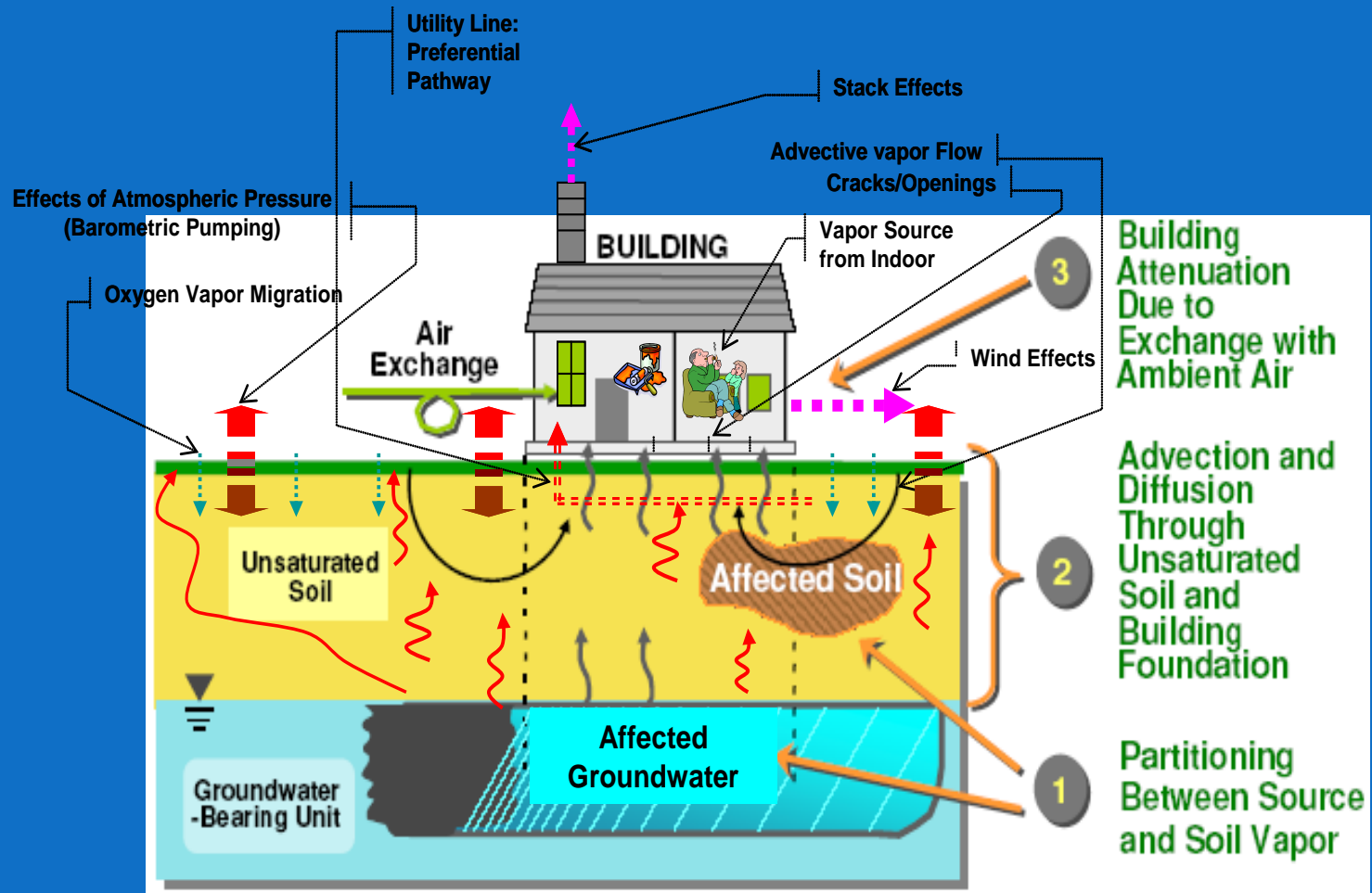


Overview of Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action

Washington State Department of Ecology, Toxics Cleanup Program

Craig Rankine, RG, LHG



Typical Example of Vapor Intrusion Pathway

Vapor Intrusion Guidance

Content

- Similar to guidance prepared by most states, ITRC, EPA
- Recommends a “tiered” or phased approach
 - (1) is there VOC contamination and VI potential at the site?
 - (2) are VOCs in groundwater or soil gas elevated [compared to VI-based screening levels]?
 - (3) are VOCs in indoor air elevated?
 - (4) ambient levels, are VOCs in indoor air due to VI?
 - (5) *mitigate* buildings when VOCs are elevated in indoor air due to VI
 - (6) set site cleanup levels to be protective of indoor air
- Assumes the RI/FS will be conducted per existing regulations

VI assessment

Where are soil gas VOC concentrations high enough to pose a VI threat?

