

Wisconsin's Vapor Intrusion Zone Contract (VIZC) – Partnerships, Public Outreach and Passive Sampling

Jennifer Borski, WDNR Vapor Intrusion Team Leader

Indoor Environments 2023

October 30, 2023

Vapor Intrusion Priority Evaluation & Response (VIPER) 2022

- ~2,600 open cases
 - ~150 cases dry cleaners – tetrachloroethene (PCE)
 - More than 500 cases with trichloroethene (TCE)
 - Many stalled cases
- WDNR identified ~150 sites statewide with PCE and/or TCE where state funded action and/or enforcement being considered

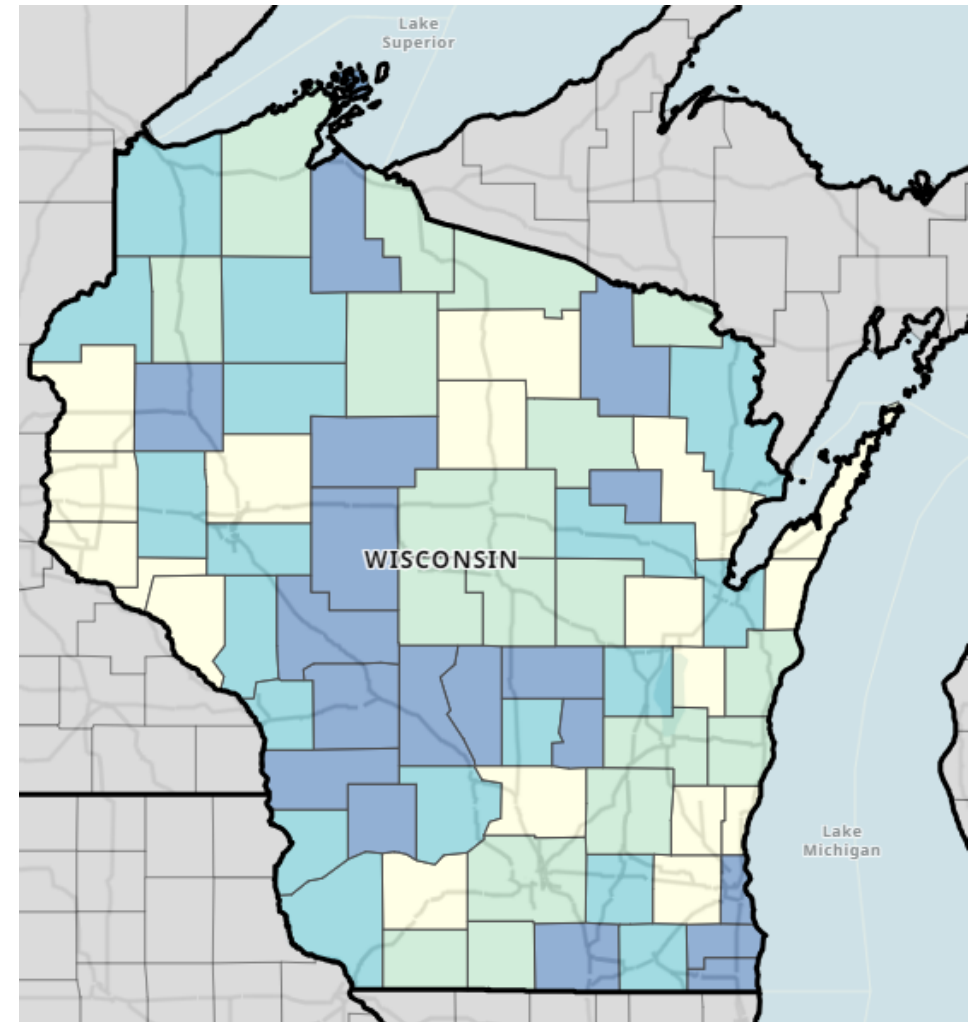
VIPER Site Selection 2022

Priority Factors for Ranking

- Presence and concentration of PCE and TCE
- Number of properties potentially impacted
- Potential for sewer impacts
- Surrounding population
- Social Vulnerability Index (CDC/ATDSR)
- Investigation status

