

From: Schultz, Josie M - DNR
Sent: Thursday, December 1, 2022 5:08 PM
To: Andy Delforge
Cc: Ken Juza
Subject: V&L Stripping, BRRTS # 02-05-216722
Attachments: 2022-11-16 Issues Trends Passive Air Sampling for VI.pdf

Hi Andy,

Thanks for the conversation yesterday afternoon. As mentioned during the call, DNR has reviewed the emerging contaminant scoping statement submitted for the site and is requiring PFAS sampling. This is because the source for the contamination is unknown.

DNR is also requesting that a third round of passive, long duration vapor sampling be performed at the off-site residences. DNR recently presented a webinar on passive air sampling for vapor intrusion, which can be found [here](#), and I've also attached the power point. We require 2-3 rounds of vapor sampling in residential settings, and recommend 3 rounds when the contaminant of concern is CVOCs. Passive sampler vendors and labs can be found on page 47 of the attached power point. We generally recommend a sampling duration of 10 days (minimum 7 days).

The vapor mitigation system's OM&M plan has a good base, but needs additional information included. I will send a follow-up email with details for what VMS OM&M plans should include.

As previously mentioned, a soil remedial action is recommended to address the high concentrations of CVOCs that remain in soil beneath the building. Wis. Admin. Code NR 724.17 requires long-term monitoring after a remediation is completed unless otherwise directed by the DNR. A Long term monitoring plan (LTMP) should be included with the remedial action plan (RAP).

Please let me know if you have any questions. Thank you for your continued efforts with the investigation and remediation for this site.

Josie

We are committed to service excellence.

Visit our survey at <http://dnr.wi.gov/customersurvey> to evaluate how I did.

Josie M. Schultz

Hydrogeologist – Northeast Region Remediation and Redevelopment Team

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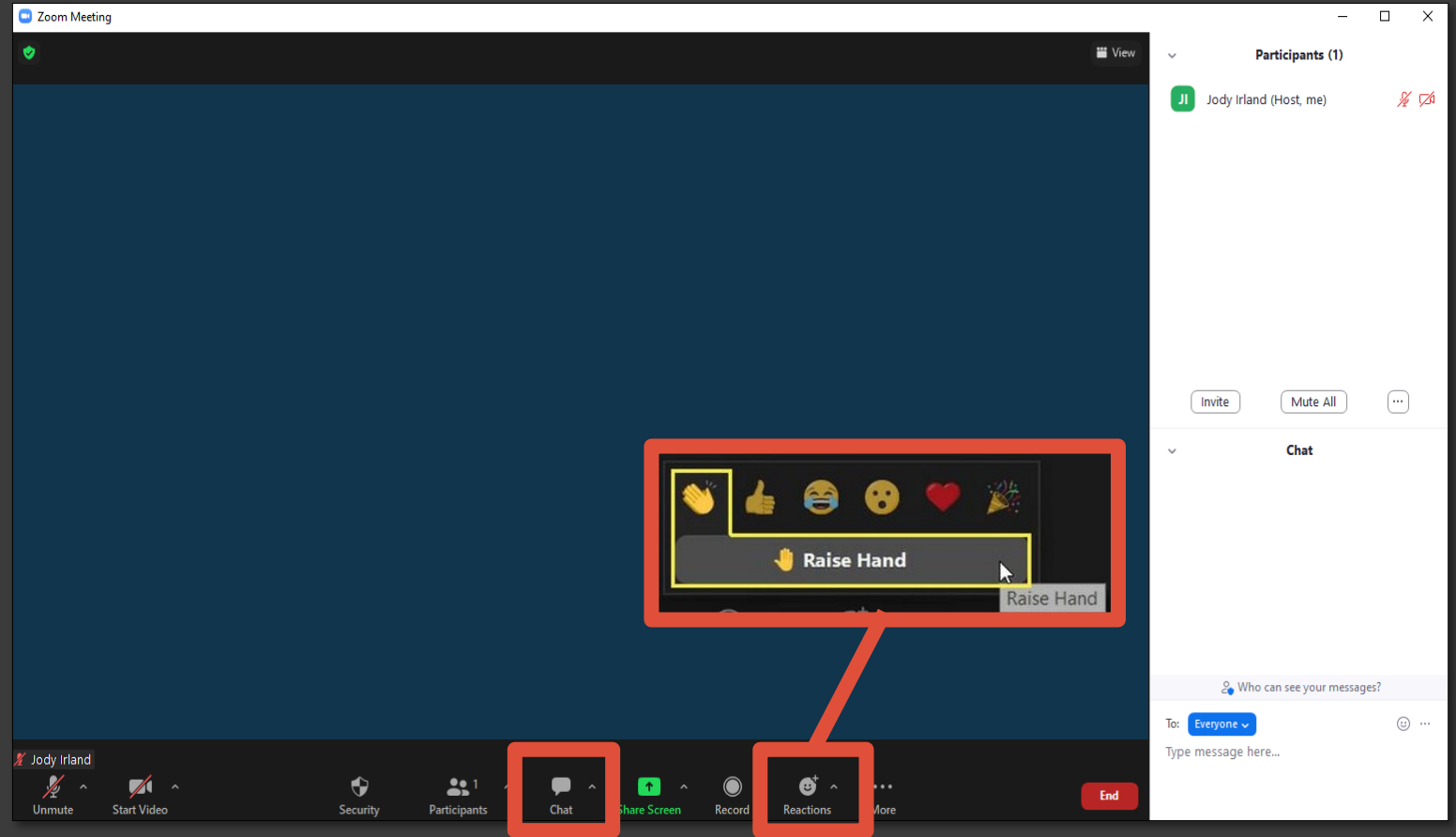


Issues & Trends

Passive Air Sampling for Vapor Intrusion

Zoom Logistics

- All attendees muted
- To comment or ask questions, use **chat** or **raise hand**
- Send questions to Jennifer Borski
- Q&A session open at end of presentation



Today's recording will be available at dnr.wi.gov, search "RR Training Library"



Public Input Opportunities

Public input Nov. 17, 2022

- RR-0141 VPLE Guidance
- RR-627 USTs
- RR-973 Environmental Contamination and Your Real Estate

Coming Soon

- RR-0124 Sediment Guidance
- RR-800 Vapor Intrusion Guidance
- RR-982 Post Closure Modifications

Wisconsin DNR – Environmental Contamination
Remediation and Redevelopment Program November 2022
Guidance: Environmental Contamination & Your Real Estate
Wis. Stat. ch. 709

Contamination can impact the market value of your home or property. The good news is that effects of environmental contamination – human-made or naturally occurring – can be managed. For example, in homes where radon gas is an issue, a special ventilation system can be installed to keep the gas from collecting inside the home. Deck systems are widely used and generally viewed as an acceptable remedy to this annually occurring toxic gas. Similar systems or other remedies exist to mitigate contamination caused by human activity (e.g., vapors from petroleum or chlorinated solvents).

Purpose
The purpose of this guidance is to help property owners understand the impact contamination may have on the market value of their property and the legal obligations they have should the property be sold in the future.

Market Value is the price at which a home will sell within a reasonable period of time.

