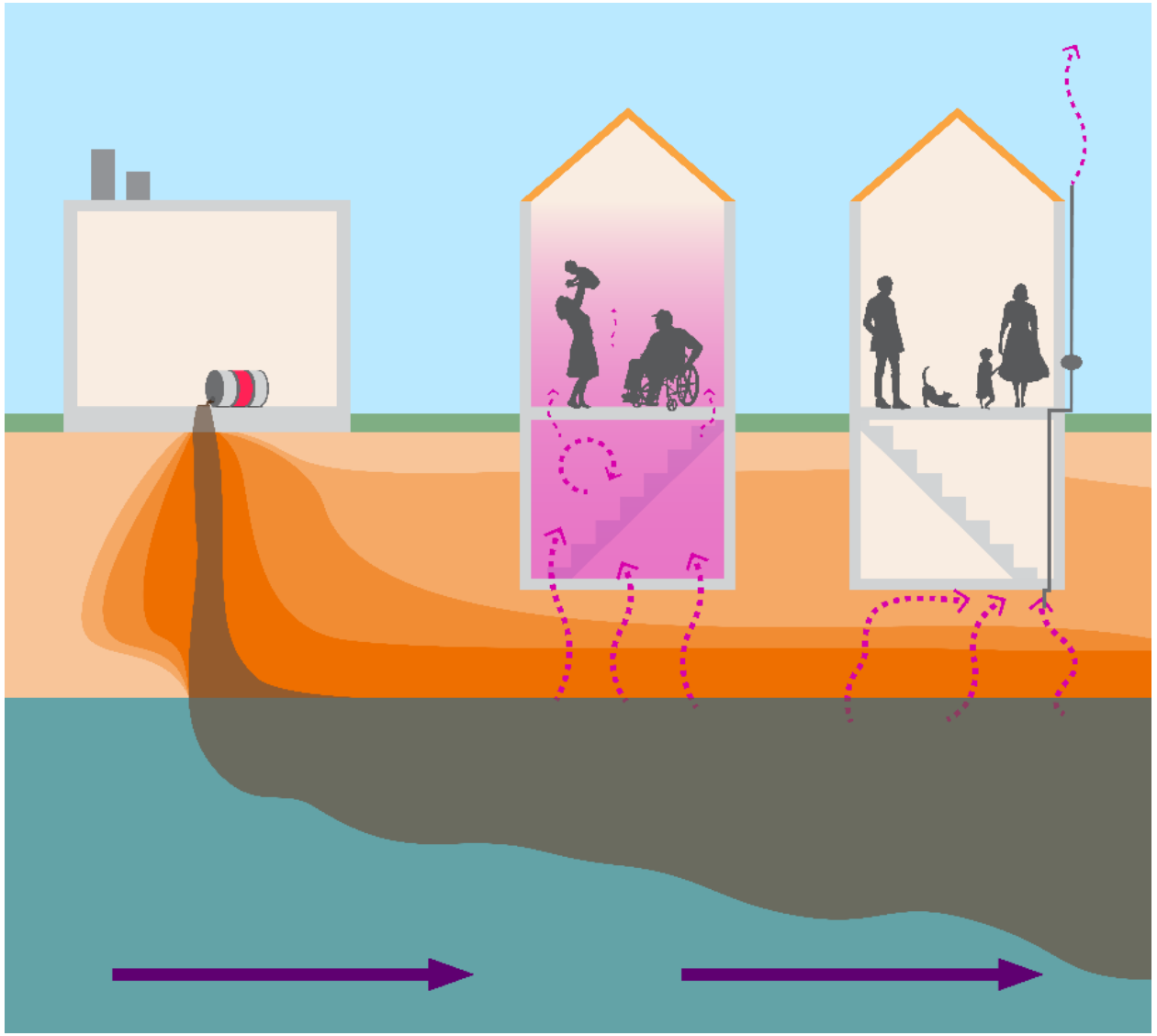


From RR-800

Deep Dive Into Vapor Intrusion: Application Of RR-800

August 20, 2026

Jim Walden, Vapor Intrusion Technical Expert

Jennifer Borski, Vapor Intrusion Team Leader

2026 Issues & Trends Schedule

September 17, 2026

- Conduit Vapor Intrusion: Application of RR-649 and RR-800

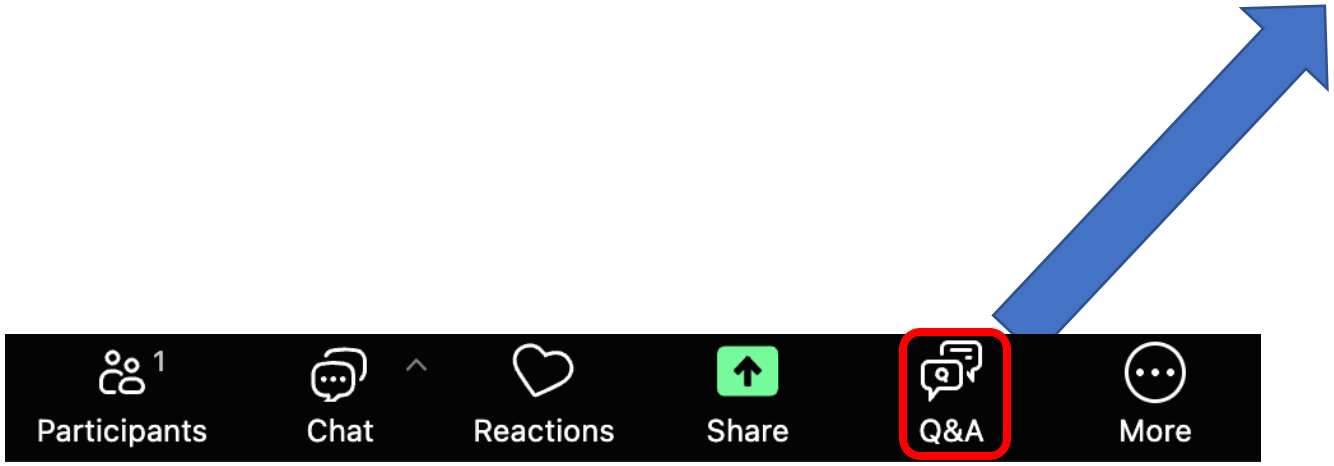
Recorded Sessions

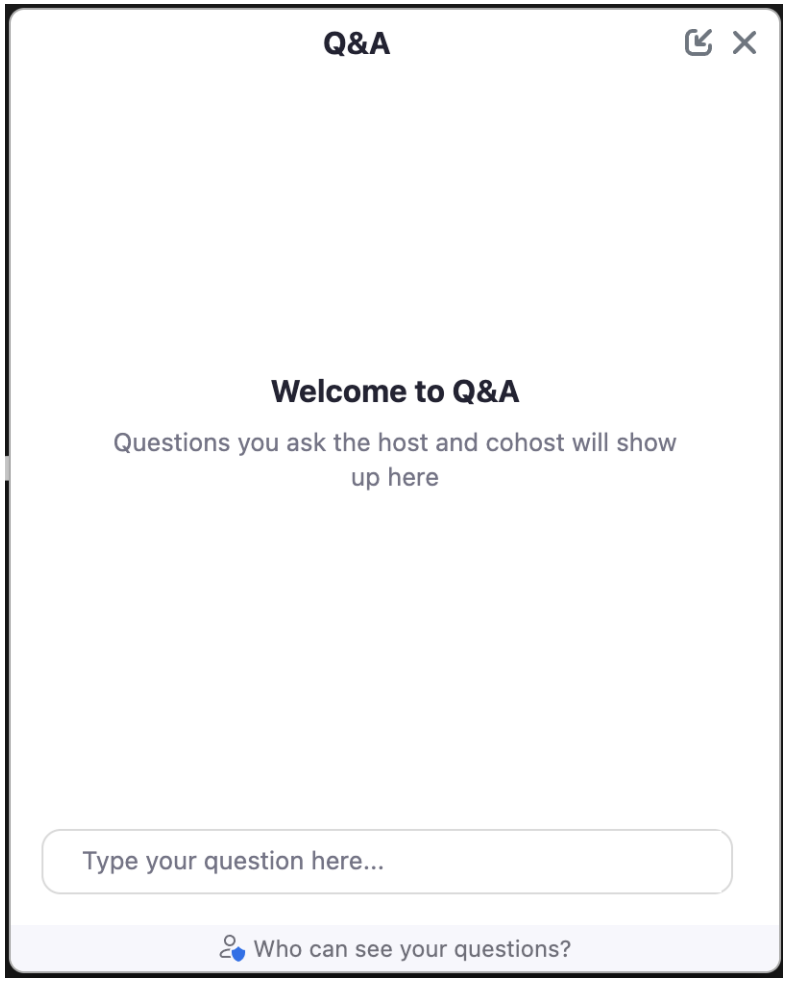
- Vapor Intrusion Guidance and Forms
- Using Monitored Natural Attenuation in Cleanup of Contamination
- Deep Dive Into Vapor Intrusion: Application of RR-800 (available after today)

Recorded sessions available at dnr.wi.gov, search “RR Training Library”

Asking Questions – Use Q & A

Please use the Q&A button in Zoom for all questions.





Agenda

- Collecting Demographics Information
- Screening (Chlorinated Volatile Organic Compounds (CVOCs)
- Soil Gas Sampling CVOCs – General Conceptual Model for Vapor Intrusion
- Questions

Technical Assistance Available

Site investigations involving vapor are often complicated, iterative and time/resource intensive

Requesting technical review, with fee, can help avoid delay

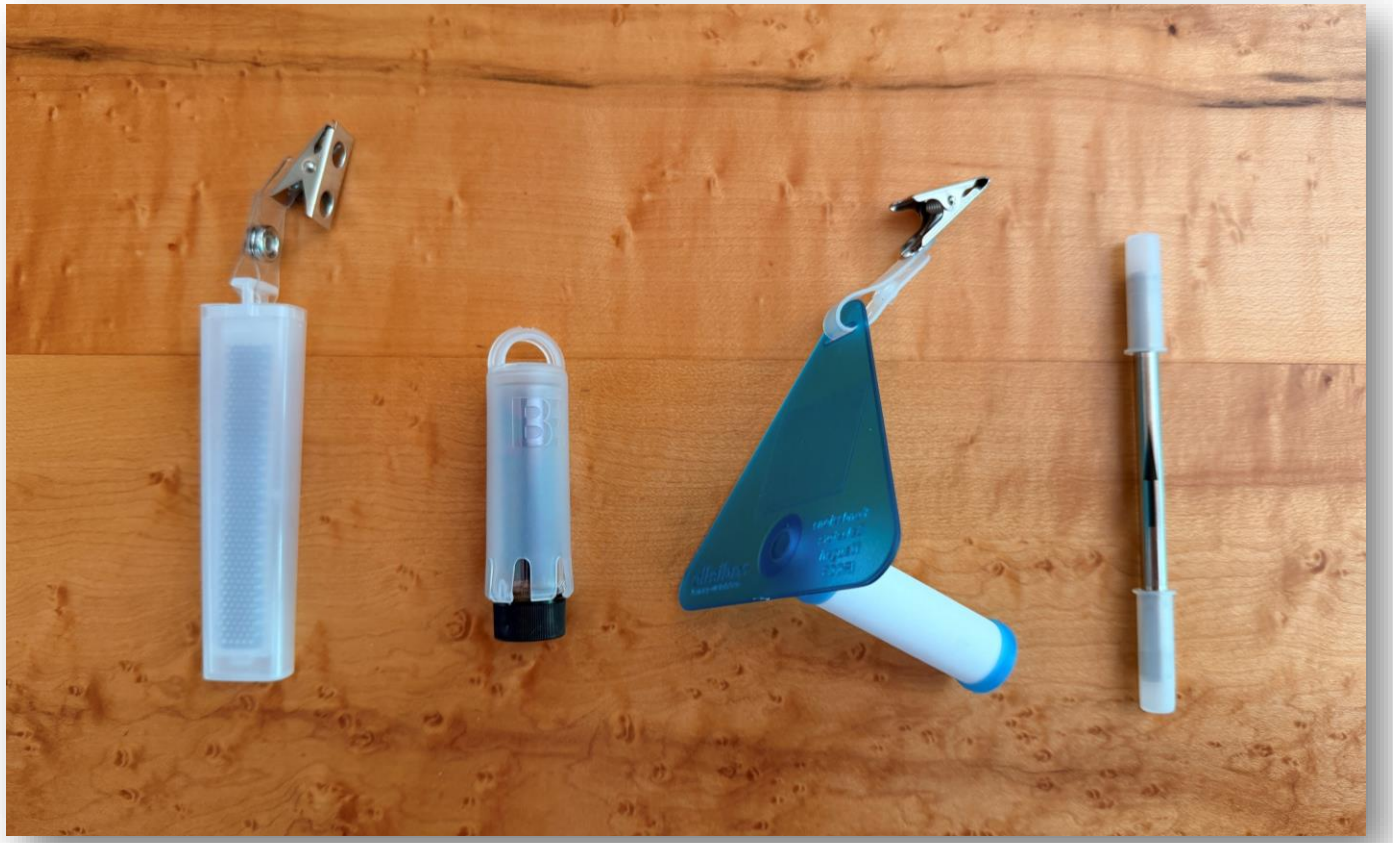
Find form to request assistance by visiting **dnr.wi.gov**; search “RR technical assistance.”