CDC = Center for Disease Control & Prevention

ATSDR = Agency for Toxic Substances and Disease Registry



Level of Vulnerability

Low

Low-Medium

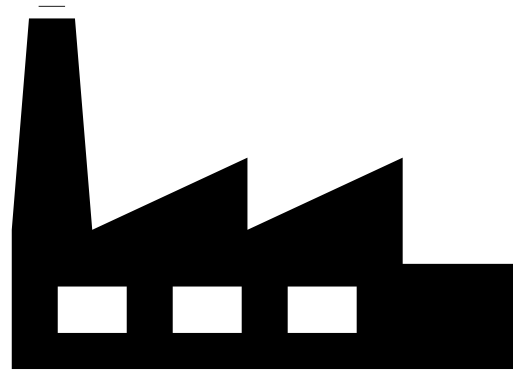
Medium-High

High

No Data

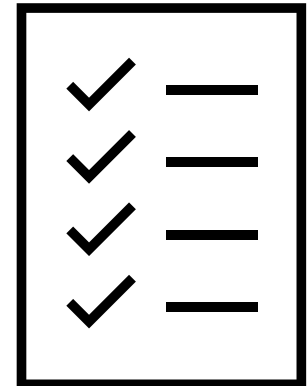
Sources for Selected Sites 2022-2023

- 9 dry cleaners (1 still operating)
- 4 manufacturing operations where TCE was discharged
- 1 formal wear location (suspected source) where PCE was discharged



Vapor Intrusion Zone Contract (VIZC)

- Request for Qualifications – July 2022
- Statements of Qualifications – August 2022
- Vapor investigation and mitigation contracts – September 2022
 - Three environmental consulting firms selected
 - Two vapor intrusion mitigators (sub-contractors) selected
 - Contract includes option to renew annual contract twice



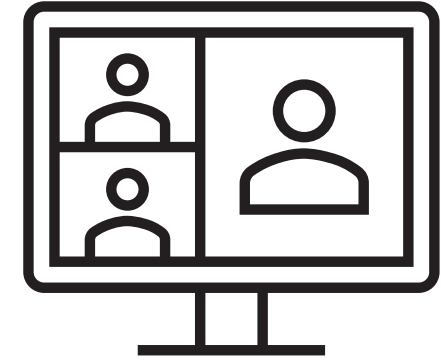
General Scope of Work (SOW)



- Using passive samplers
- Sanitary sewer sampling up and down flow from lateral
- Soil gas sampling in rights-of-way
- Investigation at **residences** that “screen in” for risk for VI (up to three rounds):
 - Sub-slab vapor
 - Sump water (if present)
 - Temporarily sealed sump headspace
 - Indoor air / outdoor air
- Mitigation including installation, commissioning, construction documentation and operation, monitoring & maintenance (OM&M) plan
- Assignment of “continuing obligations” following mitigation

Communications – Identify Stakeholders

- WDNR VIZC Lead
- VIZC Consultant
- WDNR Project Manager
- Wisconsin Department of Health Services (WDHS)
- Local Health
- Municipal Public Works
- Responsible Party – Data Sharing / Cost Recovery / Lien
- Off-site Property Owners / Occupants
- Others



Communications – Gaining Access

- Community Engagement Plan
- Letter to neighborhood
 - Introduction of issue
 - WDNR & WDHS Contacts
 - *TCE in the Air* (WDHS)
 - *Trichloroethene-ToxFAQs* (ATSDR)
 - *Tetrachloroethylene-ToxFAQs* (ATSDR)
 - *What is Vapor Intrusion?* (WDNR)
 - Access Agreement for Vapor Investigation
- WDNR/WDHS canvassing & door-hangers
- Engage community leaders as needed (e.g., Alders)

TCE in the Air

Trichloroethylene (TCE) health effects and actions you can take to protect your home's air

TCE is a man-made chemical used to clean metal in some factories and is found in some household items like paint, spot removers, and varnishes. If spilled, it can stay in the ground for a long time.

Why should I care?

- It can enter your home through cracks in the floor or walls of your basement, and other openings.
- It evaporates quickly and breathing the vapors is not healthy.
- It can cause cancer if you breathe it over a long period of time.

Who has more risk?

Babies whose mother's breathe in TCE while pregnant can have:

- Lower birth weights
- Heart defects
- Nervous or immune system problems

What if TCE is in my community?

If there is a known concern, environmental health professionals will ask to check your home to make sure there is no TCE inside.

They need your permission to drill in your basement and test.

If they find high levels of TCE, they will suggest that you have a special system installed to fix the problem.

Do I have to pay?

The people responsible for the spill will probably have to pay for the testing and any repairs that have to be made.

What else can I do?

- Wear protective gloves if you use products with TCE (like paint remover).
- Use only small amounts of products containing TCE.
- Use the chemical in well-ventilated areas.
- Do not stay in the room for long periods of time if you can smell the chemical while using it or after using it.

Where can I learn more?