If contamination exists at a property, owners should know that if they are to sell their home or land in the future, they may be required by Wisconsin law to disclose certain conditions about the property.

As a seller, what am I required to disclose in Wisconsin?
If you own real estate in Wisconsin and are planning to sell, you are required to disclose any "defects," as defined in ch. 709 that would:
• Have a significant adverse effect on the value of the property.
• Significantly impair the health or safety of future property owners.
• If not repaired, removed or replaced, would significantly or adversely affect the expected normal life of the property.

How do I meet the disclosure requirement?
The disclosure process varies by property type (e.g., residential, commercial, vacant land). Standard real estate forms are available for residential property and vacant land comply with disclosure requirements. Pre-purchase investigations and disclosure duties in commercial real estate transactions are rigorous and should identify environmental issues.

1. The **Residential Real Estate Condition Report** asks questions regarding fuel storage tanks located on the premises, including radon, lead and hazardous substances on the premises, and unsafe or conditions related to hazardous or toxic substances on the premises.
2. The **Facet Lead Disclosure Form** includes questions about violations of environmental rules, the presence of underground storage tanks, school conditions that...

Publication: RR-073 This document is intended solely as guidance and does not constitute any mandatory requirement except where requirements listed in statute or administrative rules are referenced. Any regulatory decisions made by the Department of Natural Resources are based on the information provided in this guidance and are not intended to be used as a basis for any legal action.

Wisconsin DNR – VPLE
Remediation and Redevelopment Program November 2022
Guidance: Voluntary Party Liability Exemption
Wis. Stat. § 292.15

Purpose
The purpose of this guidance is to provide information about the voluntary party liability exemption (VPLE), which was created by the Wisconsin State Legislature in 1994 when Wisconsin Statutes (Wis. Stat.) § 292.15 was enacted to aid in the redevelopment of brownfield properties.

Contents

| | |
|--|---|
| VPLE Fundamentals | 1 |
| Types of COCs | 2 |
| How to Participate in the VPLE Process | 4 |
| Table 1 – Comparison of the VPLE and traditional processes | 6 |
| Frequently Asked Questions | 6 |

VPLE Fundamentals
The VPLE program is a process by which a person conducts an environmental investigation and cleanup of a property voluntarily and then receives limits on their liability for historical contamination on that property.

What are the benefits of the VPLE program?
Many developers, lenders, and prospective purchasers of brownfields choose this route because the VPLE program provides certain liability insurance benefits to investors and future property owners. Benefits of participating in the VPLE program may include:
• Assurance that contamination on a property was cleaned up to the satisfaction of the state.
• Transferability of the exemption to future owners.
• Liability protection in the event the cleanup standards change, the remedial discharge that was the subject of the cleanup is discovered to be more extensive than what was reported.

How is the VPLE process different than traditional cleanup process?
Successful completion of the VPLE process provides an exemption from civil liability for historical contamination on that property. The VPLE process provides an exemption from civil liability for historical contamination on that property. The VPLE process provides an exemption from civil liability for historical contamination on that property. The VPLE process provides an exemption from civil liability for historical contamination on that property.

Publication: RR-014 This document is intended solely as guidance and does not constitute any mandatory requirement except where requirements listed in statute or administrative rules are referenced. Any regulatory decisions made by the Department of Natural Resources are based on the information provided in this guidance and are not intended to be used as a basis for any legal action.

Wisconsin DNR – Environmental Contamination
Remediation and Redevelopment Program November 2022
Guidance: Registering and Removing Underground Storage Tanks
Wis. Admin. Code Ch. ATCP 93

Purpose
The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) administers Wisconsin Administrative Code Ch. ATCP 93, titled *Flammable, Combustible and Hazardous Liquids*, which regulates the installation, registration, and removal of underground storage tanks (USTs). All underground storage tanks must be registered with DATCP. When an underground storage tank is removed it must also be registered as removed. Detailed information about storage tank regulations is available on DATCP's website. Visit datcp.wis.gov, click on "Programs/Services" and select "Petroleum/Hazardous Storage Tanks."

Best Practice Suggestions

- Plan ahead. Check the state database of registered storage tanks to identify registered underground storage tanks before beginning cleanup or construction work at a property. Visit the DATCP Storage Tank website and select "Storage Tank Database" in the right-side quick links.
- Contact a DATCP tank specialist to discuss the property, ask questions, inquire about timelines and extensions, and make sure you have acquired all relevant information from the state database. Visit the DATCP Storage Tank website and select "Storage Tank Contacts" in the right-side quick links.
- Have a qualified environmental consultant and/or do your own historical research on the property to assess if any unregistered underground storage tanks may exist on the property from past property uses. Visit datcp.wis.gov and search "selecting an environmental consultant."
- If an underground storage tank is found, hire a DATCP-certified tank service company or technician to appropriately clean and remove the tank. Visit the DATCP Storage Tank website and select "Service Companies and Service Technicians" in the right-side quick links.

If contamination is identified around or near the tank during tank removal, notify the Wisconsin Department of Natural Resources (DNR) immediately in accordance with Wis. Stat. § 292.11. Report spills that need an immediate response by calling the 24-hour emergency hotline at 1-800-94-2003. Report non-emergency spills by using the online Notification for Hazardous Substance Discharge Form – Non-Emergency Only by visiting datcp.wis.gov and searching "hazardous spill form."

Local Government Responsibilities
Local governmental units are required to comply with Wis. Admin. Code Ch. ATCP 93 requirements at properties that are owned or otherwise controlled by the local government. Wisconsin Stat. § 292.11(9)(b) defines a local government unit as a city, town, village, county, county utility district, town authority district, public inland lake protection and rehabilitation district, metropolitan sewerage district, redevelopment authority created under Wis. Stat. § 64.13(1), a public body designated by a municipality under Wis. Stat. § 64.13(14), a community development authority, or a housing authority.

The local government environmental liability exemption set forth in Wis. Stat. § 292.11(9)(a) does not exempt local governmental units from regulations related to underground storage tanks.

Publication: RR-027 This document is intended solely as guidance and does not constitute any mandatory requirement except where requirements listed in statute or administrative rules are referenced. Any regulatory decisions made by the Department of Natural Resources are based on the information provided in this guidance and are not intended to be used as a basis for any legal action.

The Wisconsin Department of Natural Resources (DNR) is committed to promoting diversity, fairness, equity and the principles of environmental justice. We assure that we do not discriminate in employment, programs, decisions, services or delivery of services on the basis of race or ethnicity. If you have any questions or need information in an alternative format, please contact us at 608-785-5273.