Q: Why not just sample indoor air?

A: If the VOC of concern is likely to **ONLY** be found in soil gas, and there is a building, this is an option.

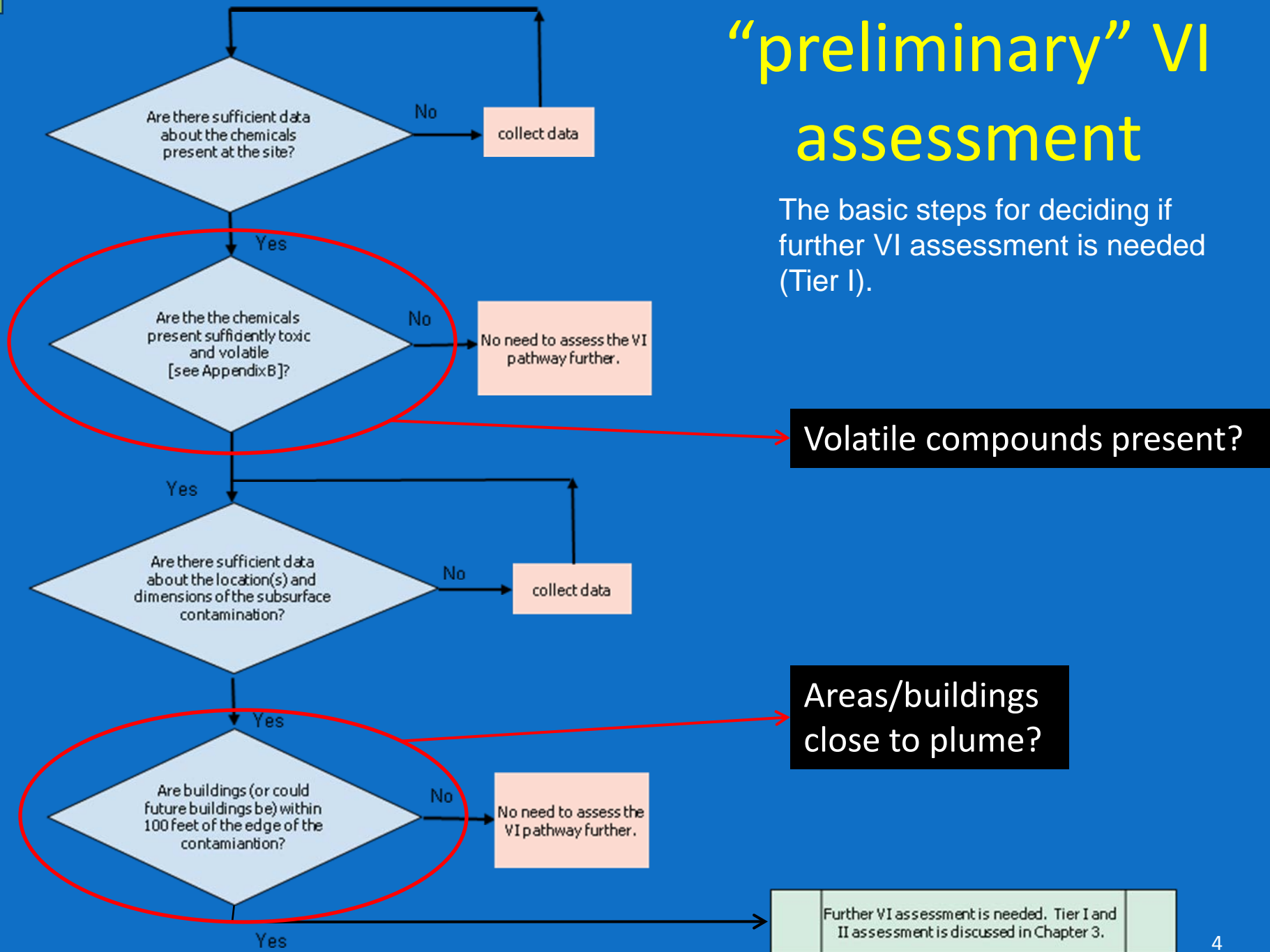
But...many VOCs are also found in:

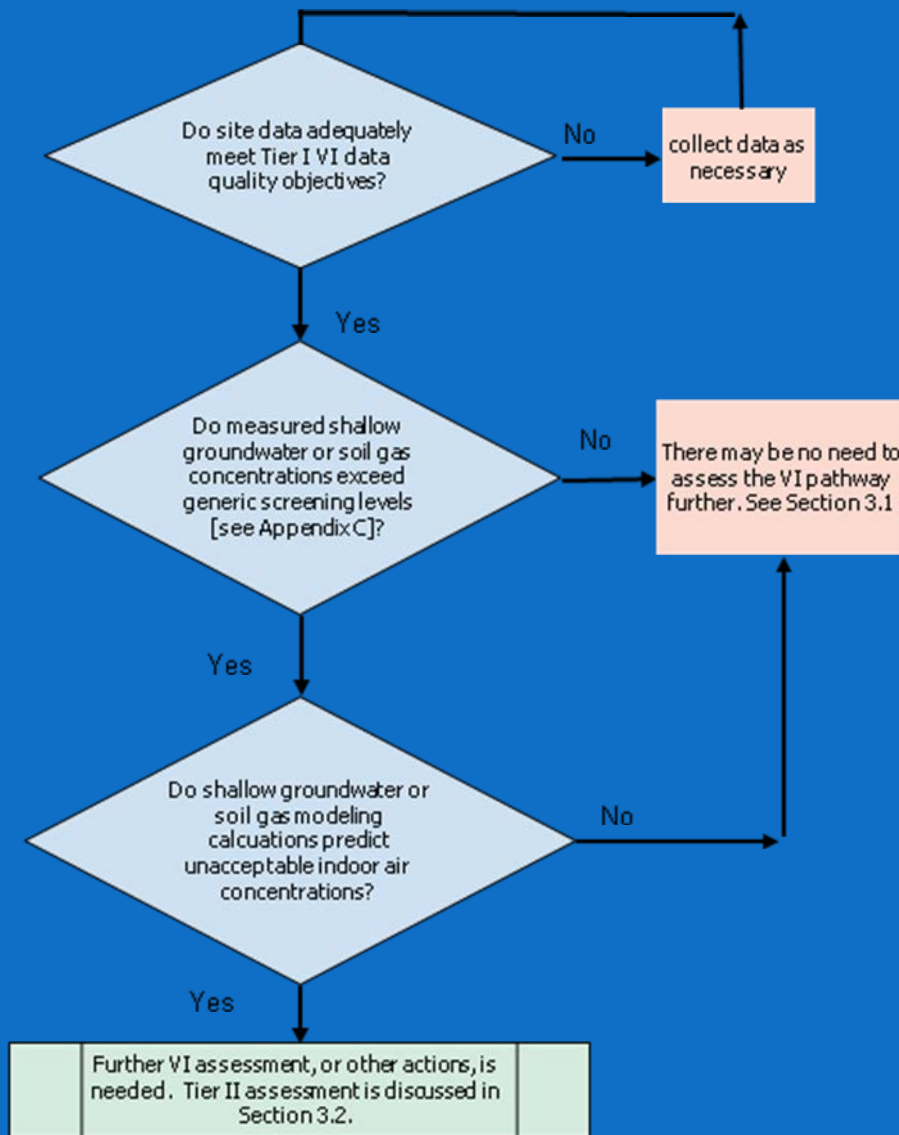
- ambient (outdoor) air
- in products or other materials inside the building

So when you sample indoor air you will detect **MORE** than just the contamination due to VI.

“preliminary” VI assessment

The basic steps for deciding if further VI assessment is needed (Tier I).





Tier I assessment

Determine from subsurface media samples [shallow GW or soil gas] whether VOC concentrations are high enough to potentially result in unacceptably elevated indoor concentrations

Tier I assessment

Screening level approach applies if preferential vapor migration conditions Do Not Exist

Geology: fractured (shallow bedrock) or solution openings

Permeable path in subsurface utility bedding material

Building foundation openings for utilities or cracks, gaps, sumps or drains

Shallow groundwater is present (less than 15 feet bgs)

Presence of product – non-aqueous phase liquid

Tier I assessment

Where are VOC concentrations high enough to pose a VI threat?