Review also available at other steps including data interpretation and confirming completeness of VI investigation.

Collect Demographic Information When Making Health-Based Recommendations

Identify sensitive populations that includes people	Do not provide DNR with
• Under age 15 • Currently pregnant or may become pregnant • Elderly	• Names • Specific ages • Individual occupancy habits

Time Critical Sampling



Assortment of passive samplers and sorbent tube on right

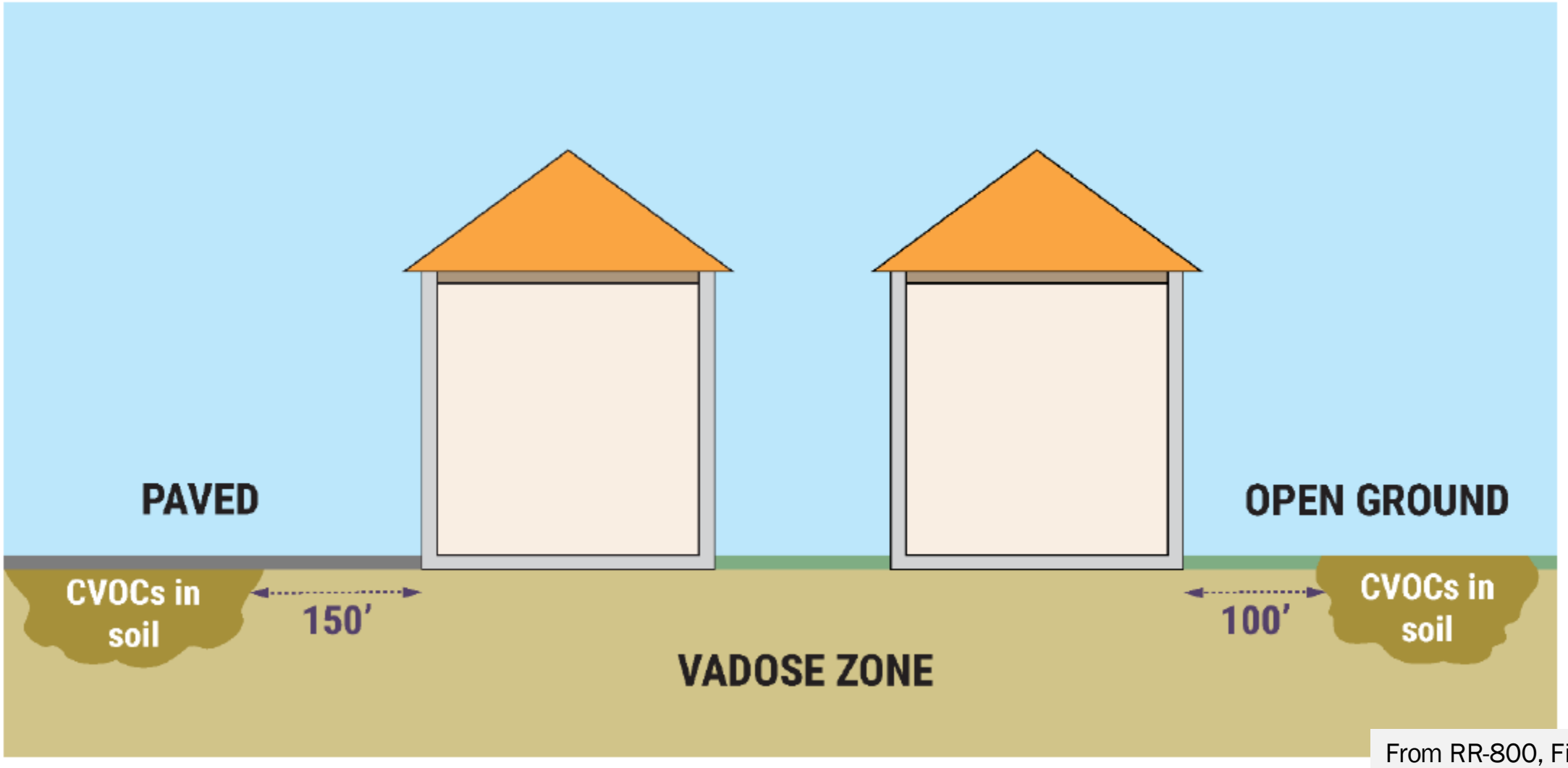
Screening for CVOCs

Vadose Zone (Soil source)

Groundwater

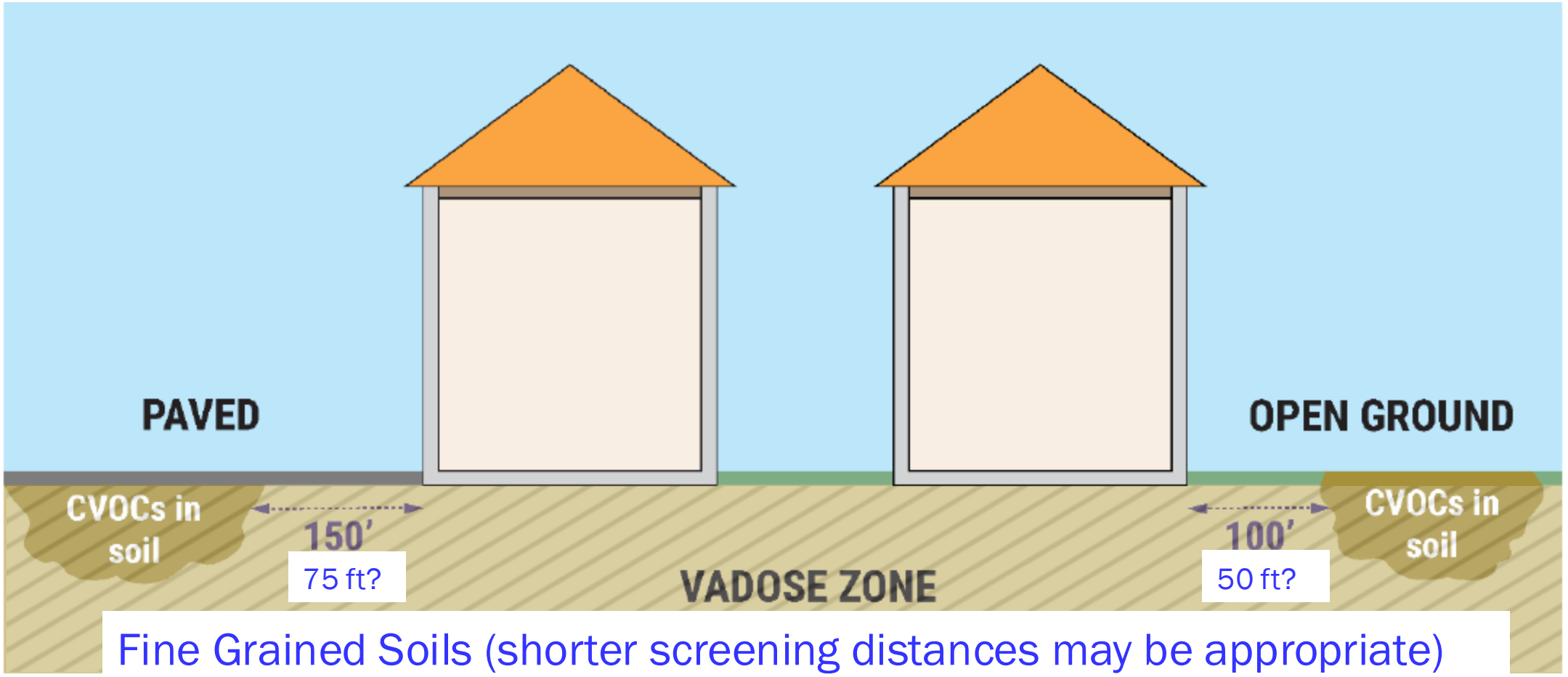
Preferential Pathway

Vadose Zone Screening



From RR-800, Figure 2

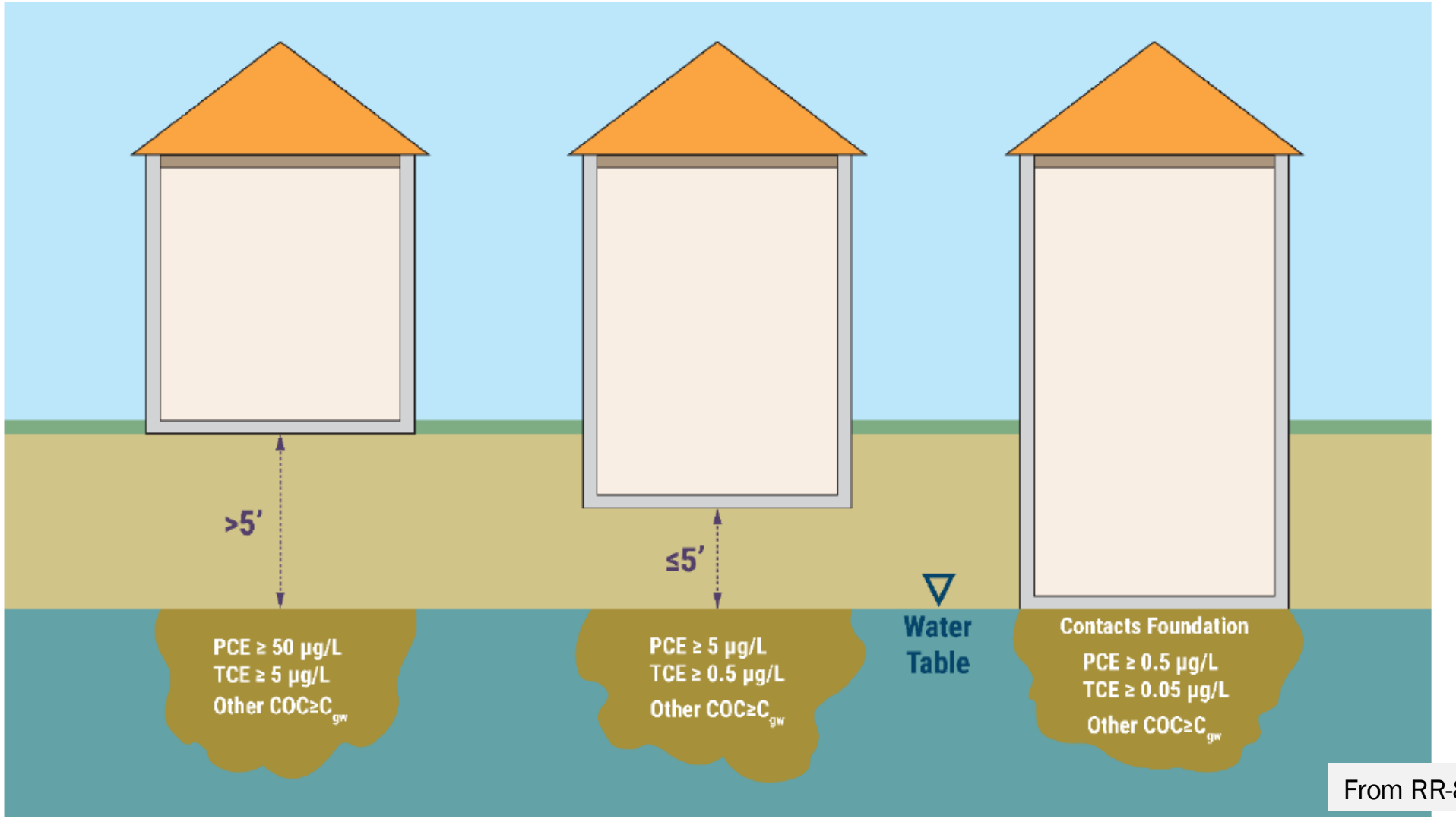
Vadose Zone Screening: Fine Grained Soils



Fine Grained Soils (shorter screening distances may be appropriate)