Public Input Opportunities

- <https://dnr.wisconsin.gov/topic/brownfields/publicnotices.html>

The screenshot shows the Wisconsin Department of Natural Resources website. The header includes the DNR logo and navigation links for HUNTING, FISHING, PARKS, CLIMATE, ENVIRONMENT, FORESTRY, LICENSES, NEWS, ABOUT, and CONTACT. The breadcrumb trail reads: » TOPIC » BROWNFIELDS: REDEVELOPMENT OPPORTUNITIES. The main heading is "REMEDIATION & REDEVELOPMENT PROGRAM PUBLIC NOTICES". Below this, there is a paragraph explaining that public notices and comment opportunities are listed below, with links to "External advisory group meeting information" and "DNR Hearings and Meetings Calendar". Another paragraph mentions "Find trainings and presentations offered by the RR Program on the RR Program presentations & trainings webpage." There are two tabs: "Program Guidance" and "Public Notices", with "Public Notices" selected. Under "PROGRAM GUIDANCE", the text states: "The RR Program welcomes input on all program guidance. Current guidance can be found using the search tools listed on the RR Program Publications and Forms page. To offer feedback on current RR Program guidance, you can email the staff contact listed in the specific guidance document or DNRRRRGuidance@wisconsin.gov. The following table lists guidance in development or under active review by the program. Email the staff contact listed in the table below to share feedback. Staff will review and consider comments received to improve the quality of the guidance. There are no program guidance postings for public comment at this time." On the right side, there is a sidebar titled "Brownfields: Redevelopment Opportunities" containing a list of links: "RR Report Newsfeed", "Find Contaminated Land Activities", "Request Green Team Assistance", "Submit Files Related to ch. NR 700, Wis. Adm. Code", "Report a Spill", and "Environmental Contamination & Cleanup". Below this is a "Related Links" section with a link for "For Environmental Professionals".

- Subscribe to RR Report Newsfeed for Notifications



SIGN UP:

dnr.wisconsin.gov/topic/Brownfields/News.html



Remediation and Redevelopment External Advisory Group

- Subgroup Meetings

December 9, 2022

GEF 2 Building – Madison

- Contaminated Sediment

- NR 700

- Funding Sustainability

- Environmental Justice

- RR EAG Meeting

January 27, 2023

Location - TBD



SIGN UP FOR UPDATES:

dnr.wisconsin.gov/topic/brownfields/rreag





Jennifer Borski

Dry Cleaning and Vapor Intrusion
Team Leader



DNR Vapor Intrusion Guidance – RR-800, v. Jan 2018

<https://dnr.wi.gov/DocLink/RR/RR800.pdf>

Addressing Vapor Intrusion at Remediation & Redevelopment Sites in Wisconsin

Wis. Stat. ch. 292; Wis. Admin. Code ch. NR 700

Purpose

The purpose of this guidance is to provide approaches for complying with the requirements in Wis. Stat. ch. 292 and Wis. Admin. Code ch. NR 700 that relate to vapor intrusion. This guidance identifies the conditions where assessment of the vapor intrusion pathway is necessary at contaminated sites; sets out the criteria for evaluating health risk; identifies appropriate responses; explains long-term stewardship; and clarifies when sites with a complete or potential vapor migration pathway may achieve closure.

This guidance is applicable to contaminated sites where volatilization of subsurface contaminants has migrated or has the potential to migrate to current or future occupied buildings. Unless otherwise noted, all provisions in this guidance apply to the responsible party (RP) and/or property owner of a contaminated site.

Related DNR Guidance

- [RR-042: DNR Case Closure Continuing Obligations: Vapor Intrusion](#)

- [RR-986: Sub-slab Vapor Sampling Procedures](#)

Related DNR Factsheets

- [RR-067: Vapor Intrusion Investigation - Information Sheet for Neighbors](#)

- [RR-892: What is Vapor Intrusion](#)

- [RR-953: Why Test for Vapor Intrusion?](#)

- [RR-954: What to Expect During Vapor Intrusion Sampling](#)

- [RR-977: Understanding Chemical Vapor Intrusion Testing Results](#)

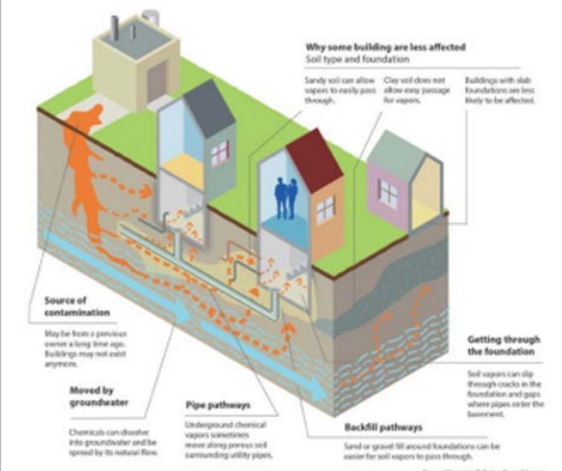
- [RR-934: Who Should I Contact About Vapor Intrusion Investigations?](#)

- [RR-973: Environmental Contamination & Your Real Estate](#)

Overview of Vapor Intrusion

Vapor intrusion generally refers to subsurface contamination that can volatilize and the vapors enter the breathing space of buildings. Vapor intrusion can also occur when contaminated groundwater infiltrates buildings and contaminants directly volatilize into the indoor air. Vapors can migrate through air space in permeable soils, fractures in bedrock or clay tills, utilities, sumps, or cracks in the building foundation.

How vapor intrusion happens: a complex path



Passive Sampling in RR-800, v. Jan 2018

- Section 5.4.2 Soil gas sampling

Quantitative passive diffusion methods are currently under development and could be used in lieu of active soil gas sampling if the investigator can show the passive diffusion method will provide an accurate quantitative measure of the soil gas concentrations.

- Section 5.4.3 Indoor air sampling

Passive indoor air sampling is another option to measure indoor air concentrations. Because passive samples can be collected over a longer duration than active samples, passive samples can average out the variability of indoor air.

Wisconsin Administrative Code

Wis. Admin. Code § NR 716.11(3)

(3) The purposes of the field investigation shall be to:

(a) Determine the nature, degree and extent, both areal and vertical, of the hazardous substances or environmental pollution in all affected media.

Wis. Admin. Code § NR 716.11(5)

(5) The field investigation shall include an evaluation of all of the following items:

(g) The presence and concentration of vapors sub-slab, when investigation of soil, soil gas or groundwater indicates that vapors may migrate to the foundation of an occupied building, taking into account the biodegradability of vapors, preferential pathways of vapor movement, or other physical or chemical factors affecting vapor movement into occupied buildings.

(h) The presence and concentration of vapors in indoor air, when it is necessary to determine the impact on an occupied structure considering applicable attenuation factors, land use, building size and other site-specific factors that affect exposure to vapor.

Wisconsin Administrative Code

Wis. Admin. Code § NR 716.13(1)

NR 716.13 Sampling and analysis requirements.

(1) Responsible parties shall use laboratory analyses of environmental media samples which are collected, handled and analyzed in compliance with subs. (2) to (17) to confirm the nature and extent and evaluate the impacts of contamination, if a field investigation is required under s. NR 716.11 (1). Analytical methods used shall be suitable for the matrix, type of analyte, expected level of analyte, regulatory limit, and potential interferences in the samples to be tested.

DNR Vapor Intrusion Guidance - RR-800



Wisconsin DNR - Vapor Intrusion

Remediation and Redevelopment Program | January 2018

Addressing Vapor Intrusion at Remediation & Redevelopment Sites in Wisconsin

Wis. Stat. ch. 292; Wis. Admin. Code ch. NR 700

Purpose
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How vapor intrusion happens: a complex path

Source of contamination: May be from a petroleum source of long time ago. Buildings may not emit vapors.

