Upcoming Updates to DEQ's Vapor Intrusion Approach

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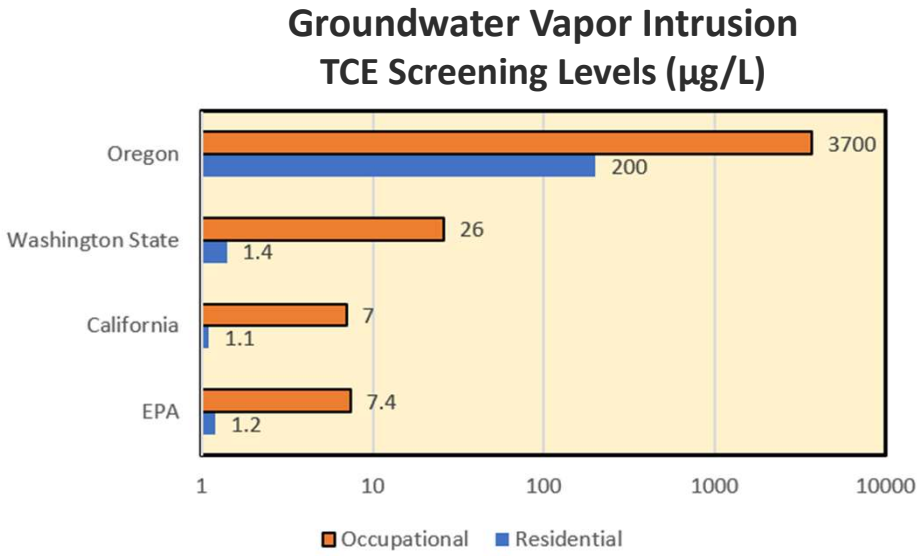
Reasons for Updating Guidance

- DEQ's groundwater and soil risk-based concentrations (RBCs) for chlorinated solvents were no longer reliably protective
- Draw from developments in field since the 2010 VI guidance was published
- Improve quality and consistency of decision making

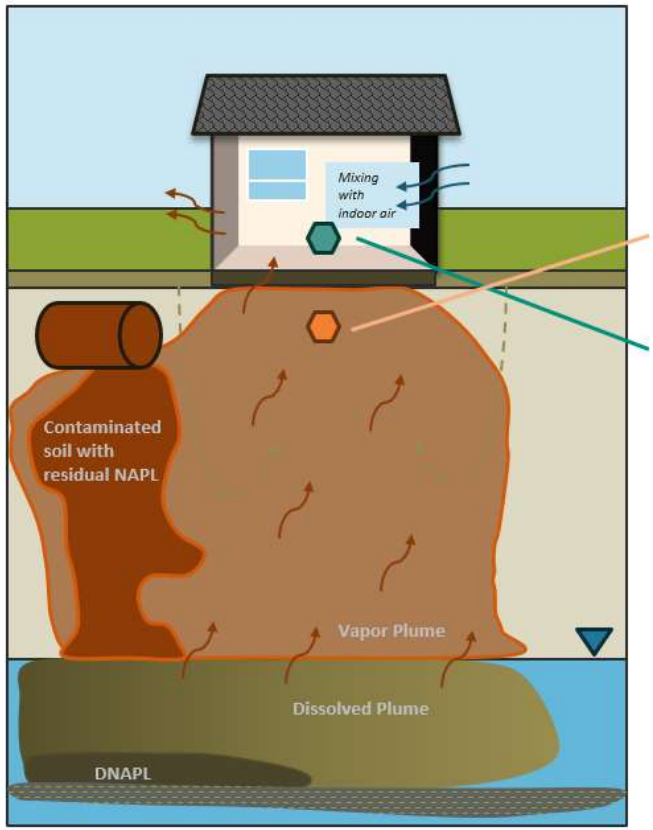


Timeline for Final Guidance 2023/2024

- New RBCs beginning June 2023
- Draft guidance early 2024
- 90-day public review period
- Consideration of comments; revise and finalize guidance