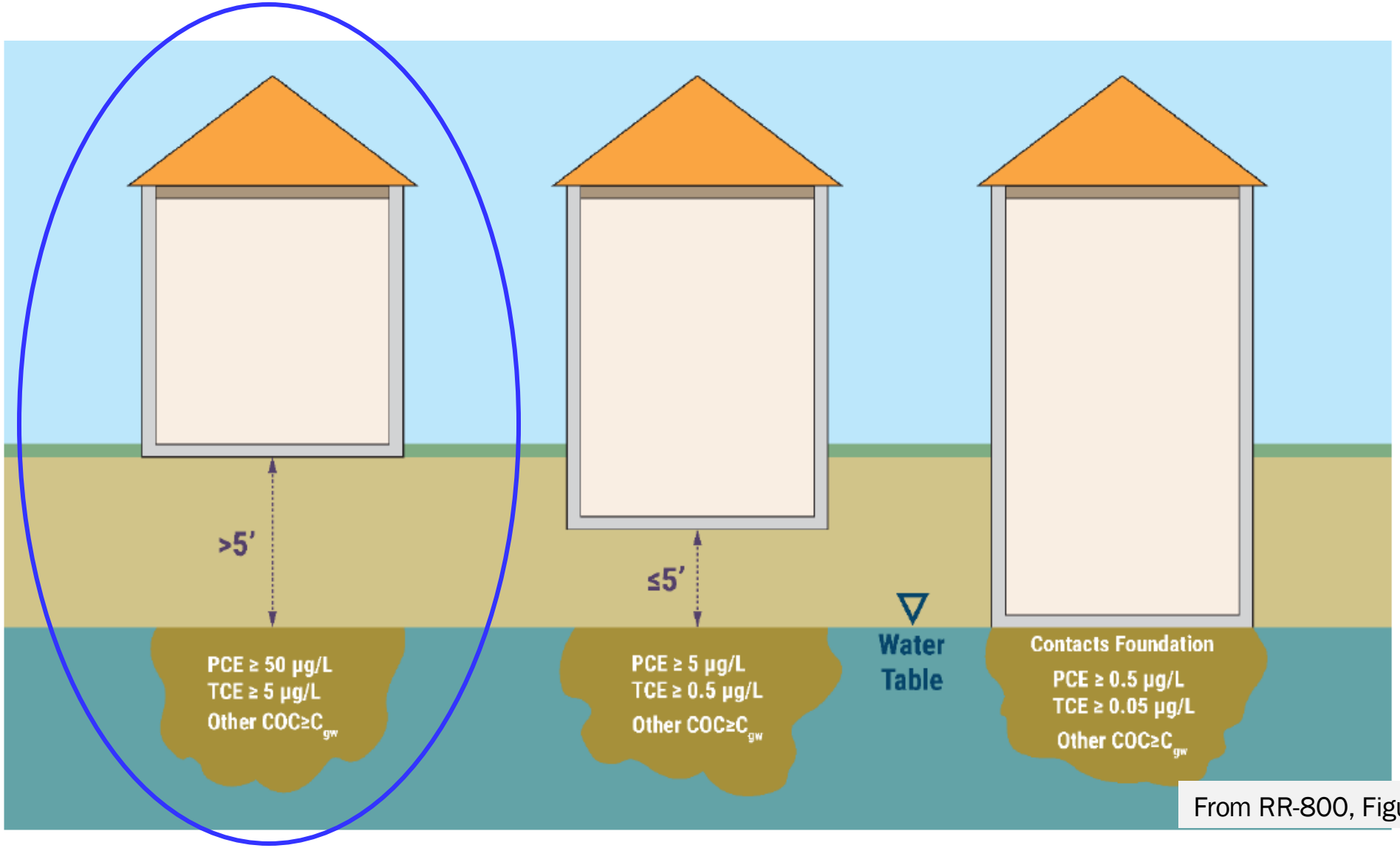
From RR-800, Figure 2 (modified)

Groundwater Screening



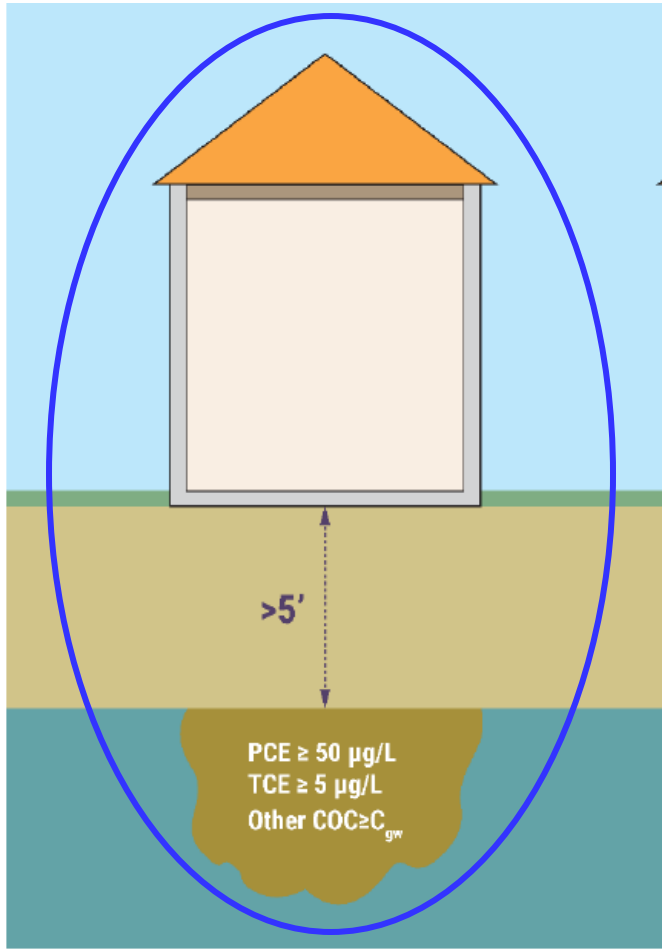
From RR-800, Figure 3

Groundwater Screening: Greater Than 5 Feet



From RR-800, Figure 3 (modified)

Groundwater Screening Criteria: Common Contaminants



From RR-800, Figure 3 (modified)

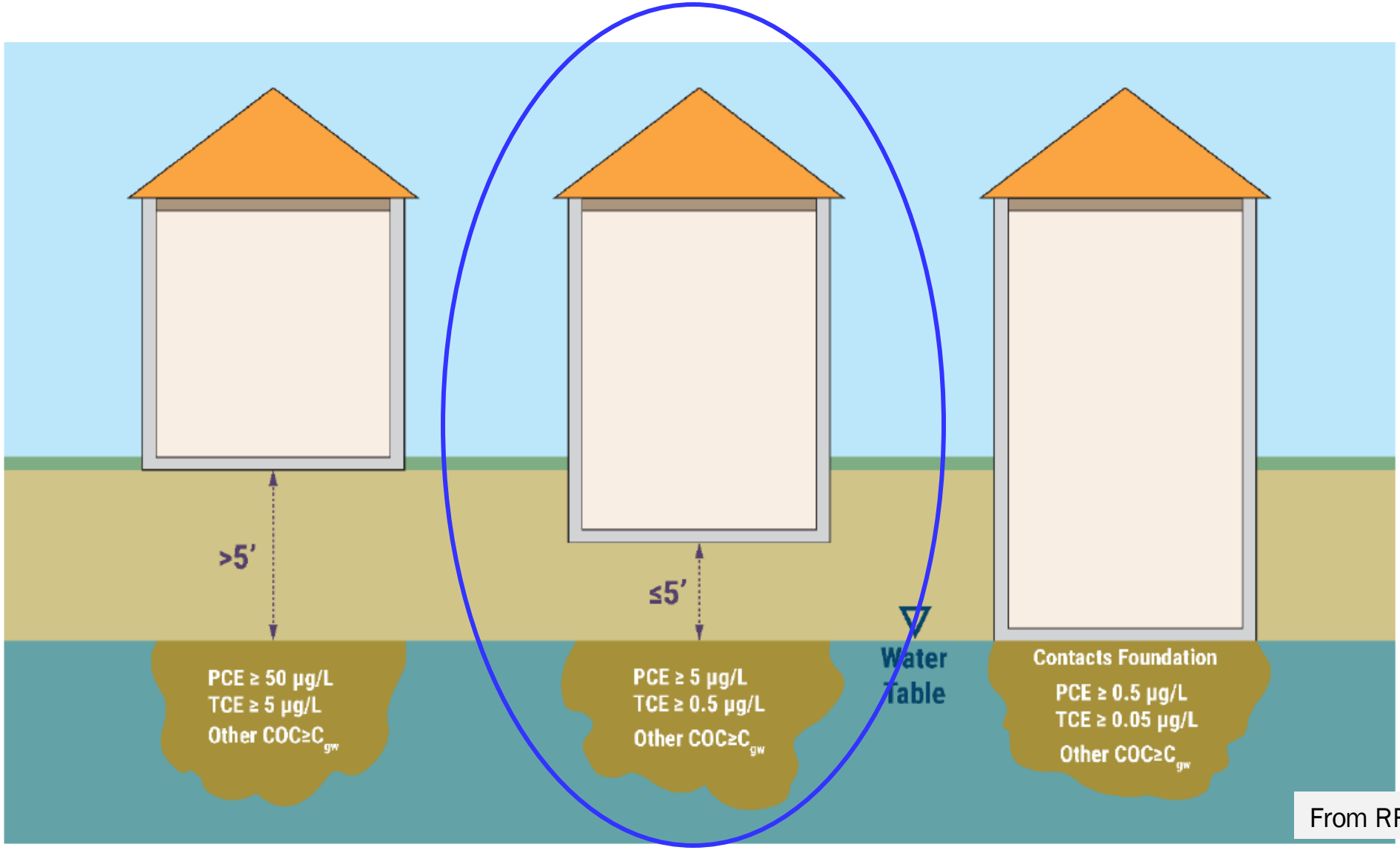
Guidance: Vapor Quick Lookup Tables (RR-0136) May 2026

Groundwater VRSL Quick Lookup Tables

Table 5. Groundwater VRSLs where groundwater is >5 feet from building foundation (in µg/L)

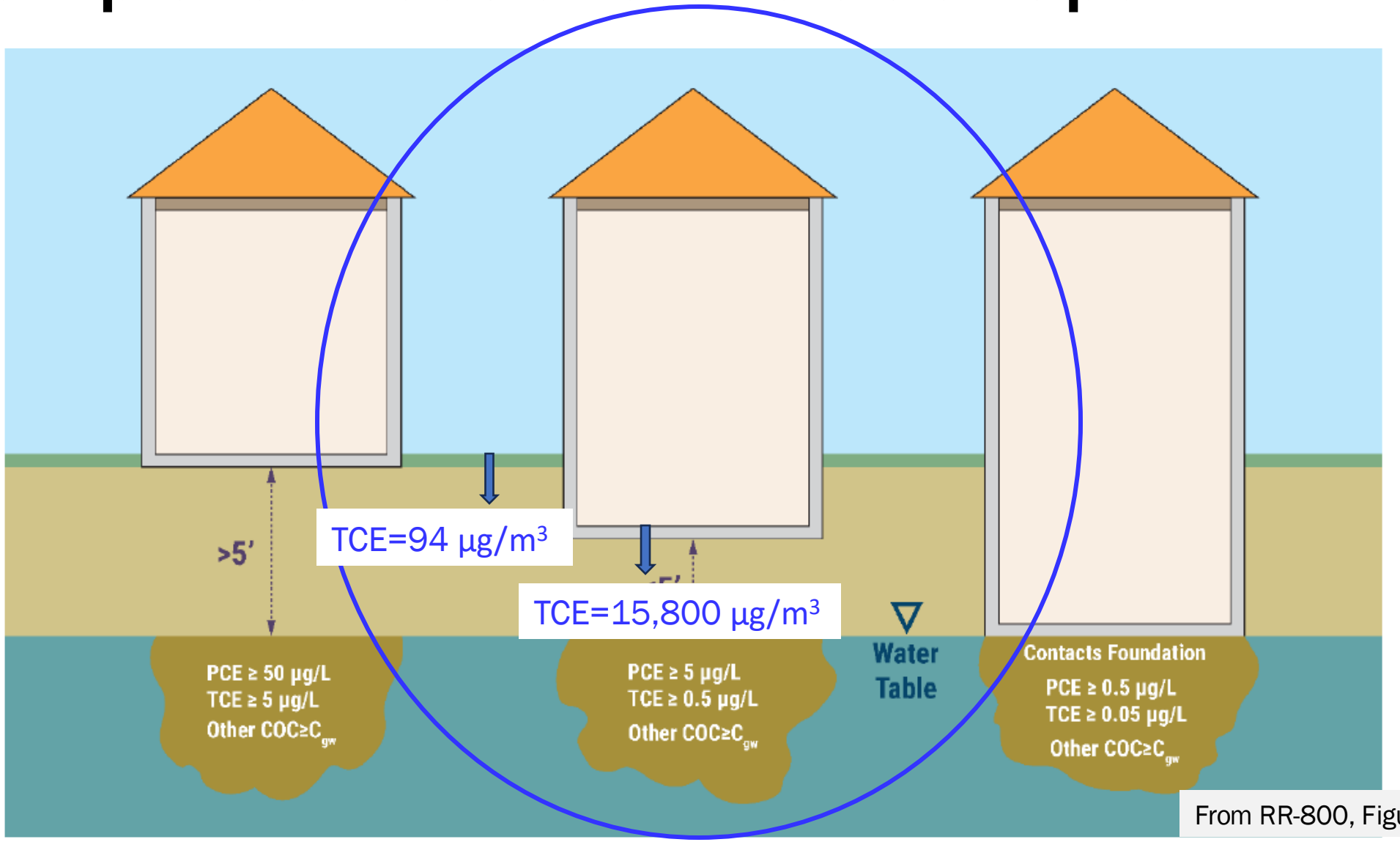
Chemical (in order reported on VISL)	Residential Groundwater VRSL (AF = 0.001)	Small Commercial Groundwater VRSL (AF = 0.001)	Large Commercial / Industrial Groundwater VRSL (AF = 0.0003)
Carbon Tetrachloride	4.2	18	60
Chloroform	8.1	36	120
Chloromethane	260	1,100	3,600
Dichlorodifluoromethane (Freon-12)	7.4	31	100
1,1-DCA	76	330	1,100
1,1-DCE	3.9	16	54
1,2-DCE, cis-	250	1,100	3,500
1,2-DCE, trans-	110	460	1,500
Methylene Chloride	4,700	20,000	66,000
PCE	See Table 4	See Table 4	See Table 4
1,1,1-TCA	7,400	31,000	104,000
TCE	See Table 4	See Table 4	See Table 4
Trichlorofluoromethane (Freon-11)	NE	NE	NE
Vinyl Chloride	1.5	25	82

