

Vapor Intrusion: Risks and Solutions

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What is Chemical Vapor Intrusion?

The migration of chemical vapors from contaminated soil, groundwater or utilities into an occupied space

US Environmental Protection Agency – What is Vapor Intrusion?

<https://www.epa.gov/vaporintrusion/what-vapor-intrusion>

WDNR *Guidance for Documenting the Investigation of Human-made Preferential Pathways Including Utility Corridors*, RR-649 (June 2021)

<https://dnr.wi.gov/DocLink/RR/RR649.pdf>

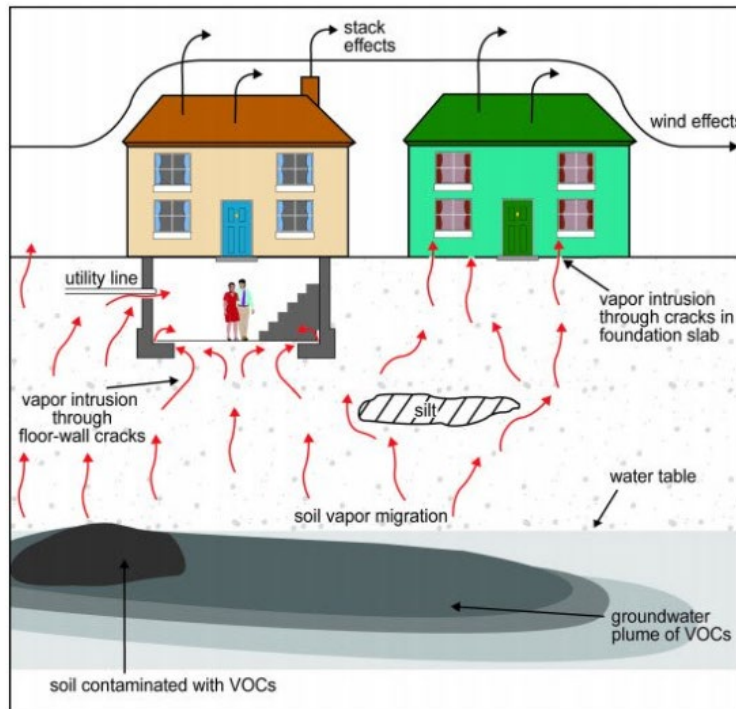


Figure 1: Migration of Soil Vapors to Indoor Air

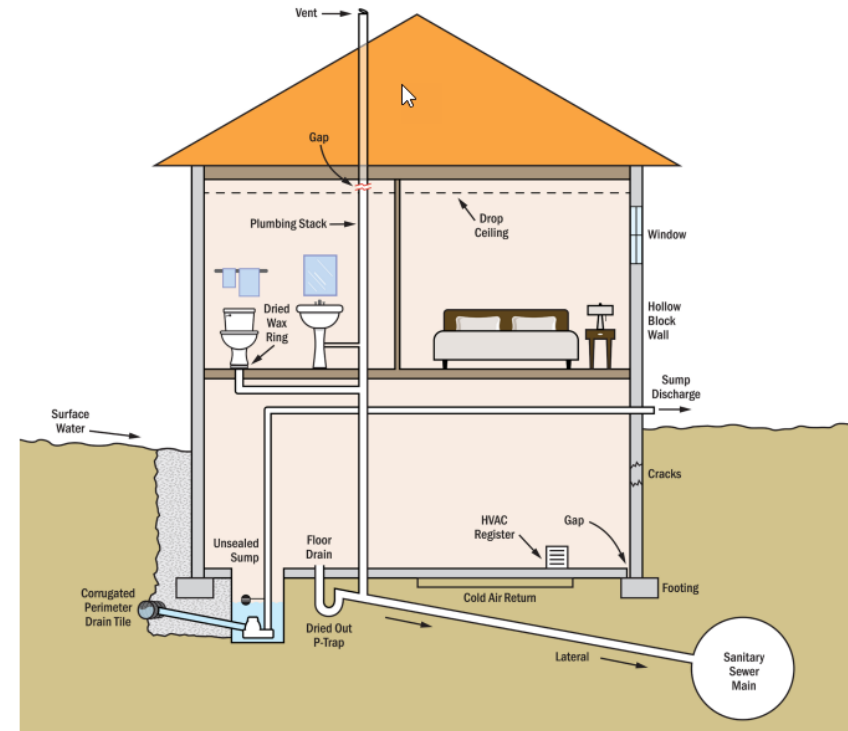


Figure 1: Examples of human-made preferential pathways – buildings

Common Sources of Environmental Contamination with Volatile Organic Compounds (VOCs)

