. This requires sellers to disclose the condition of the property at the time of sale, including any environmental issues.

The Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, regulates facilities of environmental contamination in Michigan. The TCE in the groundwater in Antrim County is covered under Part 201. Part 201 requires written disclosure of the general nature and extent of contamination when property transfers occur.

These laws do not prevent the transfer or use of property. Sellers can provide information to purchasers that safe drinking water is assured by EGLE and HDNW.

RESALE AND MARKETABILITY

Property values can be affected when property cannot be used safely. Property in Antrim County where there is TCE in groundwater is safe to use due to the HDNW's Well First Policy (See Fact Sheet 8 – What is the Well First Policy), which assures:

- **New wells are not installed in areas with TCE in groundwater, and**
- **Groundwater is safe to drink in areas where public water is not yet available.**

If groundwater becomes unsafe to use as the TCE in groundwater moves, funding is provided through EGLE to the Mancelona Area Water and Sewer Authority for extension of the public water supply to provide safe drinking water.

QUESTIONS ABOUT PROPERTY AND TCE

EGLE and HDNW are committed to working with owners and purchasers during property transfers. Please direct questions to:

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Email: adamsj1@michigan.gov

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