Major Updates

- Change in Attenuation Factors (AF)
- Updated and expanded RBCs
- Elimination of soil RBCs
- Publishing of acute RBCs **(new)**
- Response-matrix for indoor air concentrations exceeding RBCs
- Greater emphasis on delineating subsurface vapor plumes
- Descriptions and expectations of mitigation systems and performance monitoring



$$AF = \frac{Conc_{Soil\ Vapor}}{Conc_{Indoor\ Air}}$$

Basis for VI RBCs:

$$RBC_{SV} = RBC_{IA} * AF$$

Attenuation Factor Update

- RBCs updated based on empirically derived attenuation factors (AF)
  - Consistent with EPA and other states
  - Substantial decrease in RBCs
  - Previously, DEQ was using outdated version of Johnson & Edinger Model, generates higher attenuation factors than those supported by empirical data (EPA Database)

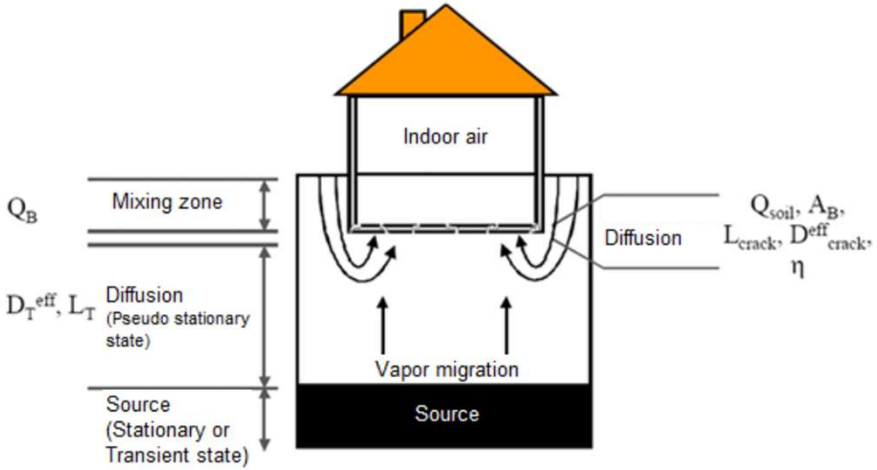
- Soil RBCs for the vapor intrusion pathway eliminated

Media	Oregon	Washington
Soil Gas	0.03 (~ 33x)	0.03
Groundwater	0.001 (~ 1000x)	0.001

Methods for Developing Generic AFs

Analytical Modeling

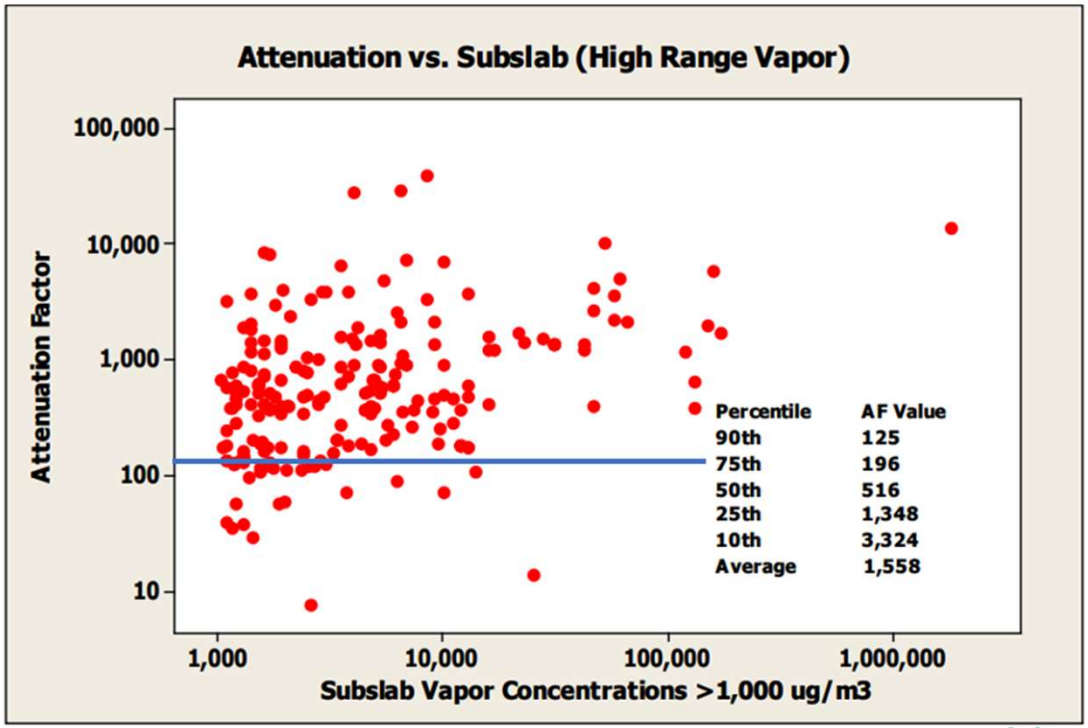
(DEQ 2010 RBDM with Johnson & Edinger Model)