- [Vapor Intrusion 101 \[video\]](#): www.youtube.com/watch?v=1200KqCt0U
- [Vapor Intrusion Investigation – Information Sheet for Neighbors](#): <https://dnr.wi.gov/files/PDF/pubs/rr/R8067.pdf>
- [Why Test for Vapor Intrusion?](#): <https://dnr.wi.gov/files/PDF/pubs/rr/R8953.pdf>
- [Mitigation: Protection from Vapor Intrusion](#): <https://dnr.wi.gov/files/PDF/pubs/rr/R8094.pdf>

WISCONSIN DEPARTMENT OF HEALTH SERVICES
Division of Public Health
Bureau of Environmental and Occupational Health
P-02480 (10/2020)

Trichloroethylene - ToxFAQs™

CAS # 79-01-6

This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Trichloroethylene is used as a solvent for cleaning metal parts. Exposure to very high concentrations of trichloroethylene can cause dizziness, headaches, sleepiness, incoordination, confusion, nausea, unconsciousness, and even death. Trichloroethylene has been found in at least 1,051 of the 1,854 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is trichloroethylene?

Trichloroethylene is a colorless, volatile liquid. Liquid trichloroethylene evaporates quickly into the air. It is nonflammable and has a sweet odor.

The two major uses of trichloroethylene are as a solvent to remove grease from metal parts and as a chemical that is used to make other chemicals, especially the refrigerant, HFC-134a.

What happens to trichloroethylene when it enters the environment?

- Trichloroethylene can be released to air, water, and soil at places where it is produced or used.
- Trichloroethylene is broken down quickly in air.
- Trichloroethylene breaks down very slowly in soil and water and is removed mostly through evaporation to air.
- It is expected to remain in groundwater for long time since it is not able to evaporate.
- Trichloroethylene does not build up significantly in plants or animals.

How might I be exposed to trichloroethylene?

- Breathing trichloroethylene in contaminated air.
- Drinking contaminated water.
- Workers at facilities using this substance for metal degreasing are exposed to higher levels of trichloroethylene.
- If you live near such a facility or near a hazardous waste site containing trichloroethylene, you may also have higher exposure to this substance.

How can trichloroethylene affect my health?


Trichloroethylene was once used as an anesthetic for surgery. Exposure to moderate amounts of trichloroethylene may cause headaches, dizziness, and sleepiness, large amounts may cause coma and even death. Eating or breathing high levels of trichloroethylene may damage some of the nerves in the face. Exposure to high levels can also result in changes in the rhythm of the heartbeat, liver damage, and evidence of kidney damage. Skin contact with concentrated solutions of trichloroethylene can cause skin rashes. There is some evidence exposure to trichloroethylene in the work place may cause scleroderma (a systemic autoimmune disease) in some people. Some men occupationally-exposed to trichloroethylene and other chemicals showed decreases in sex drive, sperm quality, and reproductive hormone levels.

How likely is trichloroethylene to cause cancer?

There is strong evidence that trichloroethylene can cause kidney cancer in people and some evidence for trichloroethylene-induced liver cancer and malignant lymphoma. Lifetime exposure to trichloroethylene resulted in increased liver cancer in mice and increased kidney cancer and testicular cancer in rats.

The Department of Health and Human Services (DHHS) considers trichloroethylene to be a known human carcinogen. The International Agency for Research on Cancer (IARC) classified trichloroethylene as carcinogenic to humans. The EPA has characterized trichloroethylene as carcinogenic to humans by all routes of exposure.

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Human Health Sciences



Wisconsin DNR vapor intrusion quick facts

PUB-RR-892
Feb 2014

What is Vapor Intrusion?



Chemicals used in commercial or industrial activities dry cleaning chemicals, chemical degreasers and petroleum products such as gasoline – are sometimes spilled and leak into nearby soil or groundwater. When this happens, these chemicals may release gases or vapors, which travel from the contaminated groundwater or soil and move into nearby homes or businesses. This is called vapor intrusion.

Why are these chemical vapors a problem?

The chemicals that cause vapor intrusion are known as volatile organic compounds, or VOCs. Even when spilled into soil or water, these chemicals easily evaporate. They don't cause human health problems when they evaporate into the outside air, but when their vapors move into homes or businesses, they may cause long-term health problems for the people who live or work in those buildings. These vapors are usually odorless and colorless and undetectable without special testing equipment.

Why is vapor intrusion a concern?

Exposure to some chemical gases or vapors can cause an increased risk of adverse health effects. Whether or not a person experiences any health effects depends on several factors, including the amount and length of exposure, the toxicity of the chemical, and the individual's sensitivity to the chemical. When harmful chemical vapor intrusion is the result of environmental contamination, the Wisconsin Department of Natural Resources (DNR) requires that steps be taken to reduce or eliminate exposures which could be harmful to human health.

The process when chemical vapors from contaminated soil or groundwater enter a home or other structure is called vapor intrusion.

What should I expect if vapor intrusion is suspected near my home or business?