Moved by groundwater: Chemicals can dissolve into groundwater and be spread by its natural flow.

Pipe pathways: Underground chemical vapors sometimes enter along porous soil surrounding utility pipes.

Backfill pathways: Sand or gravel fill around foundations can be easier for soil vapors to pass through.

Why some buildings are less affected: Soil type and foundation. Sandy soil can allow vapors to easily pass through. Clay soil does not allow easy passage for vapors. Buildings with slab foundations and low basements are less likely to be affected.

Getting through the foundation: Soil vapors can slip through cracks in the foundation and gaps where pipes enter the basement.

Publication: RR-800 | dnr.wi.gov Search: vapor intrusion

Recommended Indoor Air Sampling Proposed RR-800 Revision

Initial Sampling Event

Why: Assess likelihood of acute exposure

When: As soon as possible after a building screens-in for VI

How:

- 8-hr (workplace) or 24-hr (residential)
- TO-15, TO-17, passive
- Could also initiate longer duration sample
- Paired with sub-slab sample(s)

Recommended Indoor Air Sampling Proposed RR-800 Revision

Follow-up Sampling

- Why:** Confirm initial results by sampling when concentrations are likely to be higher but more variable
- When:** *Winter Assessment Period* (Dec. 1 - March 31)
- Most compounds and situations: two events (paired sub-slab most events)
 - **TCE:** Three events with specific time frames
 - Nov. 15 - Dec. 31
 - January
 - March 1 - April 15
- How:** Long-duration: > 10 days ideal, 7 days acceptable

Alternative, reasoned approaches are allowed/encouraged depending on site/building specific conditions

RR-800 Version 2018 vs Update

Residential Example

| | RR-800 v. 2018 | RR-800 Update |
|---------------------------------|----------------|---------------|
| TCE | | |
| Number of events | 3 | 4 |
| Days of data | 3 | 31+ |
| Days during higher VI potential | 1 | 30+ |
| Other compounds | | |
| Number of events | 3 | 2-3 |
| Days of data | 3 | 20+ |
| Days during higher VI potential | 1 | 20+ |

Assumes longer duration events are 10 days or longer



Jim Walden

Vapor Intrusion Technical Expert



Passive Sorbent Samplers

- **Primary Advantage:** Time integrated concentrations for up to several weeks (some samplers achieve reporting limits < Vapor Action Levels within hours).
- **Ancillary Advantages (over canisters)**
 - Shelf life
 - Availability
 - Rapid deployment
 - Small size
 - Reduced shipping costs & carbon footprint
 - No vacuum

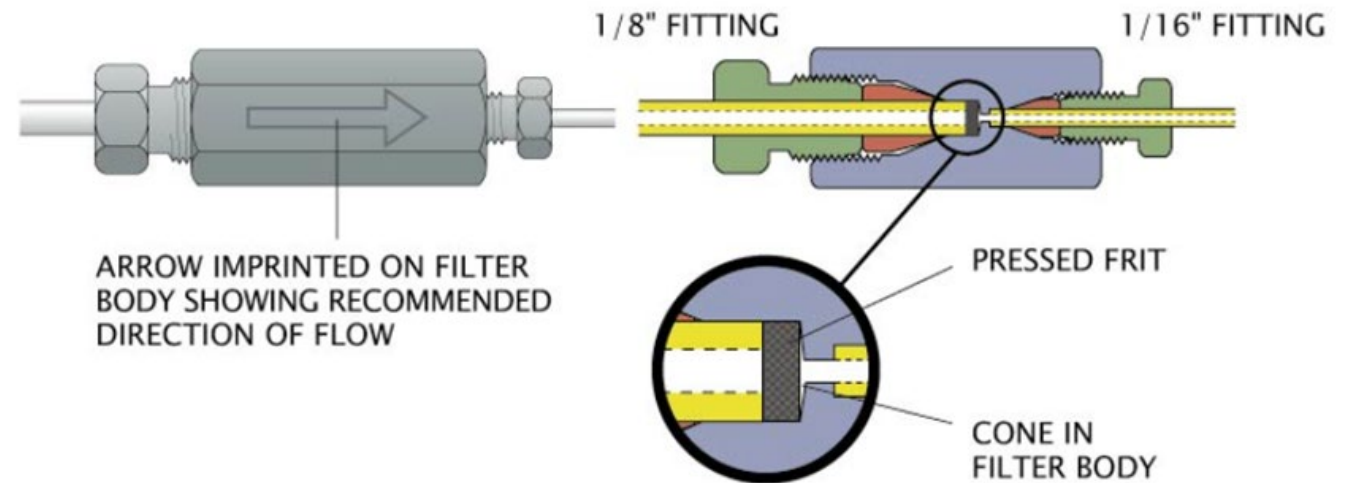
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However:

There are additional considerations with passive samplers to provide the highest quality data.