Groundwater Screening: Less Than or Equal to 5 Feet



From RR-800, Figure 3

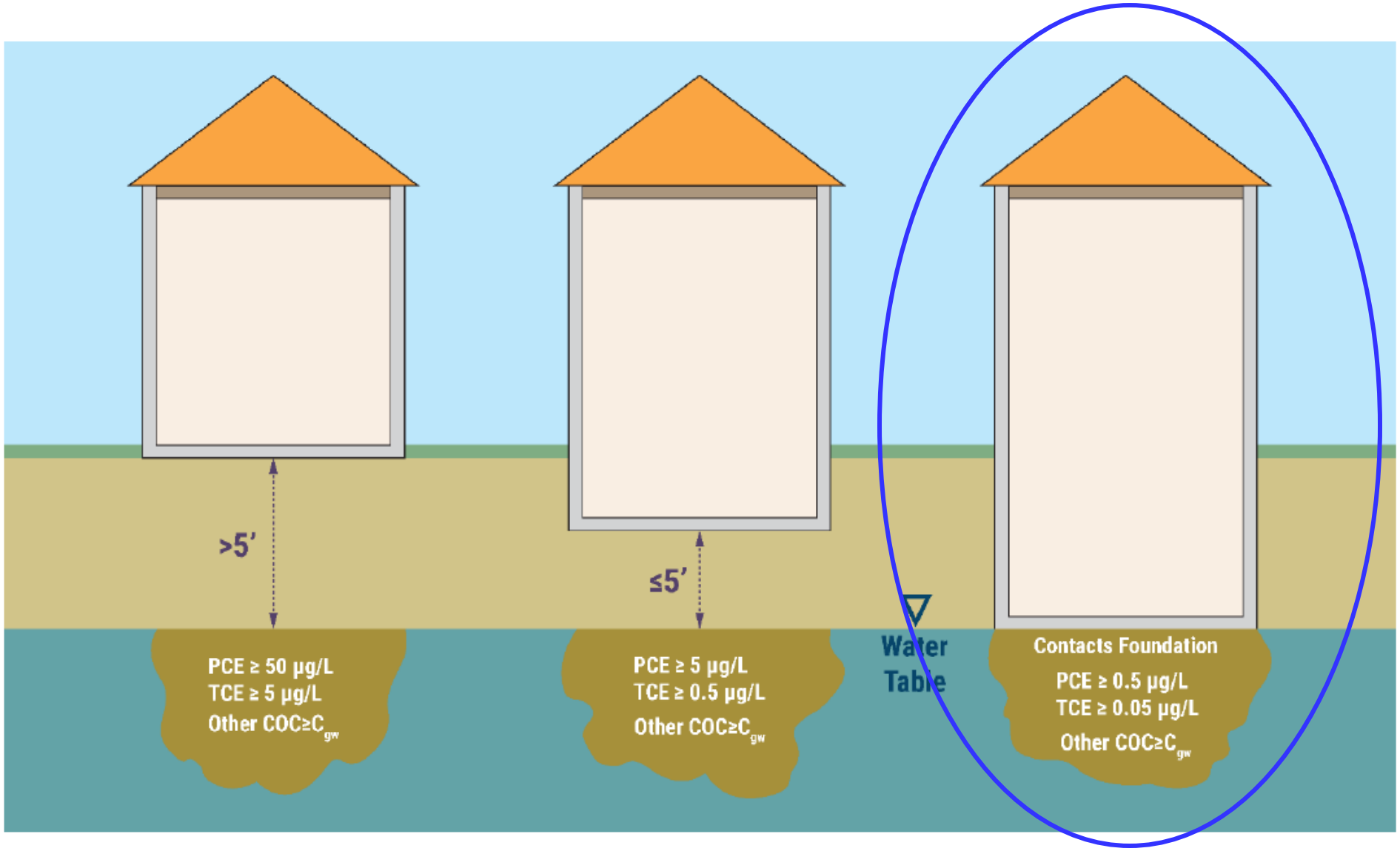
Example: Soil Gas and Sub-slab Vapor



Data from a site in Wisconsin

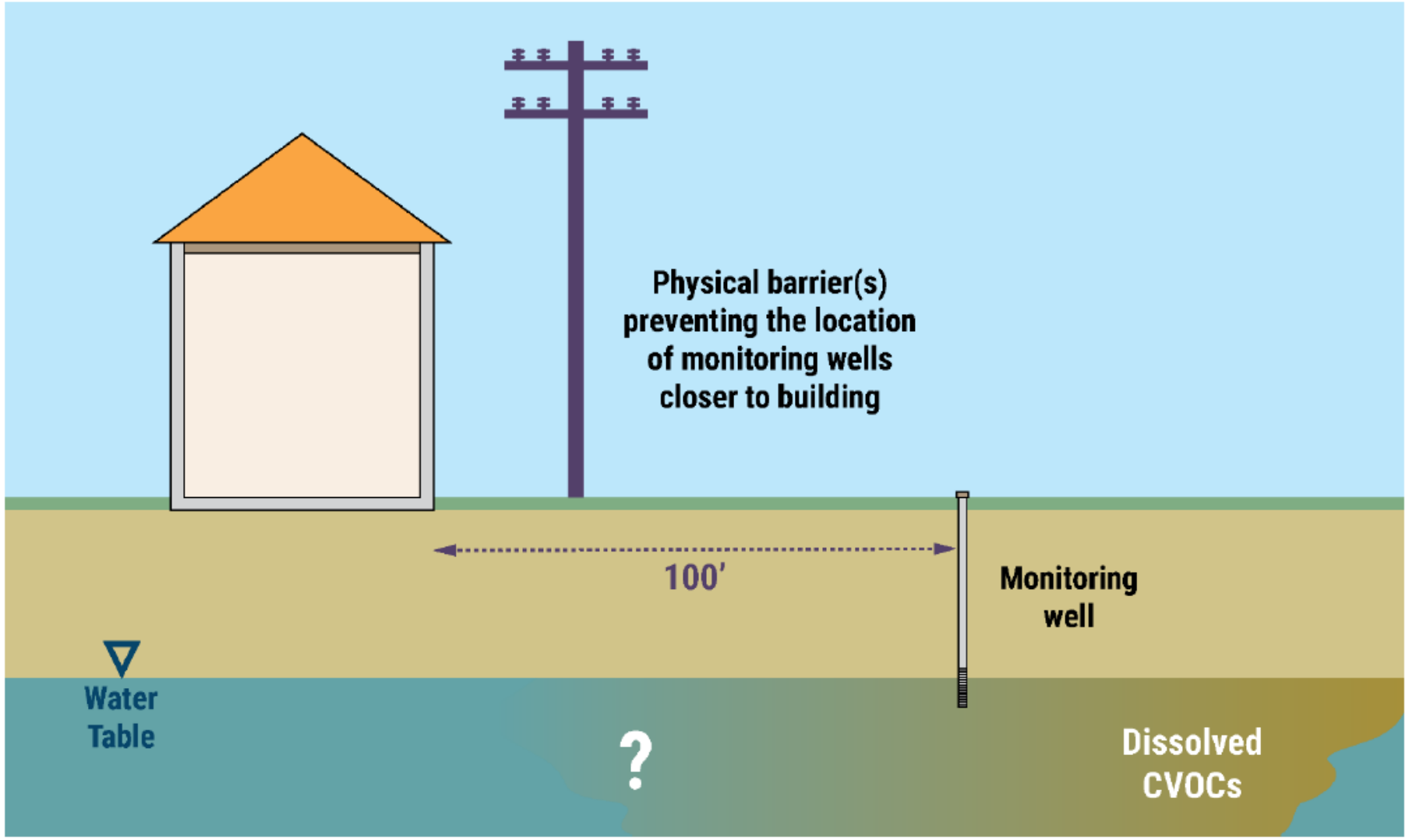
From RR-800, Figure 3 (modified)

Groundwater in Contact with Foundation



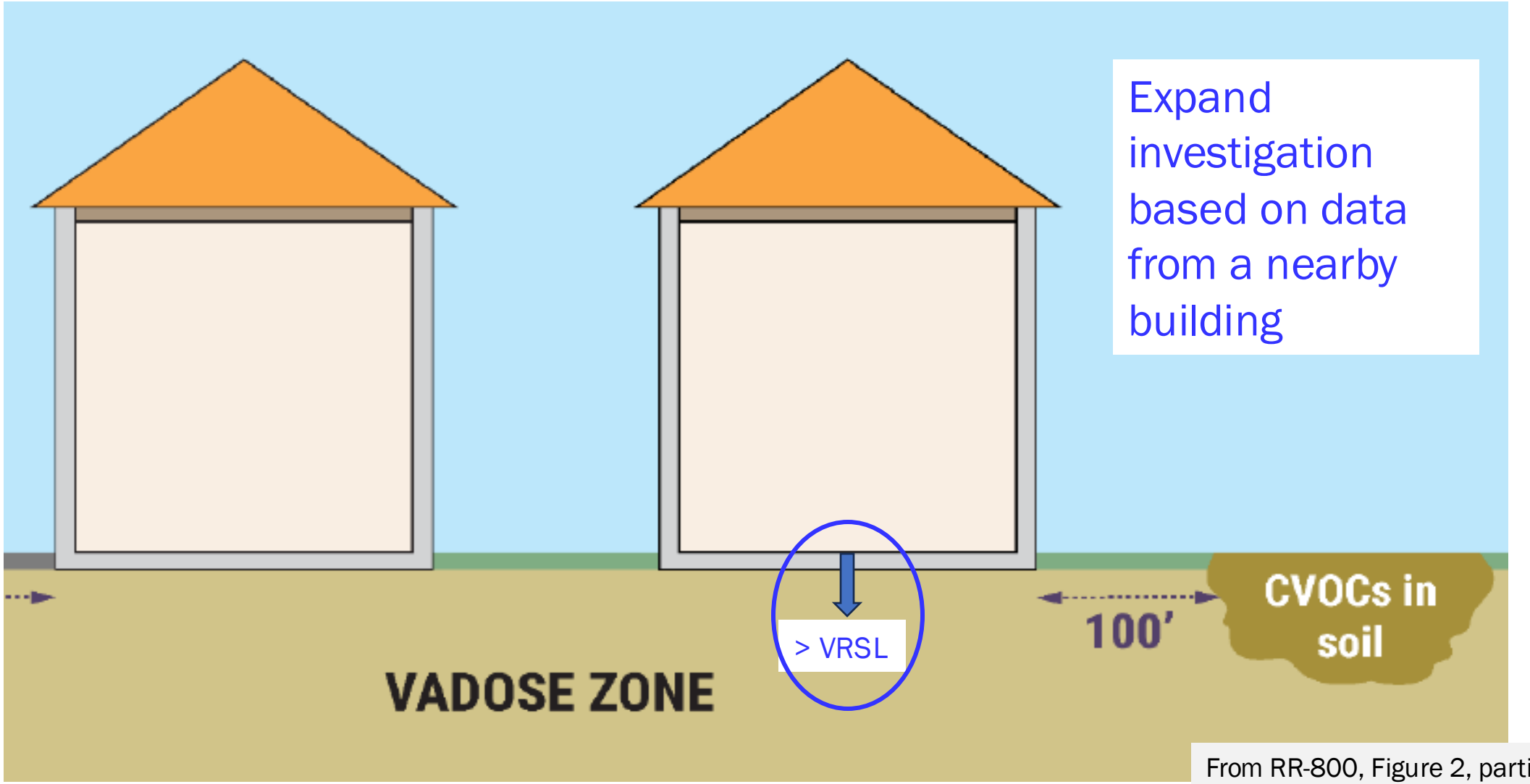
From RR-800, Figure 3 (modified)

Groundwater Screening with Physical Barrier



From RR-800, Figure 4

Expanding Vapor Screening (Horizontally)