For businesses or other locations where VOC contamination has been found, the DNR requires that the potential for vapor intrusion be investigated. If you live near a site being cleaned up, you may be contacted by the site owner or others working on the cleanup. Your cooperation and consent will be requested before any testing or sampling is conducted on your property. Ask the person contacting you any questions you have about the work being done, or contact the DNR for more information (see DNR contact information on reverse). For more information about testing for vapor intrusion, see DNR-Pub-RR-954, "What to Expect During Vapor Intrusion Sampling."



Wisconsin Department of Natural Resources
P.O. Box 7921, Madison, WI 53707
dnr.wisconsin.gov/resources/toxfaq



Communications – Share Results

- Communicate results to WDNR, property owner (municipality) and tenants within 10 business days from receipt - Wis. Admin. Code § NR 716.14(2)
- Template results letters utilized for three scenarios:
 1. No Detects
 2. Detects below action or screening levels
 3. Detects above action or screening levels – mitigation needed
 - *Understanding Chemical Vapor Intrusion Testing Results* (WDNR)
- Template letter requesting access for mitigation
 - Includes projected costs for electricity and fan replacement
 - *Mitigation: Protection from Vapor Intrusion* (WDNR)
 - Access Agreement for Mitigation

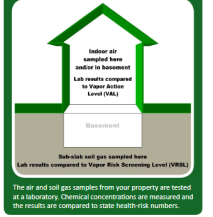
From the Lab to You
 Chemical vapor samples were taken from underneath your house or building and possibly indoors as well. These samples have been tested by a certified laboratory and a report was issued. The Wisconsin Department of Natural Resources (DNR) uses these test results to determine if people in the building are being exposed to chemical vapors coming from nearby contaminated soil or groundwater, and to decide what, if any, action is needed to prevent this exposure.

Indoor Air Testing Results
 Indoor air samples were collected in your house or building. Test results from the lab will be compared to the state Vapor Action Level (VAL) for chemicals of concern. The VAL is a chemical compound's numerical value that represents a health hazard risk to no more than 1 in 100,000 people during a lifetime of exposure. If test results show chemical concentrations in your air below the VAL then adverse health effects are extremely rare, even if you were to breathe the chemical at this concentration for your entire life.

Test results showing chemical concentrations in the air at or above the VAL prompt DNR to recommend that exposure to these chemical vapors be reduced. If test results show concentrations significantly above the VAL or more than one type of chemical vapor is identified in your indoor air, the risk from exposure increases. If the concentration of any indoor chemical vapor greatly exceeds the VAL, DNR is concerned about even short term exposure and will typically require immediate action to address the problem.

The VAL for each chemical is set by scientific research. It is protective of all people, including those who are most susceptible to adverse health effects.

If test results identify chemicals in your air that are not present in nearby soil or groundwater contamination, it is likely that these vapors are coming from some product or activity in or near your house or building. Many everyday consumer products (e.g., cleaners, solvents, paints, adhesives, lubricants, aerosols, insect repellents, etc.), combustion processes (e.g., smoking, home heating), fuels in attached garages, dry cleaned clothing or draperies, and occupant activities (e.g., craft hobbies), also release chemical vapors into the air.



Sub-slab Soil Gas Testing Results
 Soil gas samples were collected from the ground beneath the concrete slab of your building foundation or basement. The lab measured the concentrations of various chemicals in these samples. DNR compares these measurements to the state Vapor Risk Screening Level (VRESL), which identifies the concentration of a chemical in soil gas that scientific research suggests can be a health risk if vapor enters a building. If soil gas measurements exceed the VRESL for a chemical of concern, action to reduce exposure is strongly recommended.

The VRESL is a higher number (higher chemical concentration) than the VAL because it is presumed that concrete building foundations and basement walls will prevent most soil gas from entering a building. Further, any soil gas that does enter a building through cracks, holes, sump pumps, drains, etc., will be diluted to some extent by the indoor air. So, people inside will not be breathing air that includes the full concentration of chemical vapors that exist in the ground.



Wisconsin Department of Natural Resources
 P.O. Box 7923, Madison, WI 53707
 dnr.wisconsin.gov/indoorair



Wisconsin DNR – Vapor Intrusion

Remediation and Redevelopment Program

February 2018

Mitigation: Protection from Vapor Intrusion

When test results show contaminant vapors (like petroleum or solvent fumes) are present in the air below a building, these vapors can get into the indoor air and present a health risk even if you cannot smell them. The good news is that vapor mitigation options are available to prevent these contaminant vapors from getting indoors. For more information and list of DNR contacts, go to dnr.wis.gov and search "vapor intrusion".

The DNR and the Department of Health Services (DHS) recommend that building owners allow installation of vapor mitigation systems when test results show chemical concentrations in the air below or near a building exceed the vapor screening criteria.

Why Should I Allow Vapor Mitigation?
 Exposure over time to chemical vapors can have negative health effects and increase cancer risk potential. By allowing a mitigation system to be installed, exposure to these contaminant vapors will be minimized. In addition, most vapor mitigation systems can also protect against exposure to radon (a naturally occurring element known to cause lung cancer) and can lessen the moisture entering through the lower level of a building.