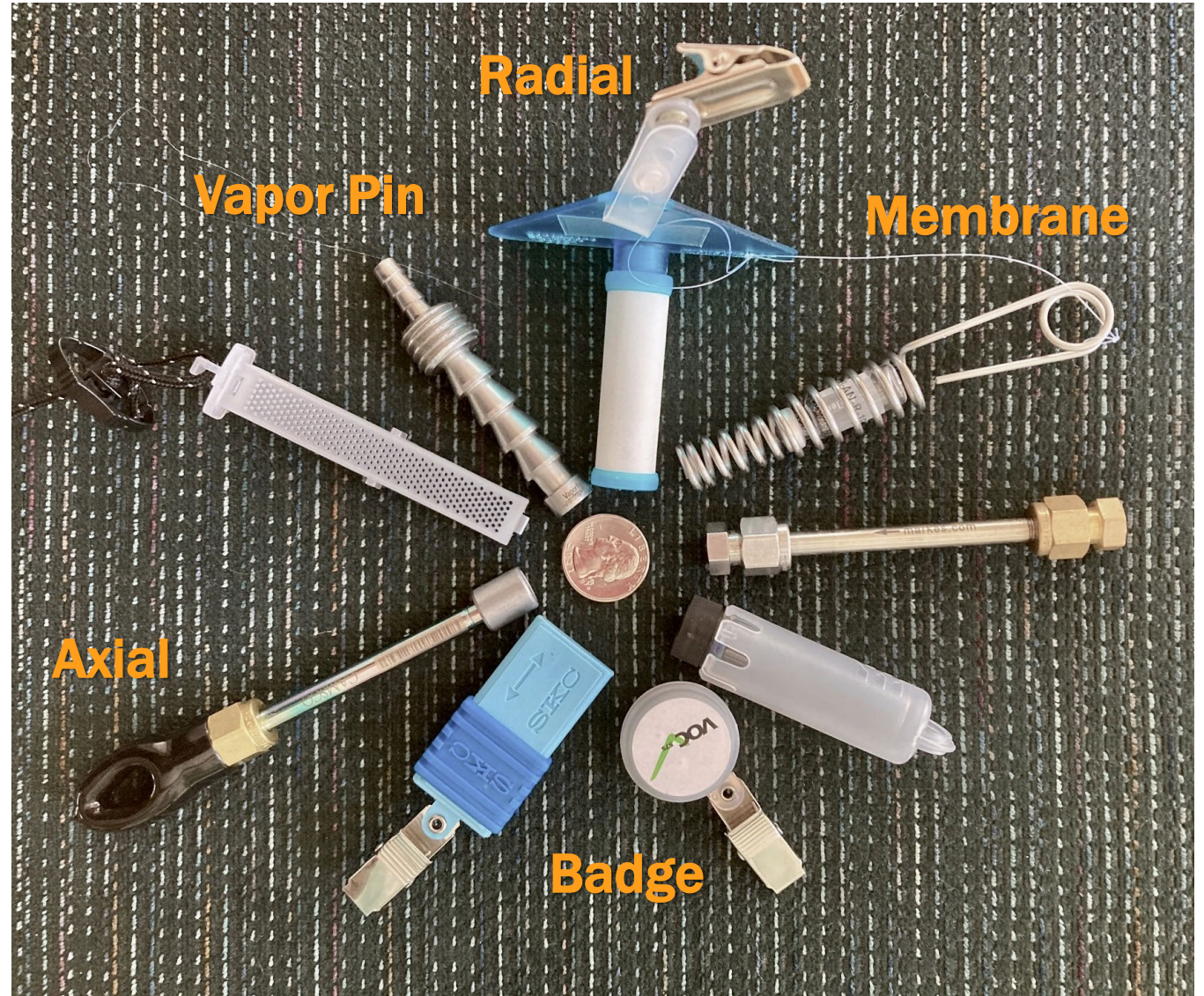
Canister use beyond 24-hour durations



If used, provide support that the device collects a true time-weighted average concentration for the duration sampled.

Passive Sorbent Samplers

- Radial, Axial, Badge, Membrane
- Different Sorbents
- Appropriate sampler and sorbent chosen based on:
 - Contaminants of Concern
 - Duration of Sampling
 - Setting Parameters
 - Air Velocity
 - Temperature
 - Humidity
 - Physical Limitations
 - Diffusion Limitations (e.g., soil)



Passive Sampling



- Work closely with the laboratory
- Provide them with a thorough description of site conditions and data quality needs

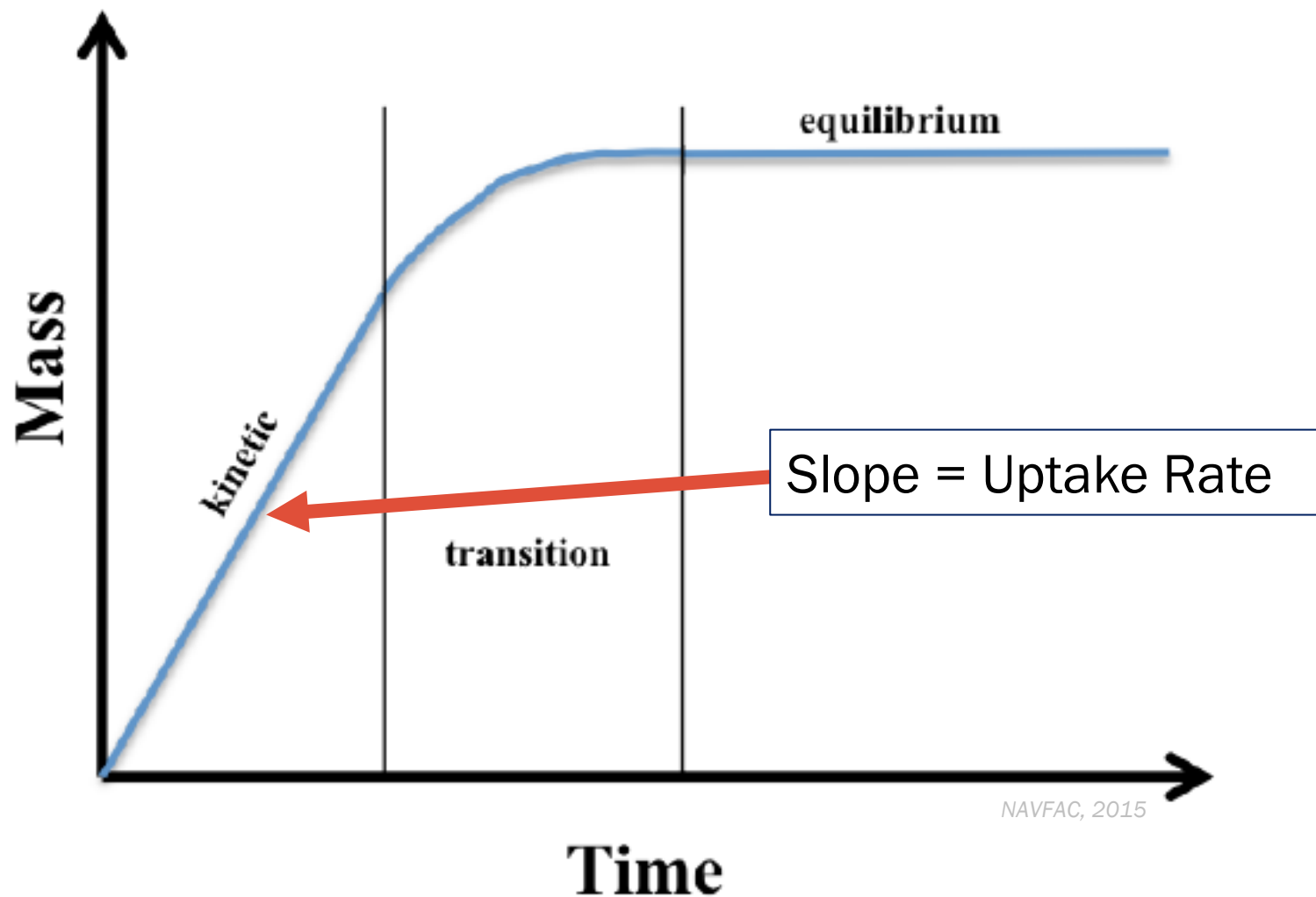


Figure 1. Relationship of mass collected versus time for a passive sampler.

$$C_{\text{coc}} = M / (\text{UR} \times t)$$

Where:

C_{coc} = time-weighted average air concentration ($\mu\text{g}/\text{m}^3$)