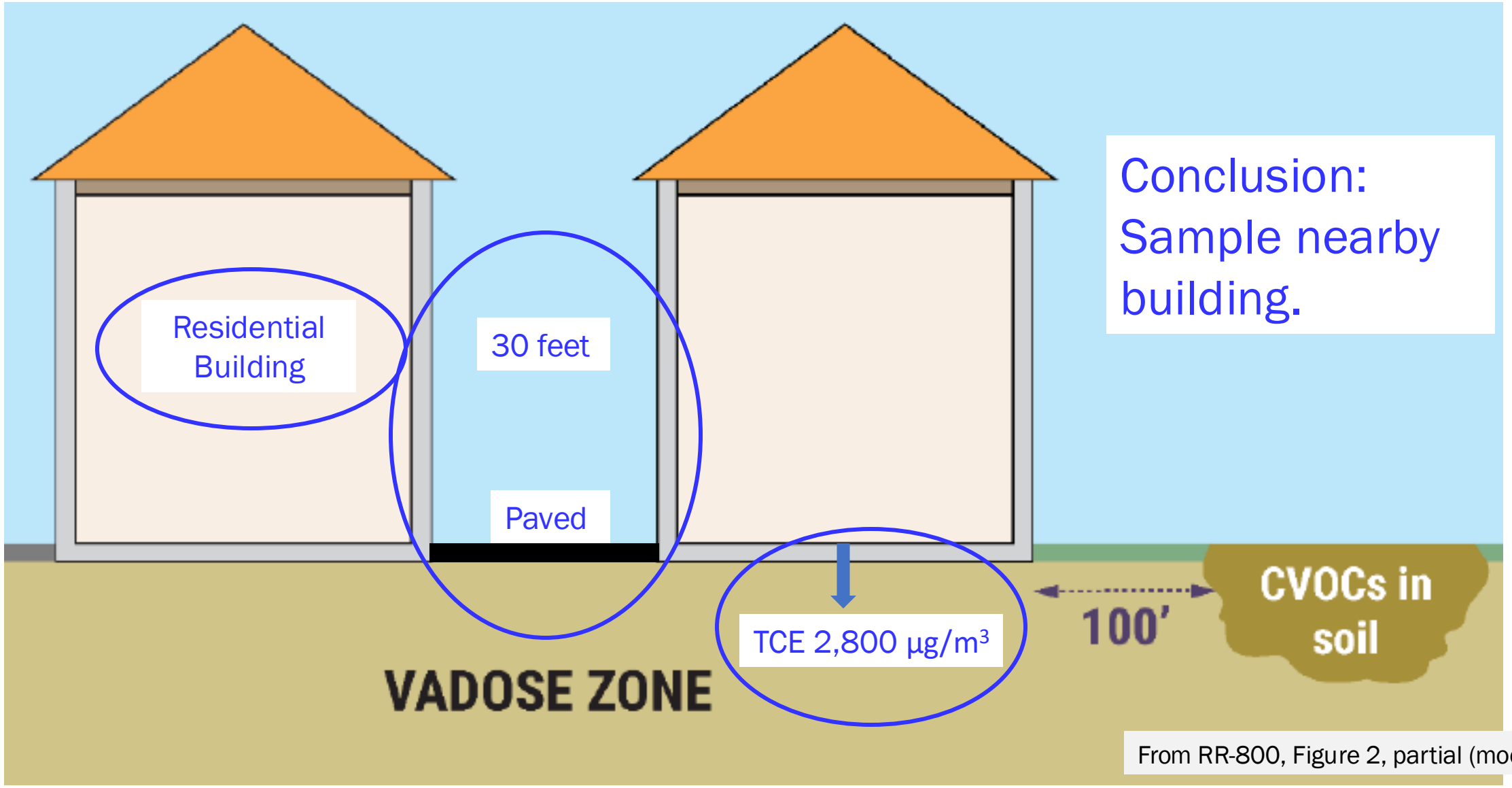


From RR-800, Figure 2, partial (modified)

Considerations: Expanding Vapor Screening Horizontally

Sub-slab concentrations
Building separation distance
Building pressurization
Soil type & heterogeneity
Surface cover
Foundation depths
Source depth
Sample density

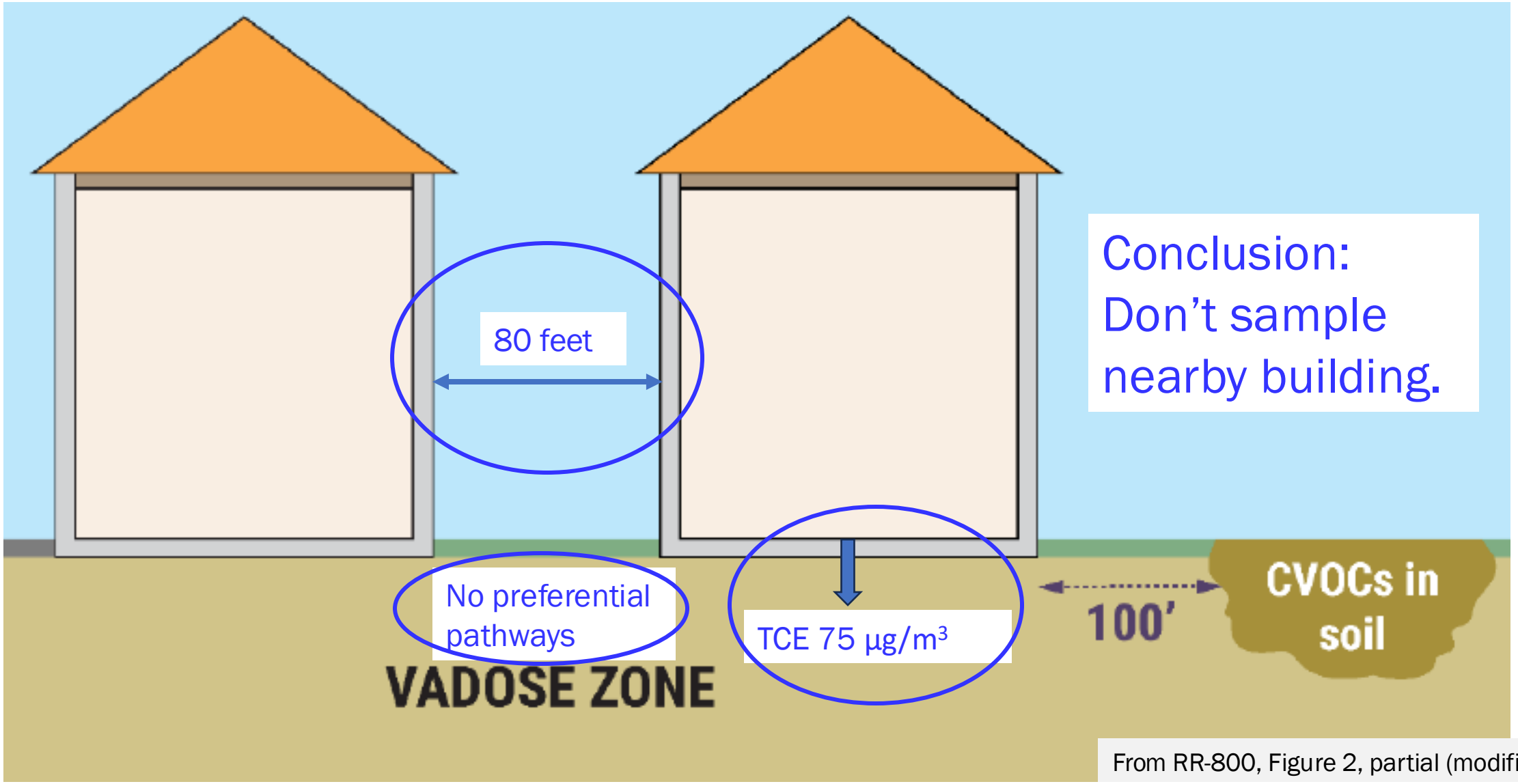
Example Scenario A



Conclusion: Sample nearby building.

From RR-800, Figure 2, partial (modified)

Example Scenario B



From RR-800, Figure 2, partial (modified)

Soil Gas Sampling - Uses

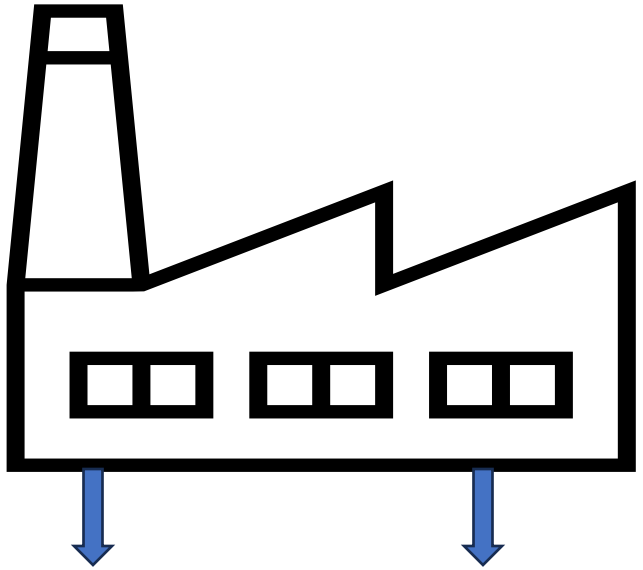
- Vapor intrusion assessment
- Source area delineation and migration pathways

Factors Affecting Measured Soil Gas Concentrations

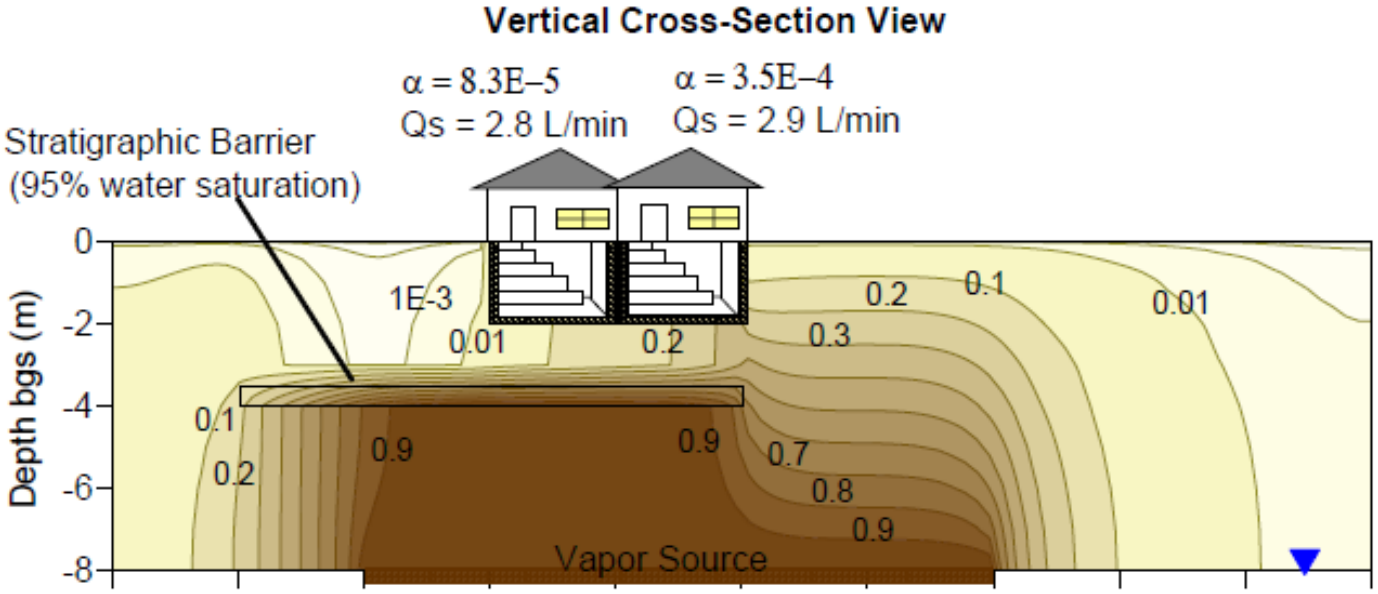
- Air filled porosity (moisture content)
- Soil heterogeneity (layering)
- Soil temperature
- Source strength
- Source: depth, lateral distance
- Water table oscillation
- Atmospheric
- Surface cover
- Building effects
- Sampling Methodology
- Transient response

Reference RR-800, Appendix A

Spatial Variability Soil Gas Concentrations
Orders of Magnitude



TCE = 3 µg/m^3 TCE = 38,700,000 µg/m^3



Normalized Vapor Concentrations

WI Investigation,
Example data from a site in Wisconsin

U.S EPA, 2012

Temporal Variability Soil Gas Concentrations
Lower than Spatial but Sometimes Orders of Magnitude

ITRC (2026)

- Less than a factor of two at depths greater than five feet and
- Seasonally less than a factor of five in colder climates

WI Investigations

- Up to ~2,000 times (sampling bias possible)

References: Soil Gas Movement

U.S. Environmental Protection Agency (U.S. EPA). *Conceptual Model Scenarios for the Vapor Intrusion Pathway*. by Lilian Abreu and Henry Schuver. U.S. Environmental Protection Agency, Washington, DC, EPA 530-R-10-003, February 2012.