These combined effects will improve the overall air quality inside a home or building, and having a mitigation system in place will demonstrate to future buyers that the building is already protected from these hazards.

What Does Vapor Mitigation Look Like?
 Vapor mitigation designs will vary, and will take into consideration the specific layout and needs of a building. In most cases, significant cracks in the floor will be sealed and a sub-slab depressurization system will be installed. Sub-slab depressurization systems are commonly known as radon mitigation systems.

Sub-slab depressurization systems are fairly simple, and involve connecting a fan to a pipe to draw air from the soil beneath the building through a suction point in the floor. This energized fan creates a vacuum that collects air from below the building and vents the chemical vapors to the atmosphere where they are dispersed. A manometer gauge on the pipe shows the fan is drawing a vacuum.

Who Pays for Installation?
 When the risk from chemical vapors is discovered as part of an environmental cleanup, the party responsible for the cleanup is also responsible for paying for the design, installation, and start-up of vapor mitigation on affected properties. Start-up of a mitigation system typically requires testing to verify it is working correctly.

Who Pays for Operation and Maintenance?
 The responsible party is responsible for any necessary maintenance until the time the environmental cleanup case is "closed" by the DNR. After that, the responsibility for the operation and maintenance transfers to the owner of each affected property. The amount of time after a mitigation system is installed until a property owner becomes responsible for the maintenance can vary from a few months to many years.

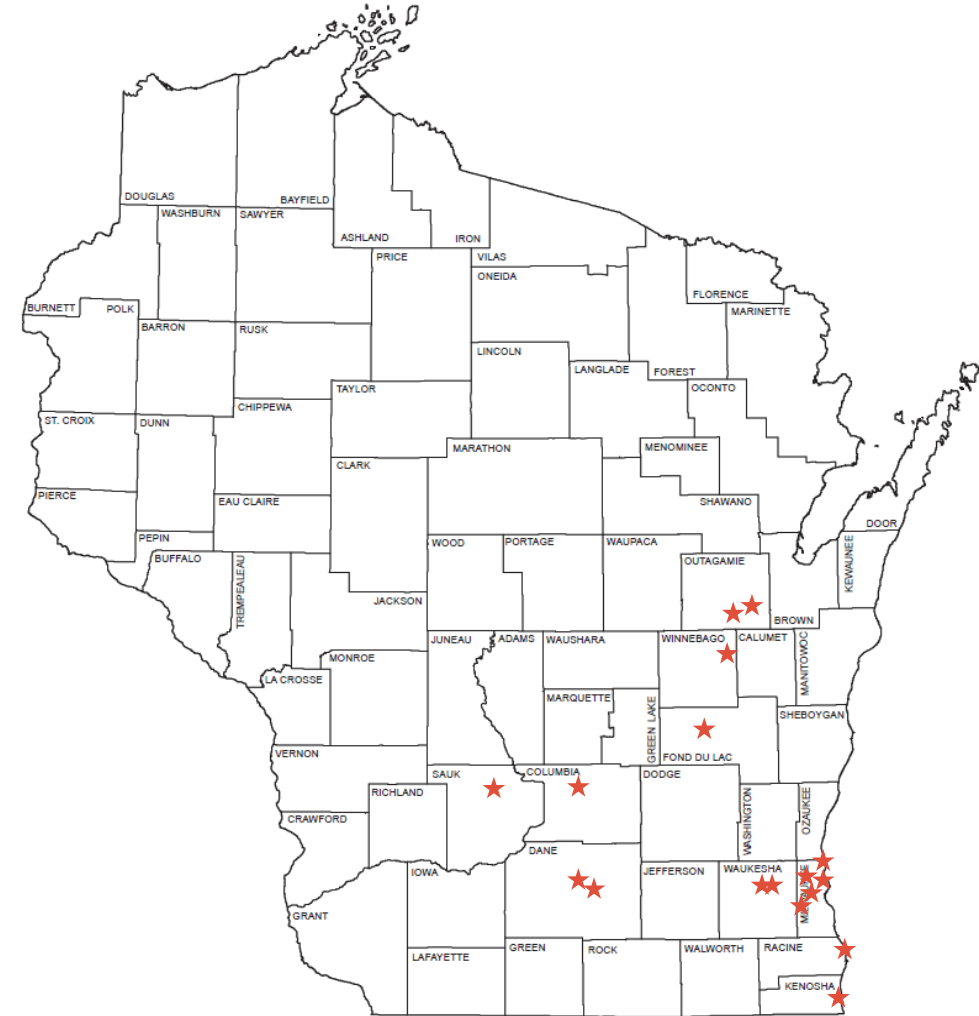
How long is mitigation needed?
 In most cases, it is expected that the vapor mitigation system will be a permanent addition to a building. However, in some instances the contaminant vapors recede the building may meet detection levels, and the mitigation system can be removed.