Collect shallow Groundwater (GW) samples or

Collect Soil Gas (SG) Samples

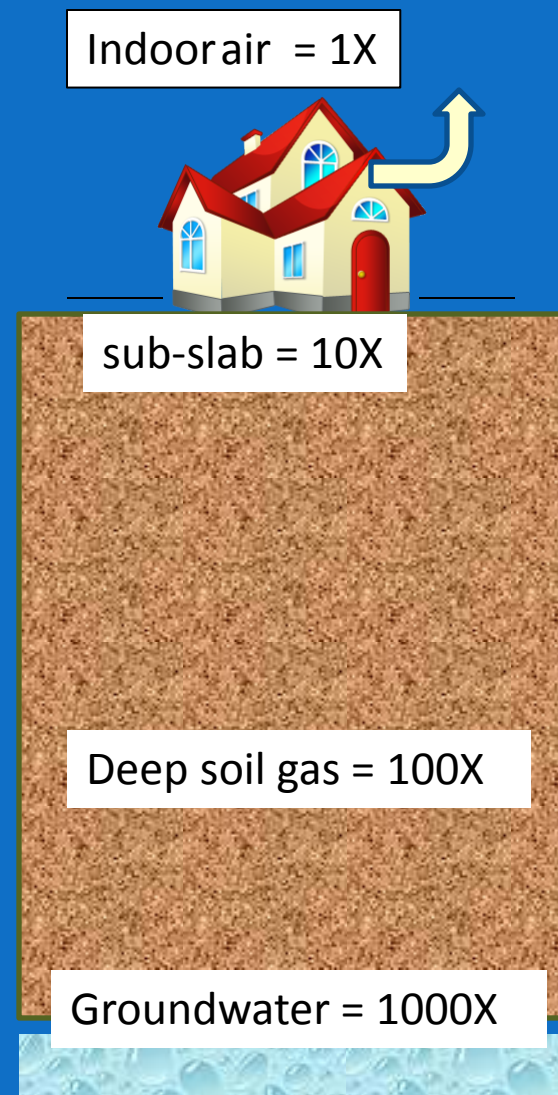
Compare to Screening Levels (SLs)

Use measured GW or SG results in predictive Model
and compare to Screening Levels

Attenuation Factors

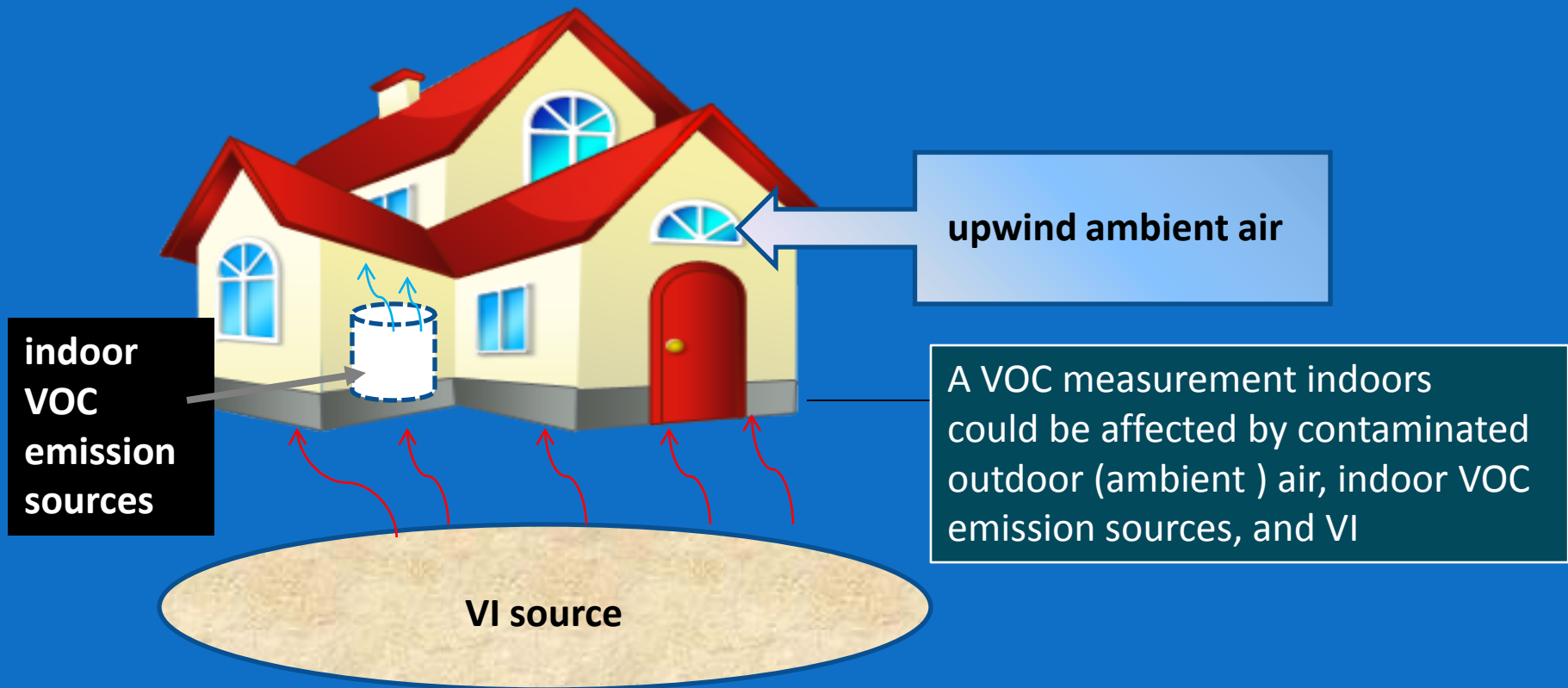
Screening levels are calculated based on depth specific attenuation factors