Industries

- Chlorinated Solvents (CVOCs)
 - Tetrachloroethene (PCE)
 - Trichloroethene (TCE)
 - 1,1,1-trichloroethane (1,1,1-TCA)
 - Others
- Petroleum VOCs (PVOCs)
- Waste Oil

Dry Cleaners

- PCE (or “perc) – primary solvent
- TCE – spot cleaners
- Stoddard Solvent – petroleum based

Not a complete listing

Common Disposal/Discharge Areas

Industries

- Chemical delivery / tank storage areas
- Chemical transfer routes
- Solvent dip tanks
- Parts washers
- Sinks, toilets & floor drains
- Back door dumping

Dry Cleaners

- Dry cleaner unit
- Perc delivery / storage areas
- Sinks, toilets & floor drains
- Exterior vent pipe
- Back door dumping
- Dumpster locations
- Seep through the concrete

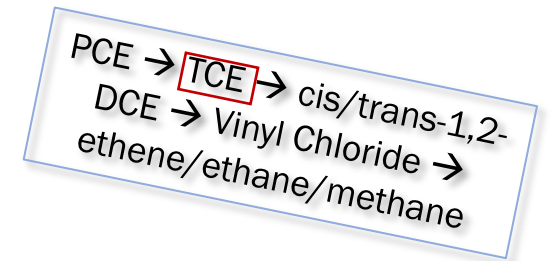
Not a complete listing

Acute Risk from Trichloroethene (TCE)

- PCE breaks down to TCE
- Letters to WDNR from WDHS regarding acute risk from TCE
 - December 7, 2017 (TCE vapors pose acute health risk)
 - March 25, 2021 (recommended response times for acute health risk)
 - June 6, 2022 (single exposure is 8-hr occupational; 24-hr residential)

Acute Health Exposure in **Bold Red**

Contaminant (Concentrations in µg/m ³)	Target Indoor Air Concentration - Residential	Target Indoor Air Concentration - Commercial / Industrial
PCE	42	180
3x PCE	126	540
TCE	2.1 (WCBA)	8.8 (WCBA)
3x TCE	6.3	26.4



WDHS = Wisconsin Department of Health Services; WCBA = Women of Child-bearing Age per CDC is ages 14-44 yrs

Radon Mitigation vs. Chemical VI Mitigation

- Design considerations
 - uniform, naturally occurring, chronic health risk from sub-surface (radon) vs.
 - variable presence, human-made chemical in soil, groundwater and utility conduits with a different half life, potential acute and chronic health risks and liability (chemical VI)
- Commissioning requirements
- Documentation requirements
- Operation, monitoring and maintenance plan requirements
- Environmental consultant certification requirements

Vapor Intrusion Solutions (not a complete list)

- Acute Risk:
 - Increase ventilation
 - Seal cracks, joints & open sumps (*also chronic risk solution*)
 - Deploy air purification units (APUs)
 - Limit occupancy
 - Temporarily relocate occupants
- Chronic Risk in Existing Structure:
 - Sub-slab / sub-membrane depressurization system (SSDS / SMDS)
 - Sub-slab / crawlspace ventilation (SSV / CSV)
 - HVAC modification
 - Epoxy seal floor