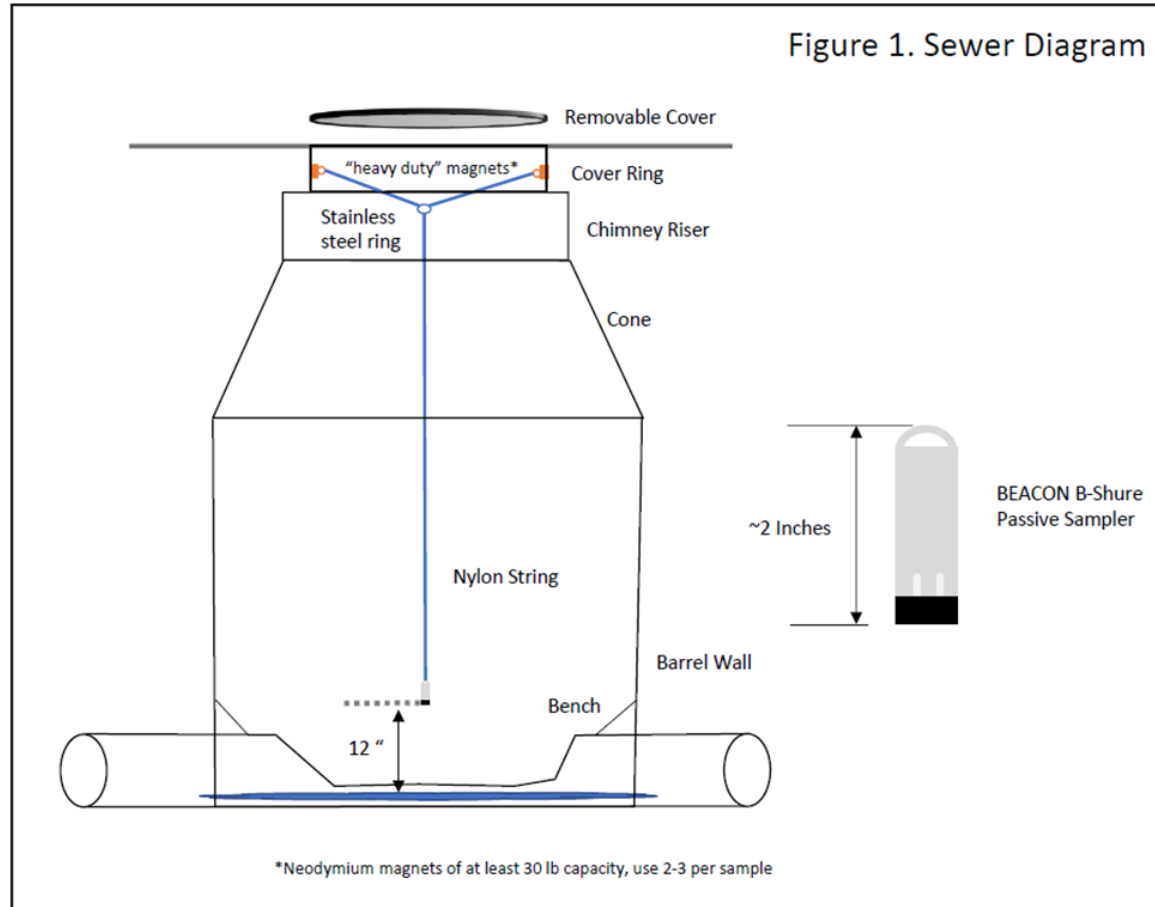
- TYPICAL INSPECTION CHECKLIST**
- ✓ Check manometer gauge for vacuum
 - ✓ Check that fan is running
 - ✓ Check that vent pipe is clear
 - ✓ Check foundation for cracks

VIZC Sept 2022 – Oct 2023

- 9 Investigations completed or started
- 7 Sanitary sewer systems sampled
- 12 Buildings sampled
- 3 Buildings mitigated
- 2 Mitigation systems evaluated or upgraded