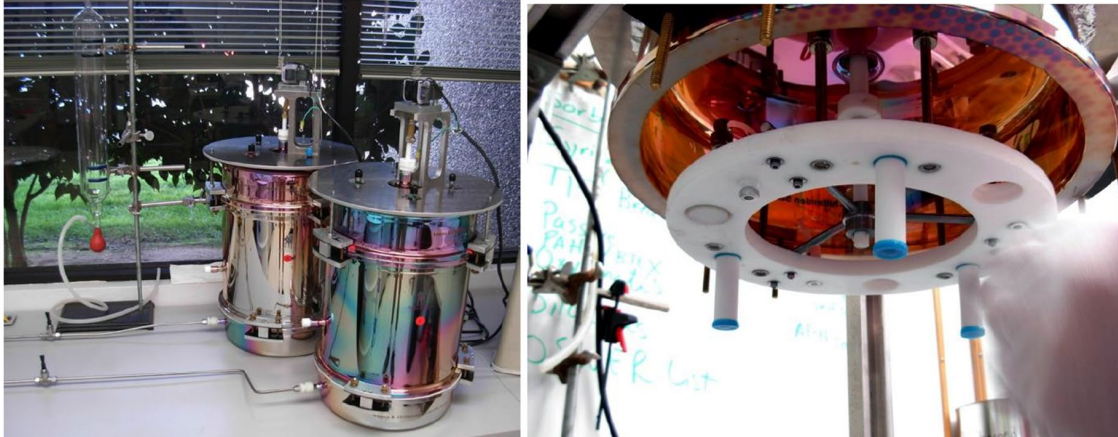
M = mass of VOC retained by passive sampler (μg - micrograms); reported by lab

UR = uptake rate (mL/min , compound-specific); also called “sampling rate” (device-specific)

t = sampling duration (min)

Passive Samplers:
Calculating Concentration

Uptake Rate Validation






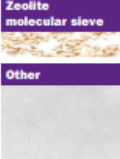
McAlary, 2014

Experimentally validated uptake rates should be available for key risk drivers (TCE, PCE, Benzene), particularly when assessing indoor air

- Uptake rates *validated* in controlled laboratory conditions provide the most confidence
- Uptake rates can be *estimated* based on compound diffusion in air and sampler configuration

TCE = trichloroethene
PCE = tetrachloroethene

Sorbents – A quick reference guide

| Sorbent | Sorbent | Volatility range | | Suitable analytes | Max. temp (°C) [1] | Desorb temp (°C) [2] |
|---|---|-----------------------------------|--------------------|--|--------------------|--------------------------------|
| | | Hydrocarbon range | Boiling point (°C) | | | |
|  | Tenax TA | C ₆ –C ₂₀ | 100 – 450 | Aromatics, apolars, polar compounds bp >150°C, and semi-volatiles. | 350 | 300 |
| | Tenax GR | C ₆ –C ₂₀ | 100 – 450 | Aromatics, apolars, polar compounds >150°C, and semi-volatiles. | 350 | 300 |
| | HayeSep D | C ₅ – C ₁₂ | 50 – 200 | Low molecular weight compounds, acetylene, halogens, and sulfur groups. GB/GE derivative of VX (CWA). | 290 | 280 |
| | PoraPak N | C ₅ – C ₁₅ | 50 – 200 | Polar VOCs, acrylonitrile, acetonitrile, propionitrile, pyridine, volatile alcohols, ethanol, methyl ethyl ketone. | 190 | 165 |
| | PoraPak Q | C ₅ – C ₁₂ | 50 – 200 | Oxygenated compounds. | 250 | 190 |
|  | Carbograph 2TD Carbopack C Carbotrap C | C ₈ – C ₂₀ | 130 – 340 | Alkyl benzenes and large aliphatics. Heavy organics: PCBs, PNAs. | 400 | 360 |
| | Carbograph 1TD Carbopack B Carbotrap B | C ₅ – C ₂₄ | 50 – 250 | A wide range from medium to high volatility: Ketones, alcohols, and aldehydes (but not formaldehyde). Non-polars within volatility range. Perfluorocarbon tracer gases. BTX. | 400 | 360 |
| | Carbograph 5TD Carbopack X | C ₅ – C ₈ | 50 – 150 | Especially good for 1,3-butadiene and light hydrocarbons. | 400 | 360 |
| | Carbopack Y Carbotrap Y | C ₁₂ – C ₃₀ | 50 – 340 | Less volatile hydrocarbons. Pesticides e.g. alachlor atrazine, isoprene, and formothyon. | 400 | 360 |
| | Sulficarb | C ₅ – C ₈ | -30 – 150 | Thiols. WOCs (vinyl chloride, CS ₂ , methanol, ethanol, and acetone). Used for sterically large WOCs (SF ₆). | 400 | 360 |
|  | Carbosieve S-III | C ₂ – C ₅ | -90 – 80 | Permanent gases, and ethene to n-C ₄ , e.g. chloromethane. Also ethylene from small volumes. | 400 | 360 |
| | Carboxen 1000 | C ₂ – C ₅ | -60 – 80 | Permanent gases, and ultra-volatile hydrocarbons, e.g. vinyl chloride. | 400 | 360 |
| | Carboxen 1003 | C ₂ – C ₅ | -60 – 80 | Permanent gases, and ultra-volatile hydrocarbons, e.g. ethane. | 400 | 360 |
| | Molecular Sieve 5A | C ₂ – C ₄ | -90 – 80 | Permanent gases, and nitrous oxide | 400 | 300 (165 for N ₂ O) |
|  | Silica Gel | N/A | N/A | Low-boiling polar compounds, especially useful for separating chlorinated or sulfur compounds from matrices with hydrocarbon interferences. | 200 | 180 |
| | Quartz wool | N/A | N/A | SVOCs. | 400 | 360 |

[1] Maximum temperature should not be exceeded, to prevent irreversible damage to sorbent. When using multi-beds of sorbents, maximum temperature is the lowest of all sorbents within the tube.

[2] Recommended desorption temperatures are a guide and may require optimisation depending on target analytes. Lower desorption temperatures are recommended where possible to prolong sorbent lifetime. Sorbent conditioning should be carried out at 10–20°C above the desorption temperature.

$$t = (M_{\min}) / (UR \times RL)$$

Where:

t = duration of sampling (min)

Calculating Duration to
Achieve a Reporting Level

M_{\min} = laboratory reporting limit for each
individual VOC (μg)

UR = the compound-specific uptake rate
(mL/min)

RL = minimum reporting levels ($\mu\text{g}/\text{m}^3$)

Passive Samplers: Placement Considerations

Sampling Goal

Breathing Zone (Occupant Interference)