Wang, Genfu, Shuaishuai Ma, Jonathan Ström, Eric Suuberg , Yijun Yao, and Lingzao Zeng. *Investigating Two-Dimensional Soil Gas Transport of Trichloroethylene in Vapor Intrusion Scenarios involving Surface Pavements using a Pilot-Scale Tank.* Journal of Hazardous Materials 371 (June 2019): 138-145.

Feng, Shi-Jin, Zhang-Wen Zhu, Hong-Xin Chen, and Zhang-Long Chen. *Two-Dimensional Analytical Solution for VOC Vapor Migrations through Layered Soil Laterally away from the Edge of Contaminant Source*. *Journal of Contaminant Hydrology* 33 (2020): 103664

Soil Gas Conceptual Models

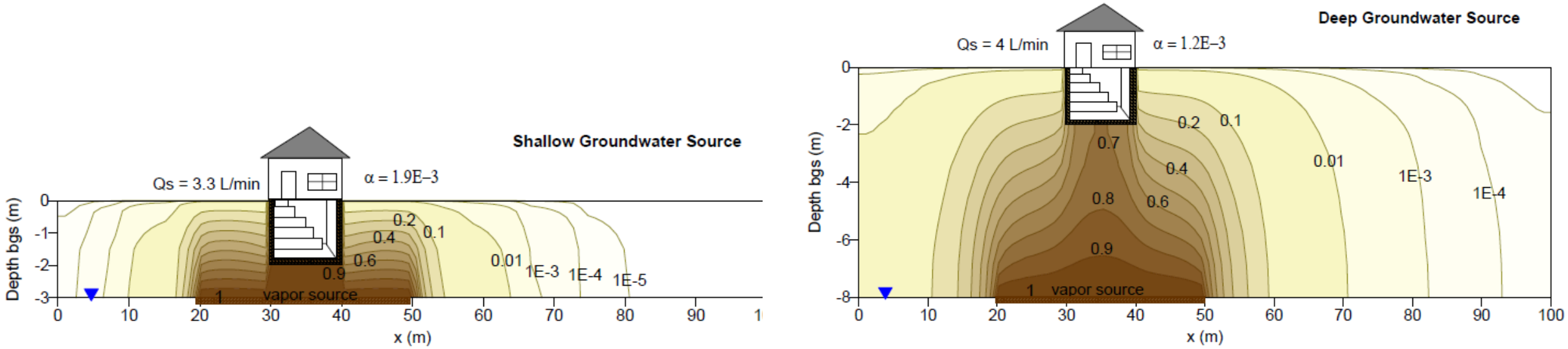


Figure 10. Soil vapor distribution and normalized indoor air concentration (α) for a spatially finite vapor source directly under a building at two groundwater depths.

The soil vapor concentration contour lines are normalized by the source vapor concentration. Qs is the soil gas flow rate predicted for building under-pressurized by 5 Pa.

(Abreu, 2005)

U.S EPA, 2012

Soil Gas Sampling Methods

Passive sample collection

Active sample collection

Active Soil Gas Sampling

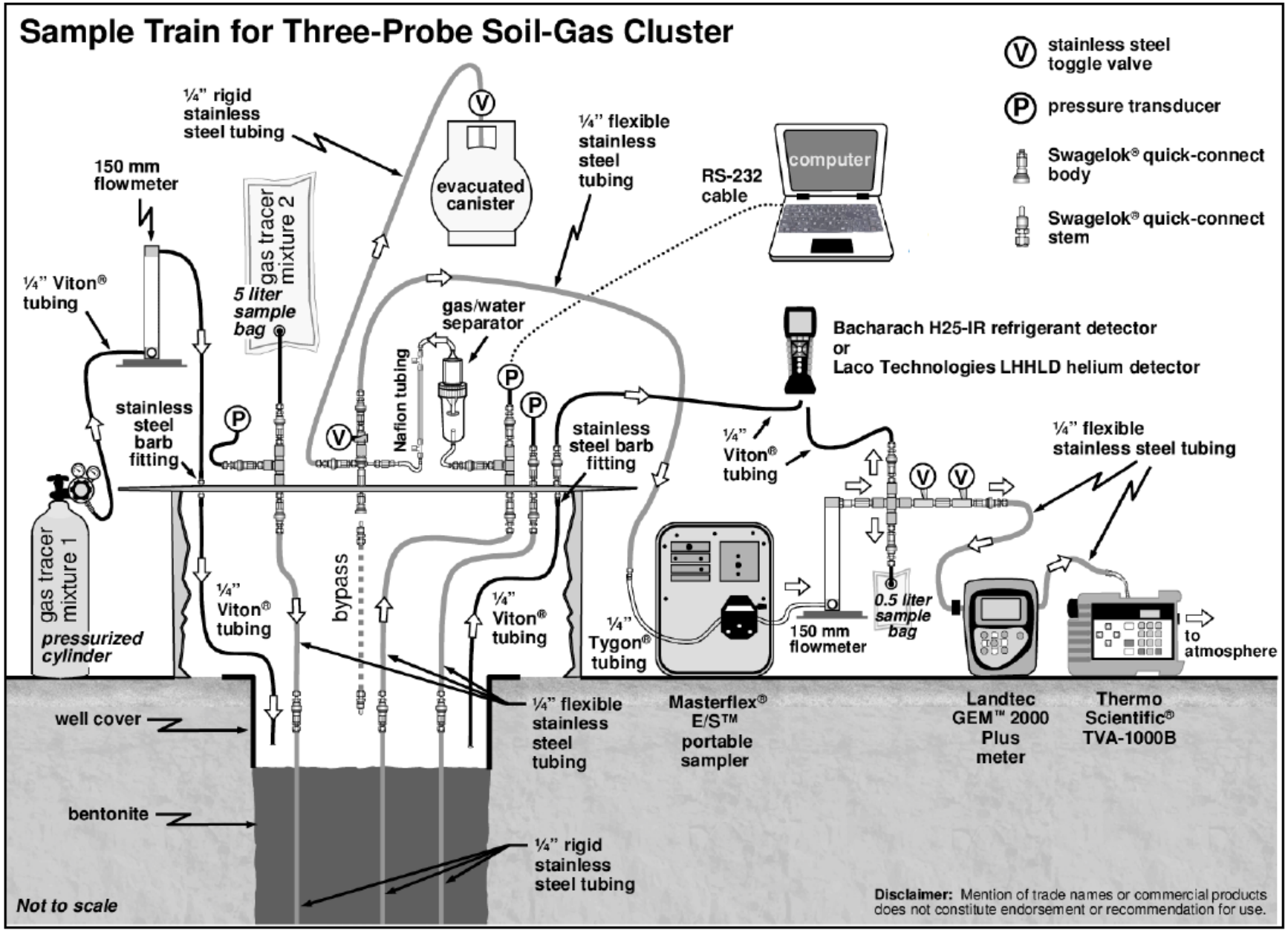


Figure 11. Schematic for leak detection chamber and soil-gas sample train for soil-gas probe clusters

U.S. EPA 2018

References: Active Soil Gas Sampling

Association for Vapor Intrusion Professionals (AVIP), 2026.

Interstate Technology Regulatory Council (ITRC), 2026.

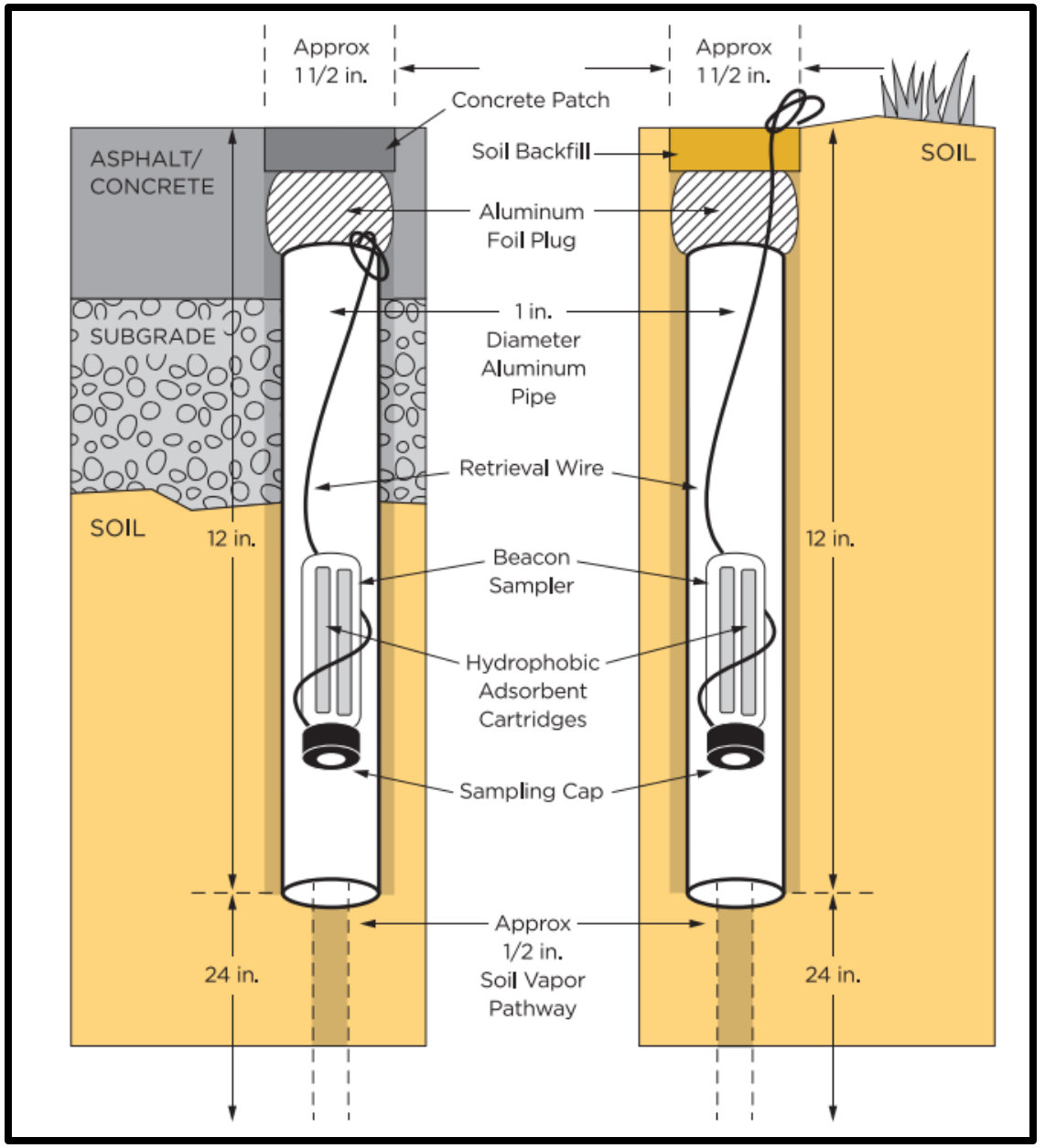
U.S. EPA, 2018, Leak, Purge, and Gas Permeability Testing to Support Active Soil Gas Sampling, EPA 600/R-18/225

McAlary, T.A, and et. al., 2009, A Case Study of Soil-Gas Sampling in Silt and Clay-Rich (Low Permeability) Soils, Ground Water Monitoring & Remediation 29, no. 1, pages 144-152.

New Jersey Dept. of Environmental Protections Field Sampling Procedures Manual, Chapter 9, Soil Gas Surveys, December 2023.