Sanitary Sewer Sampling – Passive Samplers



Sanitary Sewer Sampling – Passive Samplers

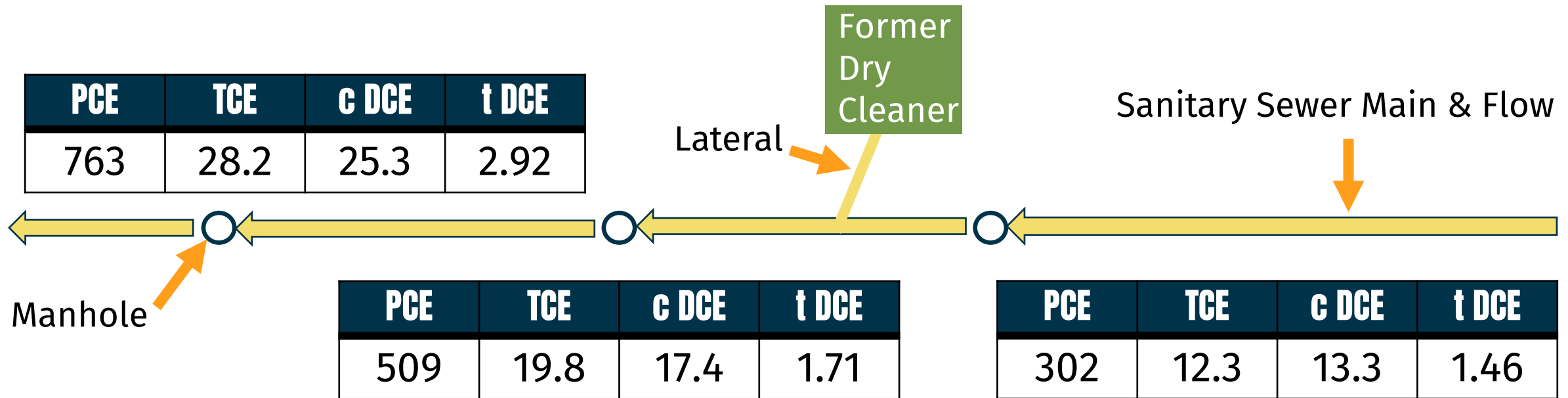


Sanitary Sewer Sampling – GC/ECD, Sewer Liquid & Passive Samplers

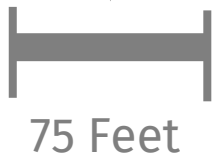


GC/ECD = Gas Chromatography / Electron Capture Device

Chlorinated Solvent Air Concentrations Sanitary Sewer Manholes ($\mu\text{g}/\text{m}^3$)



- 14-day duration
- Residential Sanitary Sewer Gas Screening Level = 1,400 PCE; 70 TCE