Source and Pathways

Workplace Setting & Variable Conditions

Humidity

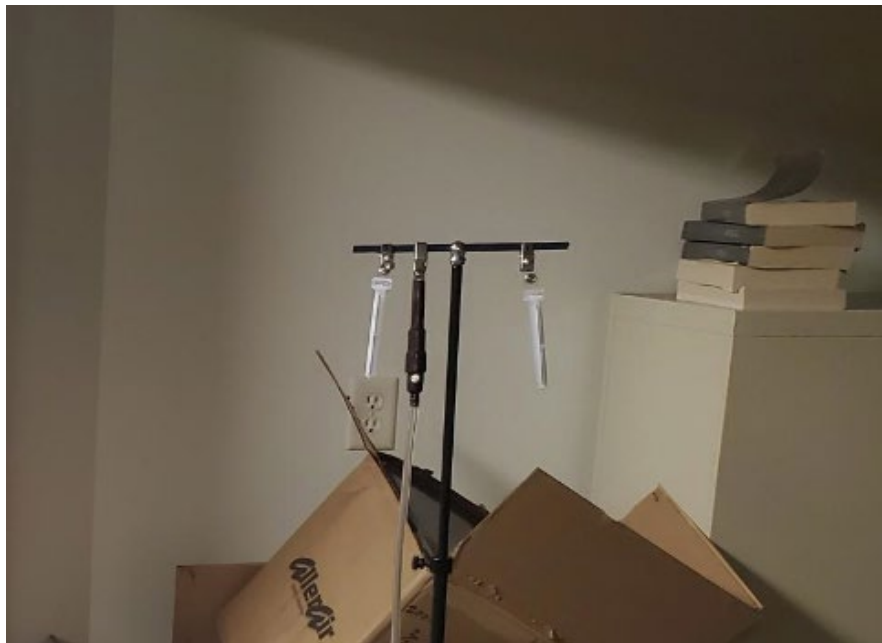
Air Movement

Temperature

Non-target compounds

Concentration Range

Sampling Goal – Breathing Zone

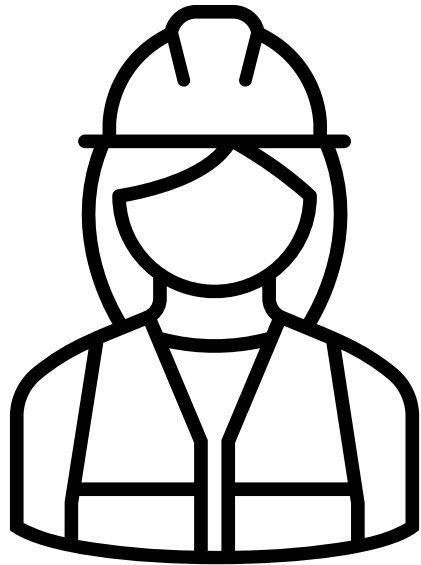


- Elevation
 - 3-5' adults
 - Lower childcare
- Mounting
- Interference
 - Adults
 - Children
 - Pets

Sampling Goal – Sources and Pathway Assessment



Workplace Settings & Variable Conditions



Sampling

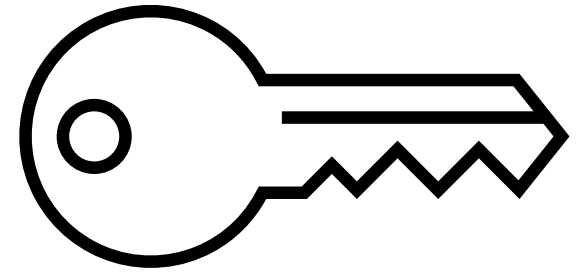


Not
Sampling

Considerations:

- Occupancy levels
- HVAC management

Is the **uptake rate** in the sampled setting the same as that calculated in the laboratory during validation for your sampler?



Air Movement

(Face Velocity)

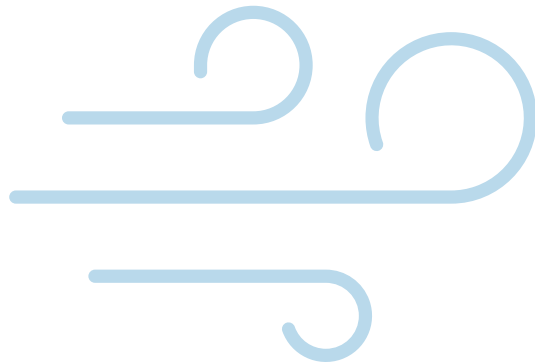
Too Low

- Sampler “starvation”
- Low-biased concentration
- Avoid closets, inside shelves, near walls
- Enhance air movement
- Some samplers less susceptible

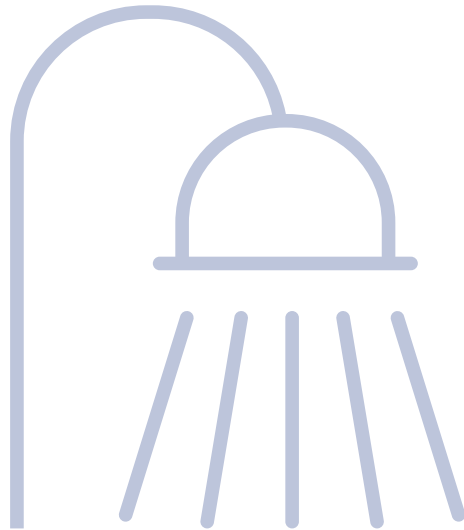
Too High

- Advective flow
- High-biased concentration
- Avoid vents, windows, exhaust fans
- Some samplers less susceptible

Optionally check with an anemometer



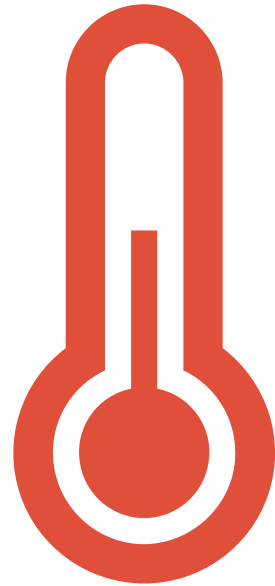
Humidity



Choose appropriate sampler for high humidity settings (i.e., wet basement, sump, conduit, sub-slab, soil):

- Hydrophobic sorbent
- Passive permeation membrane sampler

Temperature



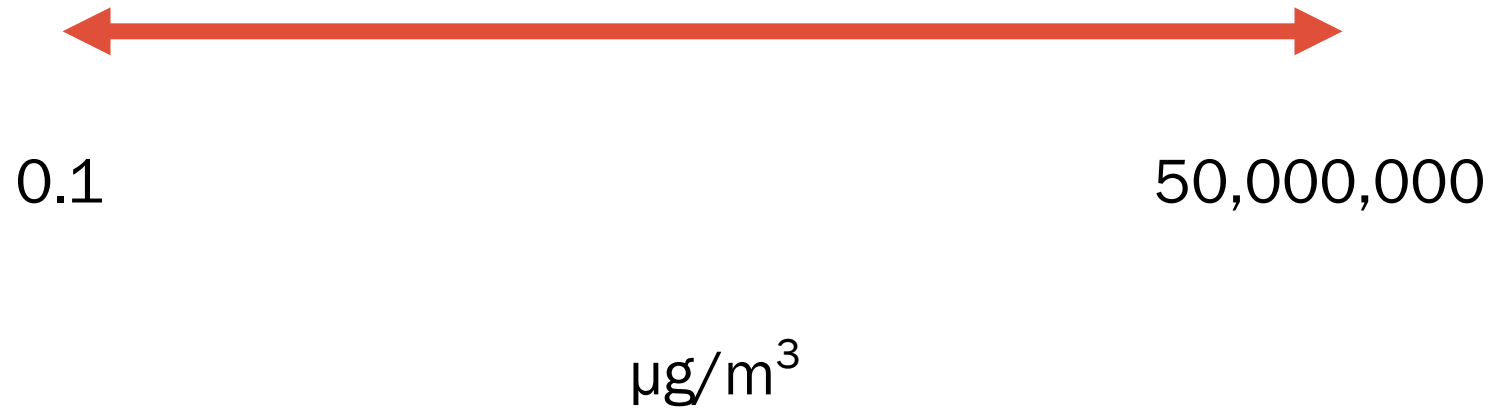
Avoid

- Direct sunlight
- Outside walls
- Heaters
- Lighting fixtures
- Air conditioners



Non-Target Compounds

Vapor Concentrations





Outdoor Air

Suggested Steps in Planning and Implementing a Passive Sorbent Sampling Investigation

- Determine the target contaminants of concern (COCs).
- Determine the target or available sampling duration.
 - Is the period shorter to obtain results more quickly or longer to better account for temporal variability?
 - Is there a practical time limit due to occupant access, permits, etc.?