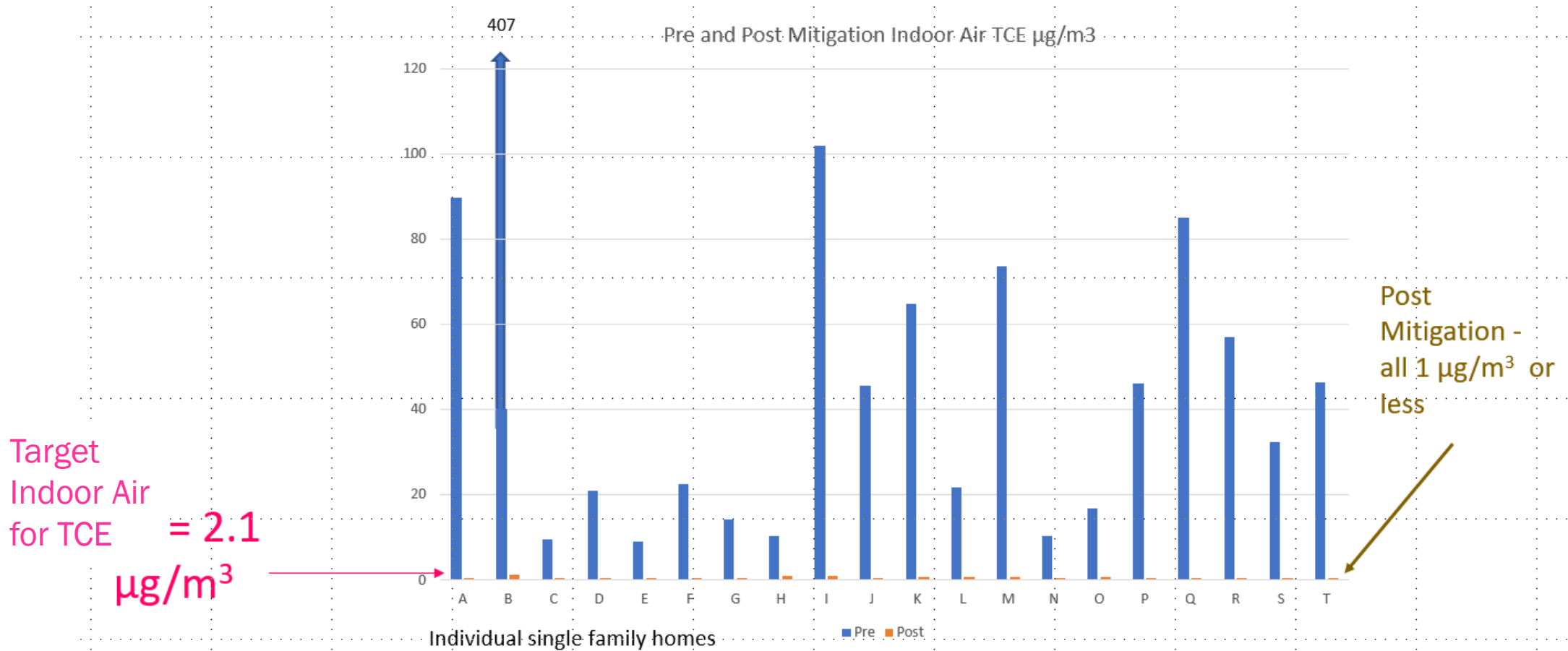
Vapor Intrusion Solutions (not a complete list)

- Chronic Risk in New Structure:
 - Chemical vapor barrier
 - Passive sub-slab ventilation system
 - SSDS
 - SMDS



Sub-slab Depressurization System (SSDS)

- Must remain operational to be effective!