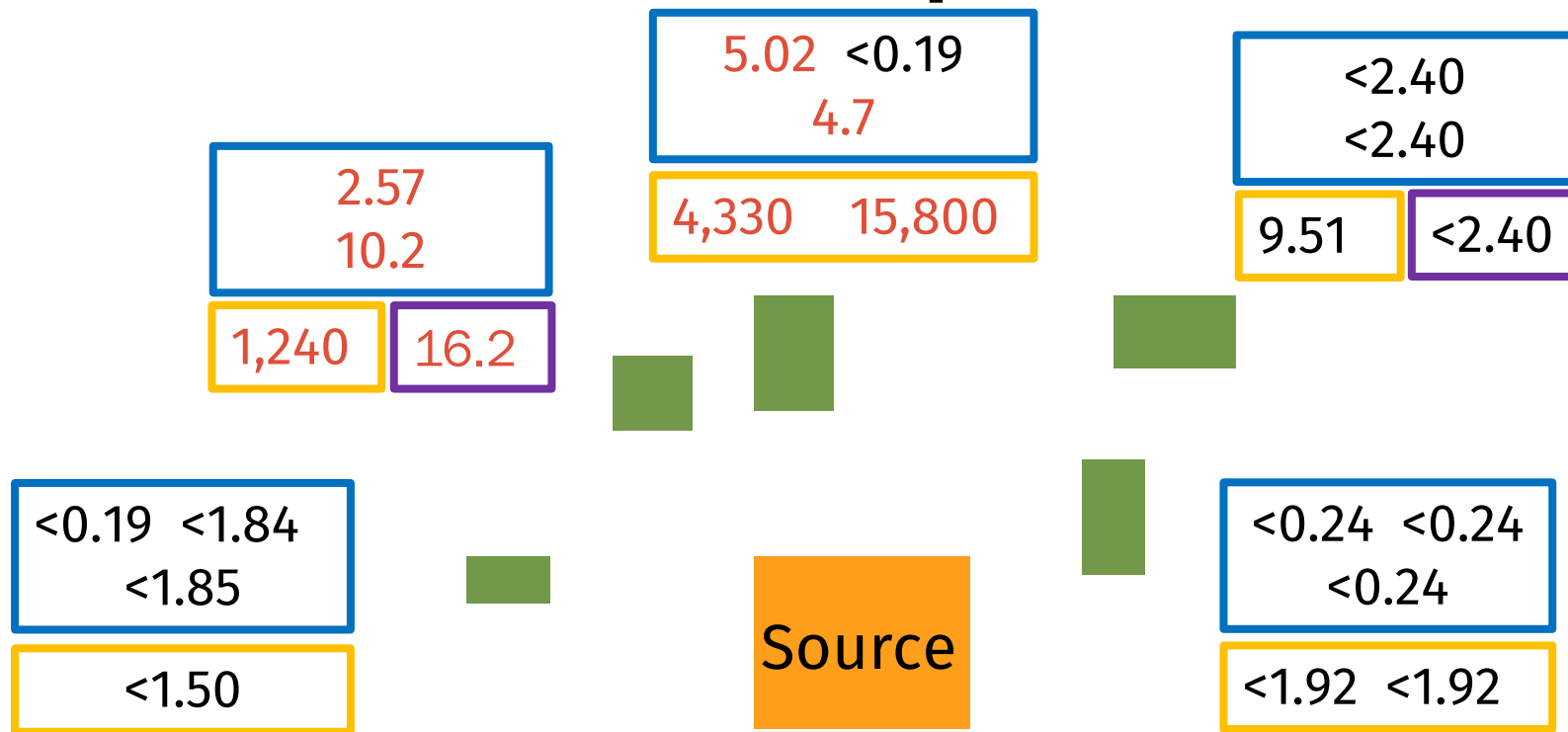
Vapor Investigations



Vapor Investigations



TCE Concentrations ($\mu\text{g}/\text{m}^3$) in Residences near a Machine Shop



Key

Indoor air Upper floors Basement	
Sub-slab	Sump air

Red if > indoor air vapor action level (VAL) or sub-slab vapor risk screening level (VRSL)



200 Feet

- 14-day duration
- Residential VAL = $2.1 \mu\text{g}/\text{m}^3$
- Sub-slab VRSL = $70 \mu\text{g}/\text{m}^3$

Vapor Mitigation Systems

One of two drop points



Exterior fan and vent stack

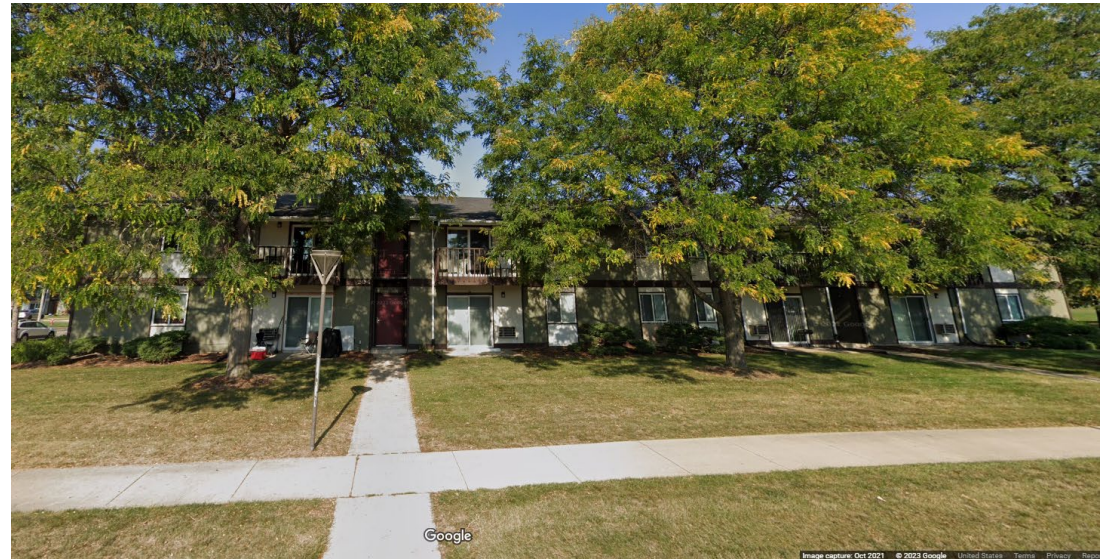


Vapor Mitigation Systems

Sanitary sewer breach at red star



Multi-family residential building impacted



Lessons Learned

1. Continue VIPER - Defensible justification for site selection important for allocation of funds and stakeholder cooperation.
2. Continue stakeholder identification & Community Engagement Plan - Perform on parallel track with SOW development & contracting.
3. Continue Introduction Letter to Neighborhood packet followed by direct health-based communication to gain access.
4. Continue to update investigation and mitigation scopes of work with experience and advances in technology.
5. Updated health-based language in results communications template to cover acute risk.

Next Steps

- ✓ Renew annual contracts (next RFP in 2025).
- Finish scopes of work for investigation of sites with funding allocated.
- Mitigate where needed and complete commissioning & documentation.
- Many additional sites remain where a responsible party is unable to move forward. Additional sites pending availability of state and/or federal funds.

CONNECT WITH US

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"WILD WISCONSIN:
OFF THE RECORD"