Indoor air	=	1
Sub -slab soil gas	=	0.1
Deep soil gas (Deeper than 15 feet bgs)	=	0.01
Groundwater	=	0.001



Tier II assessment

Tier II assessment is based on the *conceptual model* below:





Tier II assessment

Indoor air work up

- Resident outreach and education – what does indoor air sampling mean and how will it be done.
- Obtain building and utility characteristics and use this and subsurface information to select where and how to sample.
- Coordinate building access for air sample collection or to install sub-slab ports or mitigation system.
- Concurrent multi-media sampling used to build multiple lines of evidence.



Tier II assessment

Adjusting for multiple indoor air sources

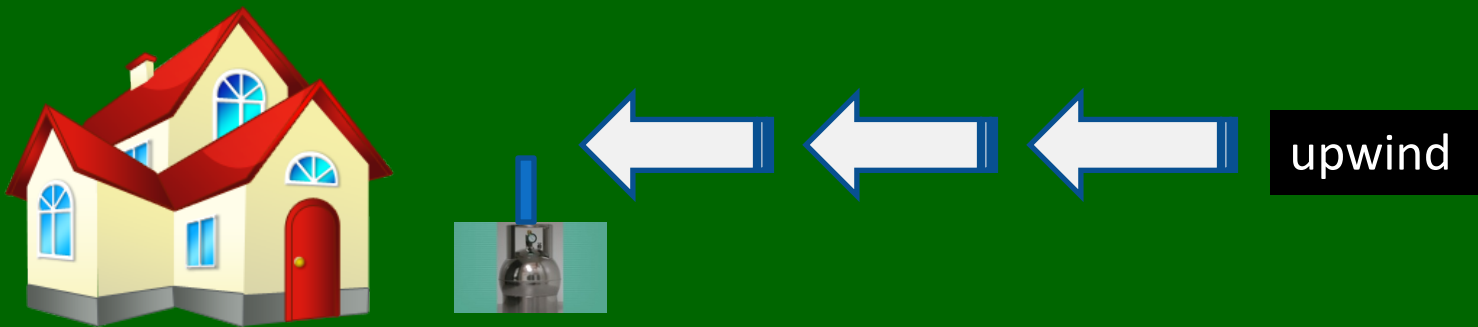
It is difficult to quantify the VOC contribution from indoor emitters unless the VOCs being emitted are unique (not in soil gas and not in ambient air).

However, estimating the VOC contribution from ambient air can be done by sampling upwind of building in question.

Tier II assessment

Evaluate VOC contribution in indoor air by sampling ambient air near/upwind of building and making adjustments for ambient levels.

So $[\text{VOC}]_{\text{due to VI}} = [\text{VOC}]_{\text{measured indoors}} - [\text{VOC}]_{\text{measured in ambient air}}$





VI Guidance Track

- Guidance is still draft but is expected to be finalized this year - 2011
- Screening levels in Appendix B are changing:
 - USEPA change in methodology on how inhalation risk is calculated
 - USEPA change to use only direct inhalation toxicity values, not extrapolating from other risk routes
 - Include how petroleum fractions are used
 - Changing algorithms is tied to MTCA rule update which is stalled by Governor's moratorium (budget constraints)



Contact and Document Information

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VI Guidance at:

<http://www.ecy.wa.gov/programs/tcp/policies/VaporIntrusion/vig.html>