Dry Cleaners in Wisconsin

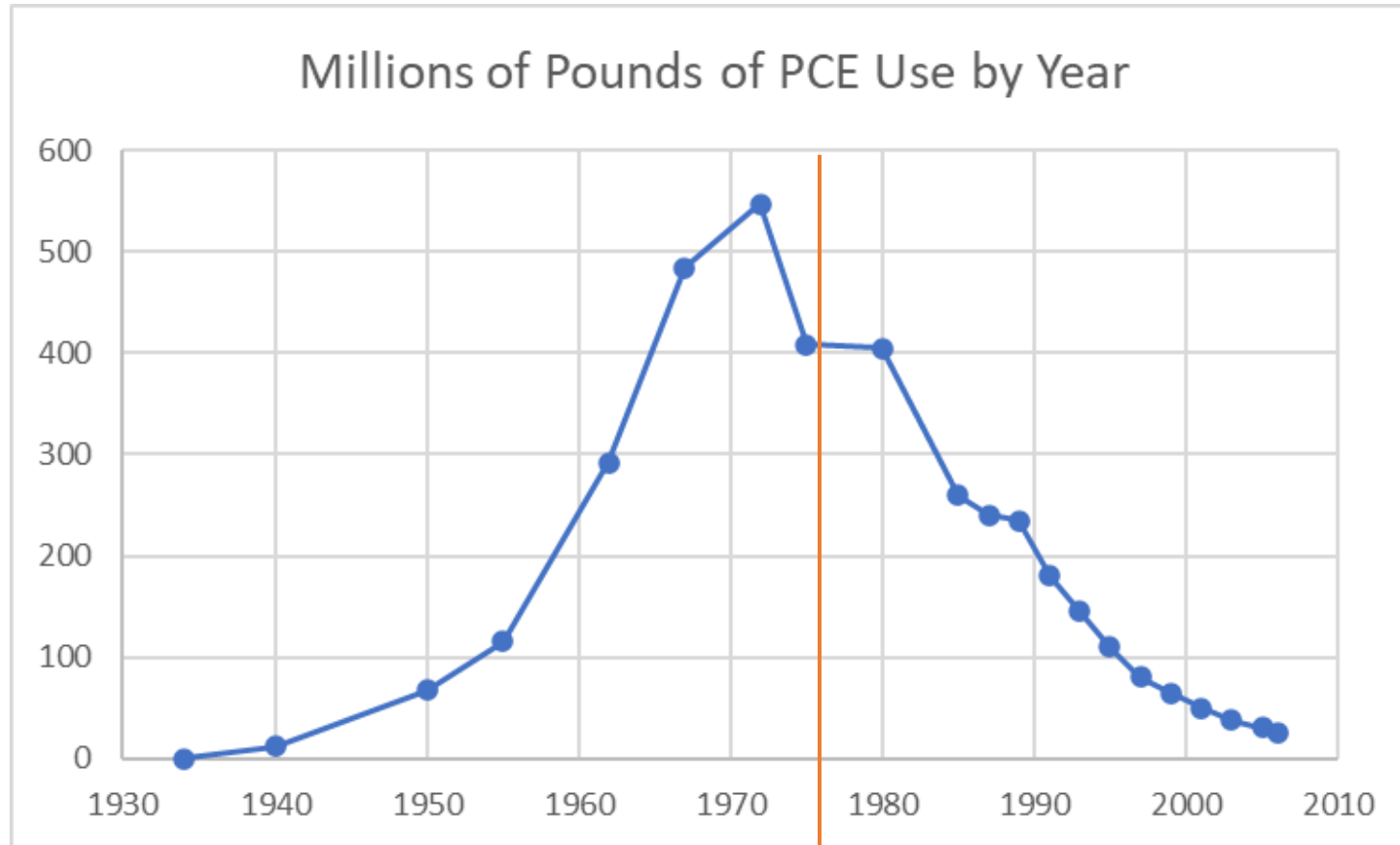
- Approximately 250 historical dry cleaner locations in Madison
 - 23 with discharges to the environment reported to WDNR
- 351 historical dry cleaner locations with discharges to the environment reported statewide
 - 161 open cases
 - 190 closed cases (many prior to a vapor investigation)
- Estimate thousands more historical dry cleaners statewide where contamination is not yet discovered



*Historical dry cleaners
likely operated in a
neighborhood where you
live or work too.*

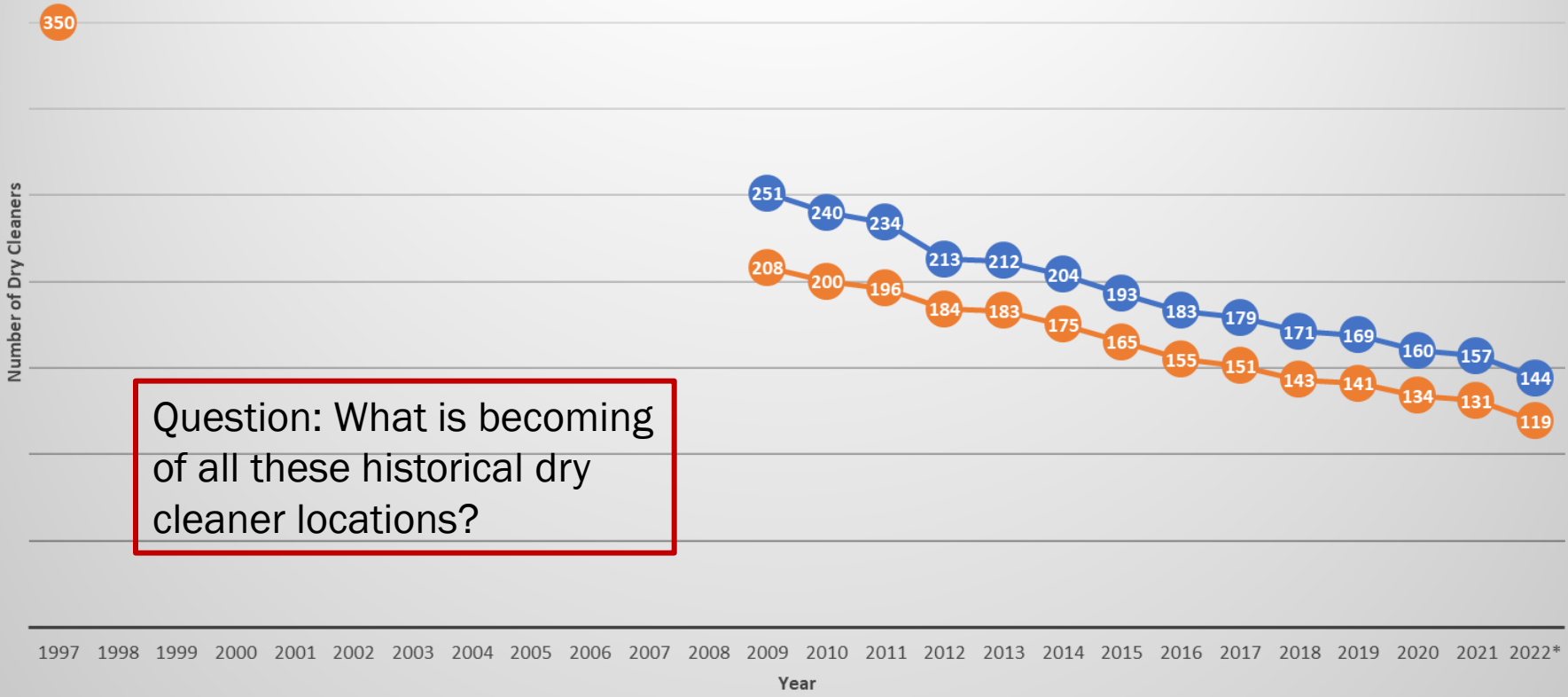
PCE Use by the Dry Cleaner Industry in the US