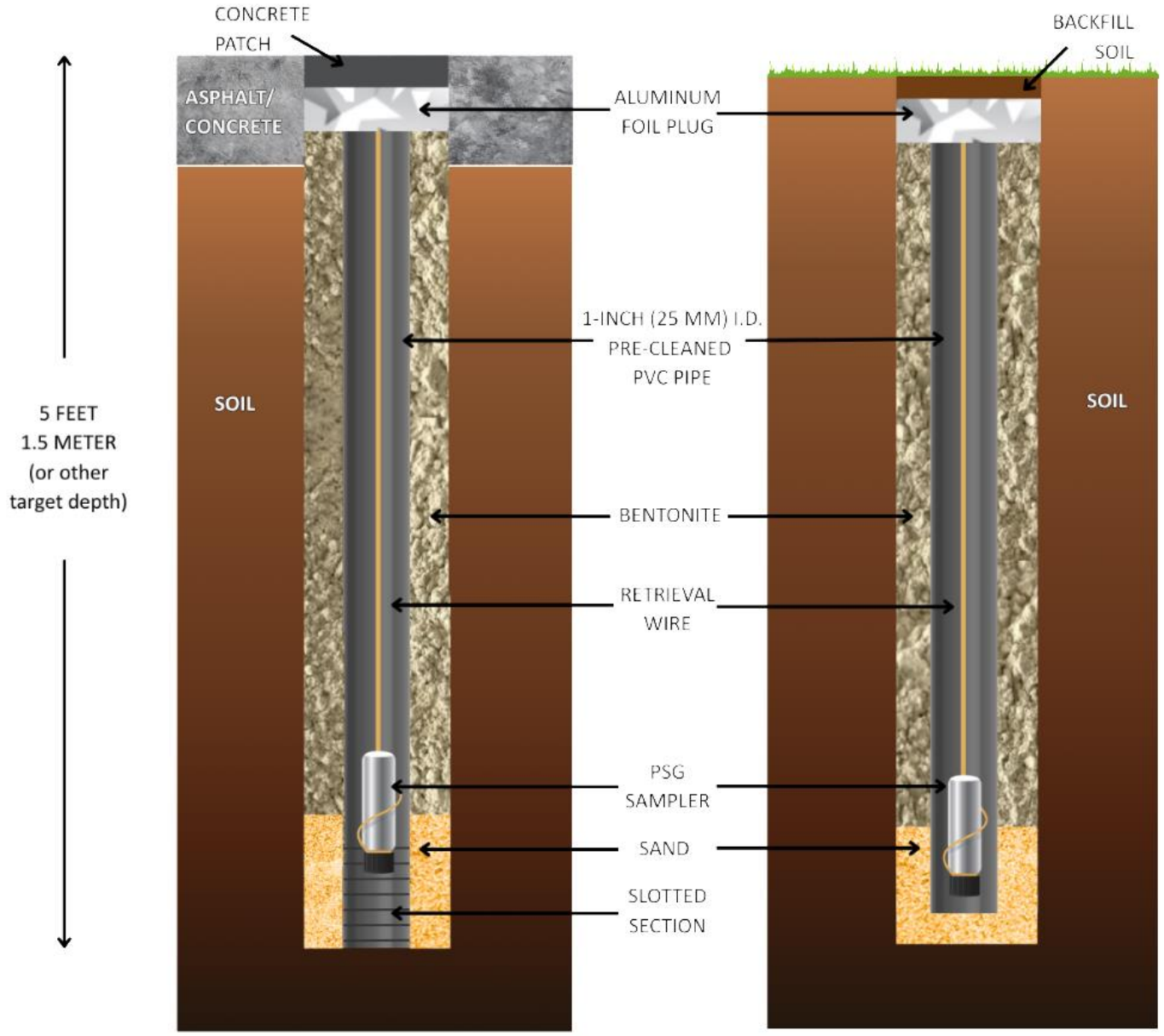
https://dep.nj.gov/wp-content/uploads/srp/chapter_9_soil_gas_surveys.pdf

Passive Soil Gas Sampling - Shallow



Courtesy of Beacon Environmental

Passive Soil Gas Sampling – Deeper



Courtesy of Beacon Environmental

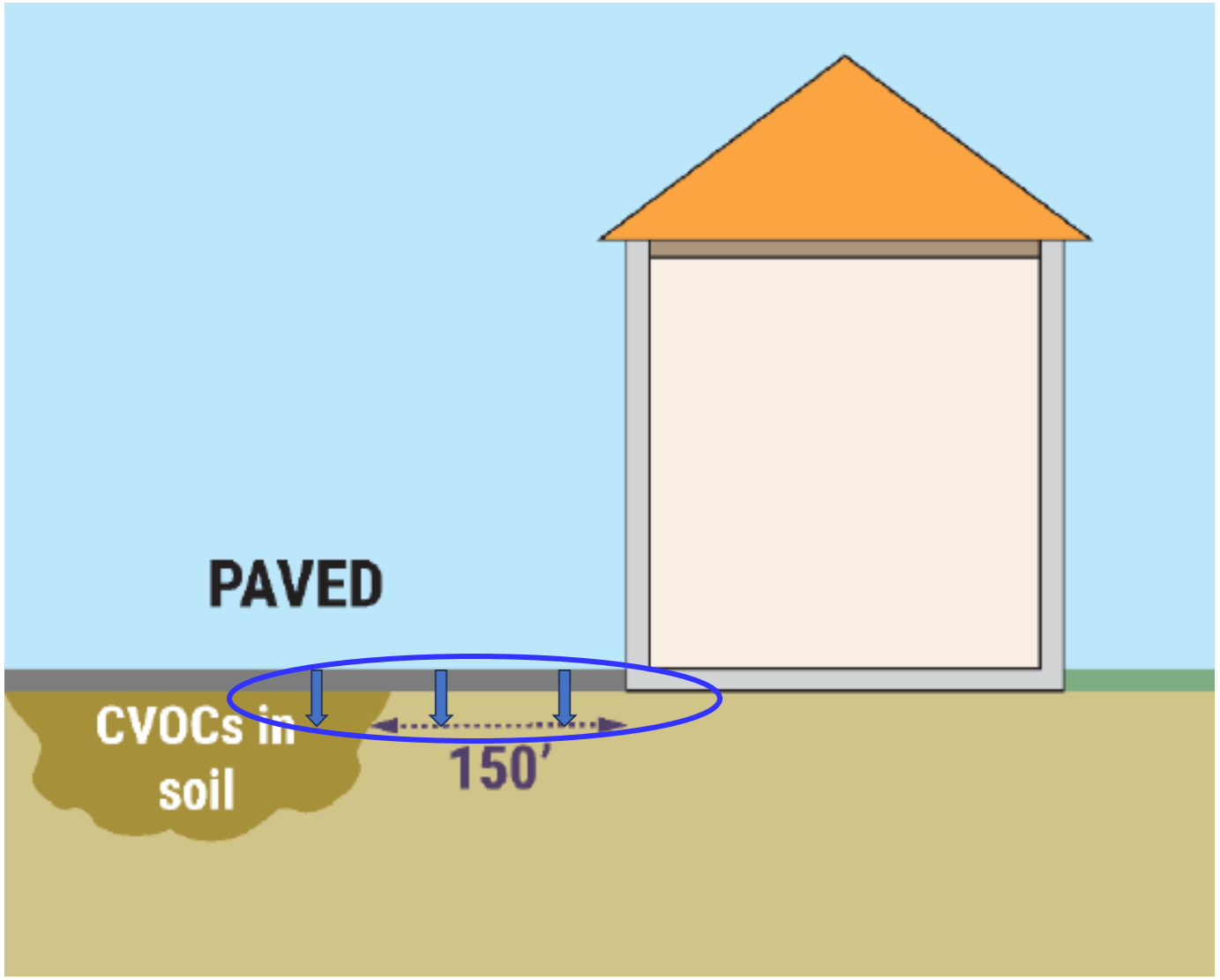
Using Soil Gas to Screen Out a Building

Considerations

- Will soil gas sampling delay identification of an indoor air exposure when TCE is present or acute risk is possible?
- Is a conduit VI risk unlikely?
- Do all other lines of evidence (LOE) indicate that the risk to indoor air is low? (soil type, source concentration, building type, occupants, etc.)

DNR Recommendation: Soil gas sampling is best suited when the risk of vapor migration to a building is low and soil gas data and other LOEs are likely to screen out a building.

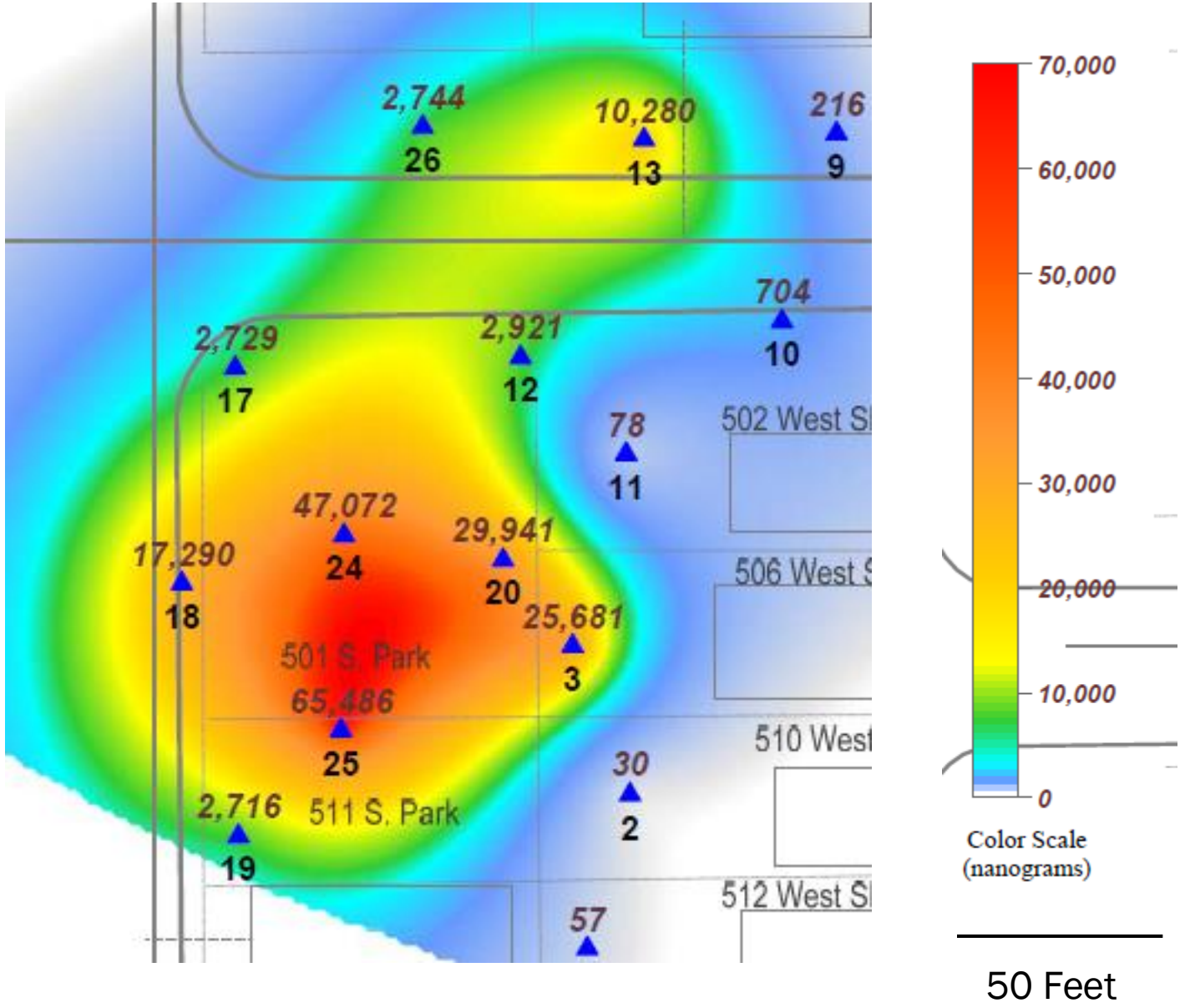
Paved Surface – Shallow Soil Source



From RR-800, Figure 2, partial (modified)