Suggested Steps in Planning and Implementing a Passive Sorbent Sampling Investigation

Determine the reporting limit. In some cases, passive samplers can be used qualitatively to determine where concentrations are higher, for example, finding a hot spot beneath a parking lot. Such applications allow more flexibility in reporting results. Whenever samplers are used to determine whether contaminant concentrations are below a Vapor Risk Screening Level (VRSL) or Vapor Action Level (VAL) (refer to the January 2018 RR-800) at a location for the purpose of evaluating risk to building occupants, reporting limits for the COC should conform to the following:

- *Indoor Air:* Below the VAL for all samples*. Longer duration samples should have reporting levels at least equivalent to those typically achieved by canister samples.
- *Sub-slab:* Below the sub-slab VRSL for all samples*. Longer duration samples should have reporting levels at least equivalent to those typically achieved by canister samples.

Suggested Steps in Planning and Implementing a Passive Sorbent Sampling Investigation

Determine the reporting limit continued...

- **Note:** Sampling events performed to quickly evaluate indoor air and sub-slab concentrations are typically conducted over durations of less than 24 hours. If passive samplers are used during such an event, the shorter duration will result in higher achievable reporting limits. The use of a passive sampler is still appropriate (and may be preferred if sampling can be performed more quickly due to canister availability limitations) if the VALs and VRSLs can be achieved. Also, passive samplers will not be able to achieve a reporting limit below the VAL for vinyl chloride over short durations such as 24 hours but should over longer duration events.
- *Conduits:*
 - For conduits that enter a building, at locations outside the building, below the Sanitary Sewer Gas Screening Level (SSGSL) (refer to RR-649).
 - For conduits within a building, below the VAL.
- *Soil Gas:* Below the shallow soil gas VRSL.

Suggested Steps in Planning and Implementing a Passive Sorbent Sampling Investigation

- Determine expected sampling conditions, for example: humidity, air flow, temperature, anticipated concentration range, presence of non-target compounds, occupant expectations, placement limitations, and the need to account for HVAC setbacks or occupancy levels.
- Consult with the laboratory to select the appropriate sampler and sorbent for the target COCs, setting, anticipated concentrations, and expected sampling duration that can achieve the target reporting limits. For critical contaminant risk drivers (i.e., TCE, PCE, Benzene but others as determined by site specific conditions), choose samplers that have uptake rates experimentally validated for the COC and the duration of the sampling event.

Suggested Steps in Planning and Implementing a Passive Sorbent Sampling Investigation

Implement the Sampling Program.

- Follow all sampler-specific procedures.
- Utilize appropriate number of field quality control samples recommended by the lab.
- Record the sampling start and stop dates and times to the minute.
- Document the sampler placement using a description, sketch, or photograph.
- Document the sampling location conditions including temperature, humidity, and air flow. For locations where these parameters do not vary substantially, such as most residences, these can be measured at the start and end of sampling. Where conditions may be highly variable in a setting, devices that record this information during the sampling period could be used.

Suggested Steps in Planning and Implementing a Passive Sorbent Sampling Investigation

Implement the Sampling Program continued...

- Collect inter-method samples, such as air canister samples, to assist in evaluating passive sampler accuracy if site conditions are likely to result in the uptake rate to deviate substantially from published values and concentrations cannot be corrected by the lab using other data collected (such as temperature).
- Provide documentation of the following: sampler manufacturer, sorbent type, extraction and analytical method, reporting limit, estimated concentrations, identify concentrations corrected by the lab (such as for temperature), air volume sampled, laboratory certifications or accreditations, QA/QC procedures, and sampling conditions as described above.

Passive Sampling



Work closely with the laboratory

Provide them with a thorough description of site conditions and data quality needs

Passive Samplers in Settings other than Indoor Air

Soil Gas

Sub-slab Soil Gas

Conduits – Sanitary Sewer Manholes

Conduits – Interior Plumbing

Conduits - Vents

Reference Pertinent to Passive Sorbent Sampling

- American Society for Testing and Materials (ASTM) Subcommittee: D22.05. “Standard Guide for Placement and Use of Diffusive Samplers for Gaseous Pollutants in Indoor Air.” In *ASTM Book of Standards Volume: 11.07*, ASTM D6306-17. West Conshohocken, PA : ASTM International, 2017.
- Department of Defense. “Passive Sampling for Vapor Intrusion Assessment.” In *DOD Vapor Intrusion Handbook*, Fact Sheet Update No: 001, Revision 1. 2009.
- Dawson, H., McAlary, T. and H. Groenevelt. *Passive Sampling for Vapor Intrusion Assessment: Technical Memorandum* [TM-NAVFAC EXWC-EV-1503]. Port Hueneme, CA: Naval Facilities Engineering Command (NAVFAC), 2015.
- Gross, D. and J. McKernan. *Passive Samplers for Investigations of Air Quality: Method Description, Implementation, and Comparison to Alternative Sampling Methods* [EPA/600/R-14/434]. Washington, DC: U.S. Environmental Protection Agency, 2014.
- McAlary, T. *Development of Most Cost-Effective Methods for Long-Term Monitoring of Soil Intrusion to Indoor Air Using Quantitative Passive Diffusive-Adsorptive Sampling: ESTCP Project ER-200830*. ON, Canada: Geosyntec Consultants, Inc., 2014.
- McAlary, T, Groenevelt, H., Disher, S., Arnold, J., Seethapathy, S., Sacco, P., and T. Gorecki. “Passive Sampling for Volatile Organic Compounds in Indoor Air-Controlled Laboratory Comparison of Four Sampler Types.” *Environmental Science: Processes & Impacts* 17, no. 5: 896-905.

Additional References

Wisconsin Department of Natural Resources. *Guidance for Documenting the Investigation of Human-made Preferential Pathways Including Utility Corridors* [RR-649]. Remediation and Redevelopment Program, 2021.

Wisconsin Department of Natural Resources. *Addressing Vapor Intrusion at Remediation & Redevelopment Sites in Wisconsin* [RR-800]. Remediation and Redevelopment Program, 2018.

Sampler Vendors & Labs

<https://www.assaytech.com/>

<https://beacon-usa.com/>

<https://www.eurofinsus.com/environment-testing/services/air-and-vapor/vapor-intrusion/>

<https://www.pacelabs.com/>

<https://radiello.com/>

<https://www.siremlab.com/waterloo-membrane-sampler-wms/>

<https://www.skcinc.com/>

Site-specific Questions

*Contact the DNR
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