(various sources)



1976-Resource Conservation and Recovery Act (RCRA)

Active Dry Cleaner Facilities/Customers as of March 31st



Question: What is becoming of all these historical dry cleaner locations?

—●— Active Dry Cleaner Facilities (as of March 31st each year)
 —●— Active Dry Cleaner Customers (as of March 31st each year)

Data from 1998-2008 not available.
 Facilities = Number of dry cleaning stores/locations per Dept. of Revenue.
 Customers = Individually licensed dry cleaner operators per Dept. of Revenue.
 * = Numbers based on manual review of licenses at Dept. of Revenue.

VAPOR INTRUSION PREVENTION & PARTNERSHIP TOOLKIT

A TOOL FOR LOCAL GOVERNMENTS, NEIGHBORHOOD ASSOCIATIONS AND PROPERTY OWNERS

FORMER DRY CLEANERS - THE HIDDEN RISK



In the 1900s, dry cleaning (waterless cleaning of garments utilizing a chemical solvent) was a common business. In bigger cities, dry cleaners were on almost every commercial block and most small towns normally had one or two.

While dry cleaning continues today, fewer dry cleaners remain due to fashion trends and advances in textiles (e.g., wrinkle-free clothing). Locations that formerly operated as dry cleaners have since been remodeled or redeveloped into other businesses, restaurants, apartment buildings and daycares. Though the redevelopment of these spaces is beneficial for the community and economy, many dry cleaners left behind hidden environmental contamination that can affect the health of occupants decades later.

Not Just Dry Cleaners

The Vapor Intrusion Prevention & Partnership Toolkit focuses on vapor intrusion resulting from dry cleaning operations. However, many other businesses used chemicals that can result in vapor intrusion (e.g., operations that used trichloroethylene (TCE) as a metal degreaser). An [environmental professional](#) may assist communities and property owners to evaluate sources of vapor intrusion from other sources.

November 2021

<https://dnr.wisconsin.gov/topic/Brownfields/VIPPI.html>

Information applicable to any municipality and any state.

August 2021

WDHS VI Website:

<https://www.dhs.wisconsin.gov/air/vi.htm>



<https://www.dhs.wisconsin.gov/publications/p03070.pdf>

Revised Law in Wisconsin



Wisconsin Department of
Children and Families

- Wis. Admin. Code chs DCF 250 & 251
- Effective March 1, 2023, day cares will be required to sample for radon every two years (residential) or five years (commercial)
- Parent notification & mitigation required if radon > 4 picocuries per liter (pCi/L)
- First radon legislation in Wisconsin
- WDCF working with WDHS on outreach & education
- WDHS coordinates the state radon program
- **Opportunity!** WDNR working with WDHS to educate day care providers about CVI health risks from historical dry cleaners



Key Points

- ✓ Chemical vapor intrusion (CVI) presents an acute and/or chronic health risk to occupants
- ✓ TCE presents an acute health risk at low concentrations
- ✓ Mitigation solutions exist to protect occupants from CVI
- Contamination from historical dry cleaner operations poses a significant threat to human health now and into future
- ✓ Childcare facilities in WI soon required to test for radon
- ✓ WDNR & WDHS collaborating to raise awareness on health risks associated with historical dry cleaners, CVI & radon

CONNECT WITH US

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OFF THE RECORD"