Shallow Passive Soil Gas Sampling

Tetrachloroethene (PCE) Mass Results

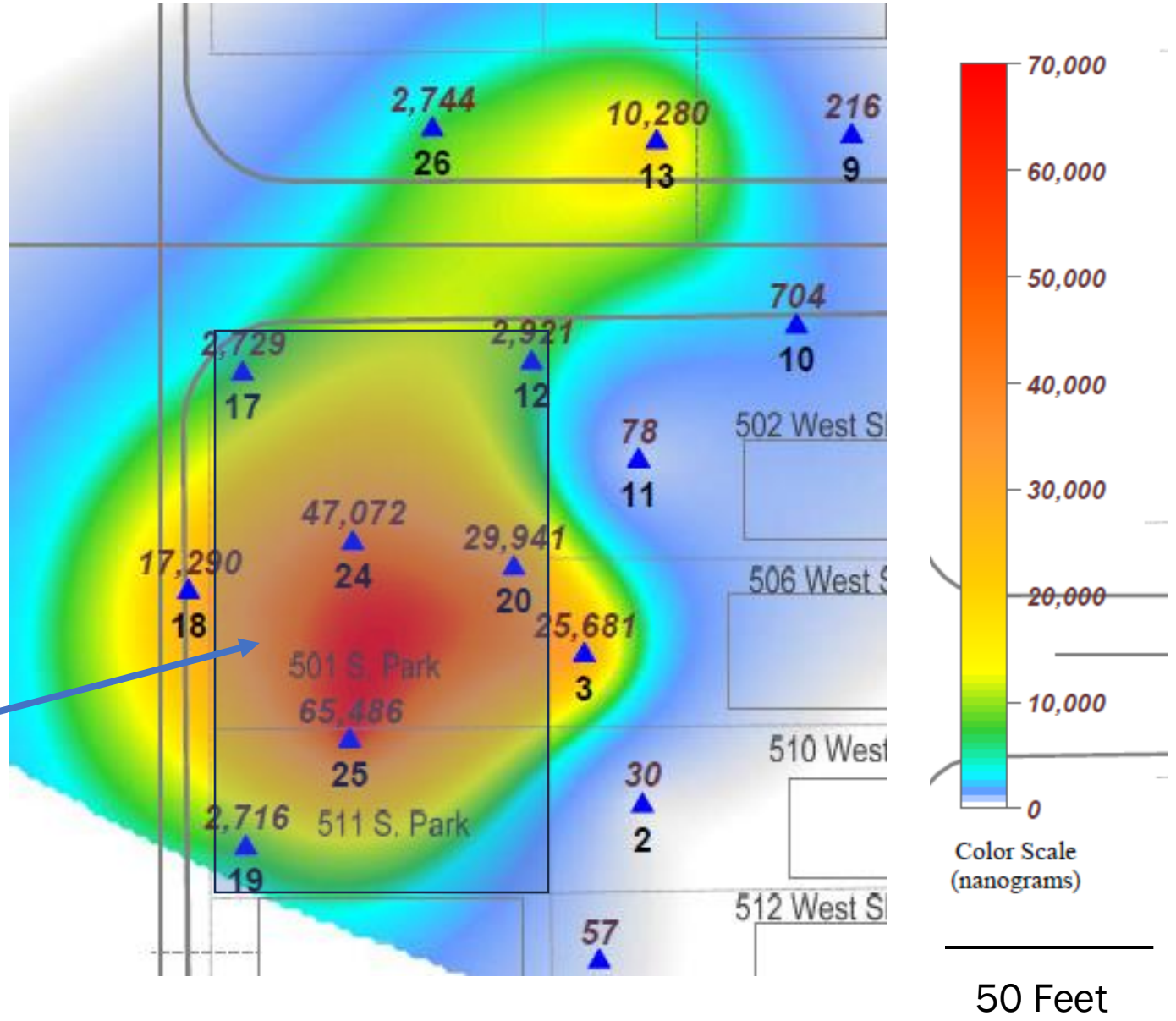


From BRRTS

Shallow Passive Soil Gas Sampling

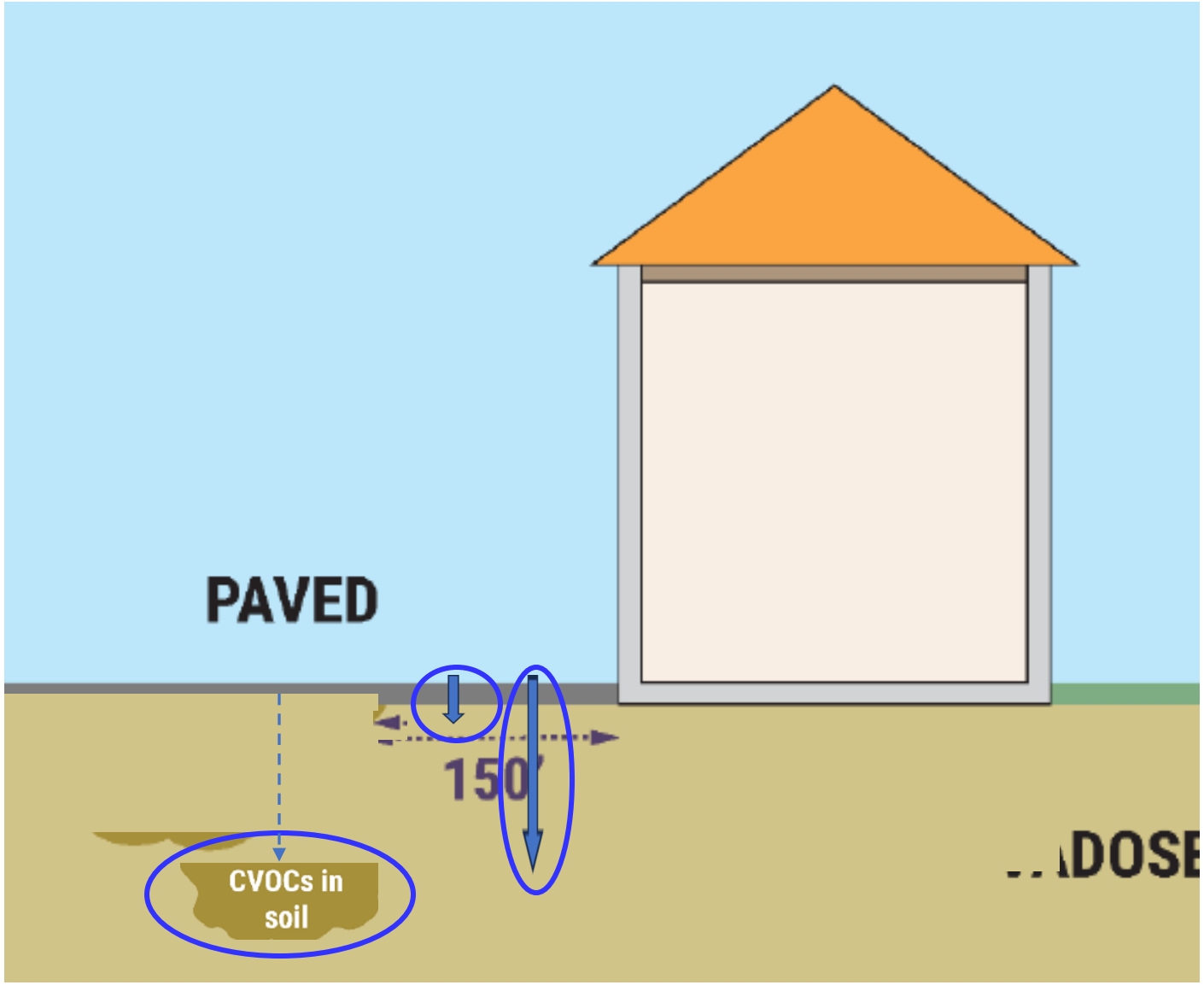
Tetrachloroethene (PCE) Mass Results

Paved Parking Lot



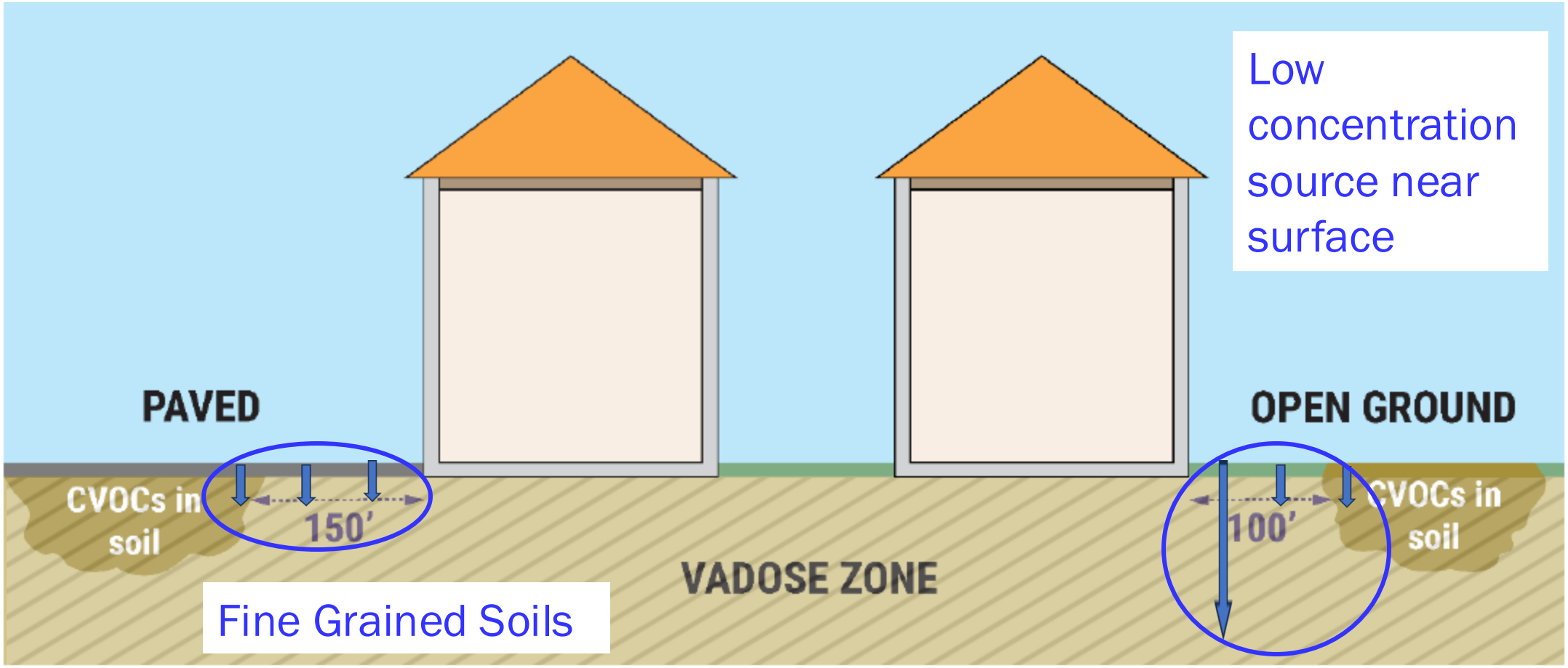
From BRRTS, modified

Paved Surface – Deeper Soil Source



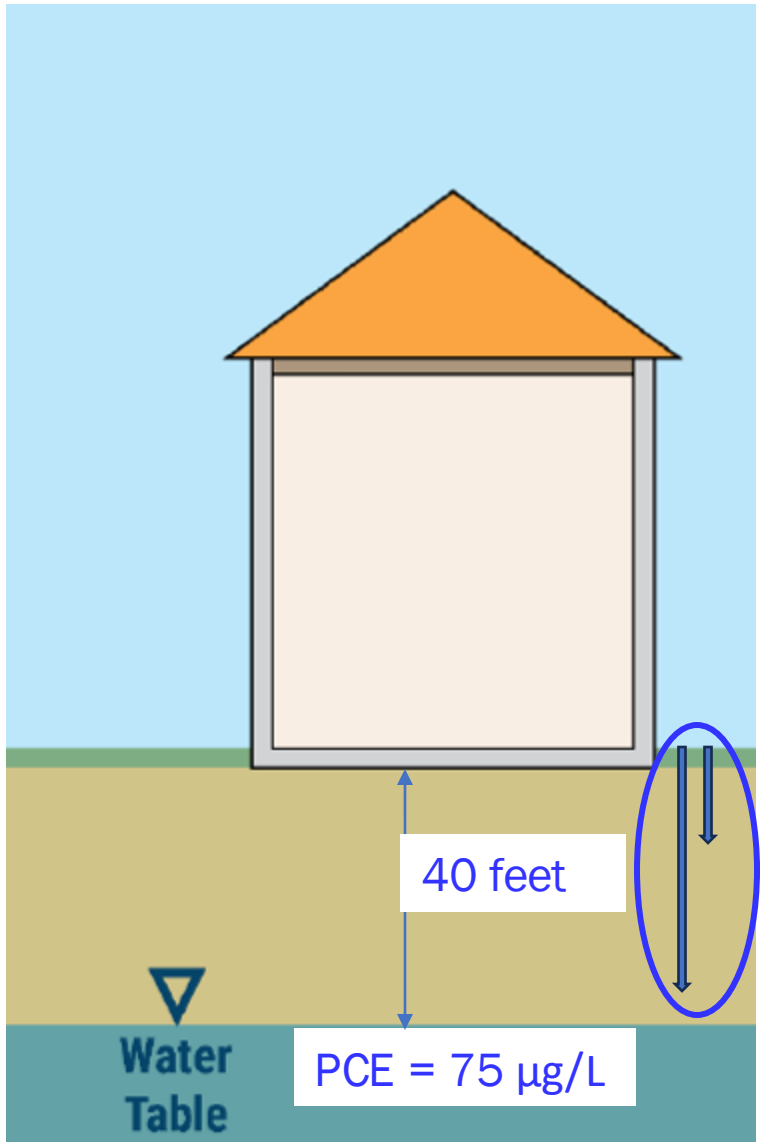
From RR-800, Figure 2, partial (modified)

Fine Grained Soils



From RR-800, Figure 2, partial (modified)

Deep, Dilute Groundwater Source Example



From RR-800, Figure 4, partial (modified)

Indoor Air Sampling
Recommendations for Commissioning

"If TCE concentrations in indoor air did not exceed the VAL during the site investigation, conduct at least one longer duration sampling event during the winter assessment period." (emphasis added)

From RR-800, Table F-1

Main Takeaway

This presentation:

Simple scenarios to illustrate concepts

Your site:

Complicated with many site-specific parameters that can impact vapor movement

DNR Recommendations

Reference state-specific guidance (RR-800, RR-649)
Reference national guidance (ITRC, AVIP)
Work with your laboratory to select appropriate samplers
Plan appropriate time for property owner/tenant engagement – gaining access, establishing trust & maintaining relationship
Request DNR Review of Workplans (Fee)
Request DNR Technical Assistance on Conclusions (Fee)

Takeaway - Soil Gas Sampling

Effective screening tool along with other LOE but must use appropriate sampling methodology and quality control procedures

Sub-slab and indoor air sampling provides the highest level of confidence that there is not a current impact to a building

Consider submitting a workplan and review fee if proposing to use soil gas sampling or interpreting soil gas data

Questions?

CONNECT WITH US

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"WILD WISCONSIN:
OFF THE RECORD"