$$\alpha = \frac{\left(\frac{D_T eff \cdot A_B}{Q_B \cdot L_{cb}}\right)}{1 + \left(\frac{D_T eff \cdot A_B}{Q_B \cdot L_{cb}}\right) + \left(\frac{D_T eff \cdot A_B \cdot L_{crk}}{D_{crk} eff \cdot A_{crk} \cdot L_{cb}}\right)}$$

Empirical Data and Relationships

DEQ (2010), EPA (2015), DTSC (2020)



Soil Data and VI Pathway

Eliminated for VI Risk Screening

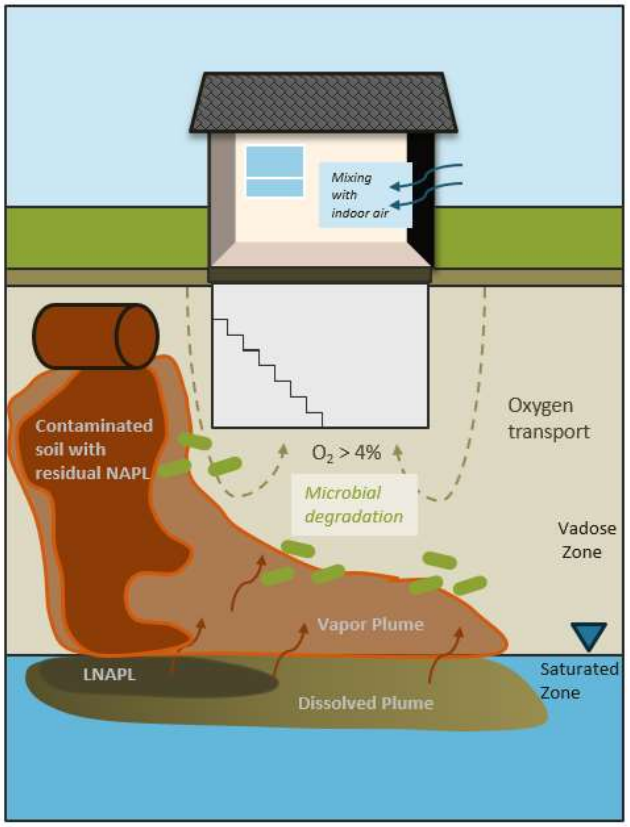
- Soil is generally an unreliable indicator of VI Risk due to:
  - Soil heterogeneities and distribution of contamination
  - Sample size/amount
  - Analytical detection limits for chlorinated compounds
  - Biodegradation of total petroleum hydrocarbons (TPH)

Continued Uses

- Delineating source areas to locate soil vapor sampling points
- Characterizing chemical composition of a source
- Evaluating source area treatment and remedial progress

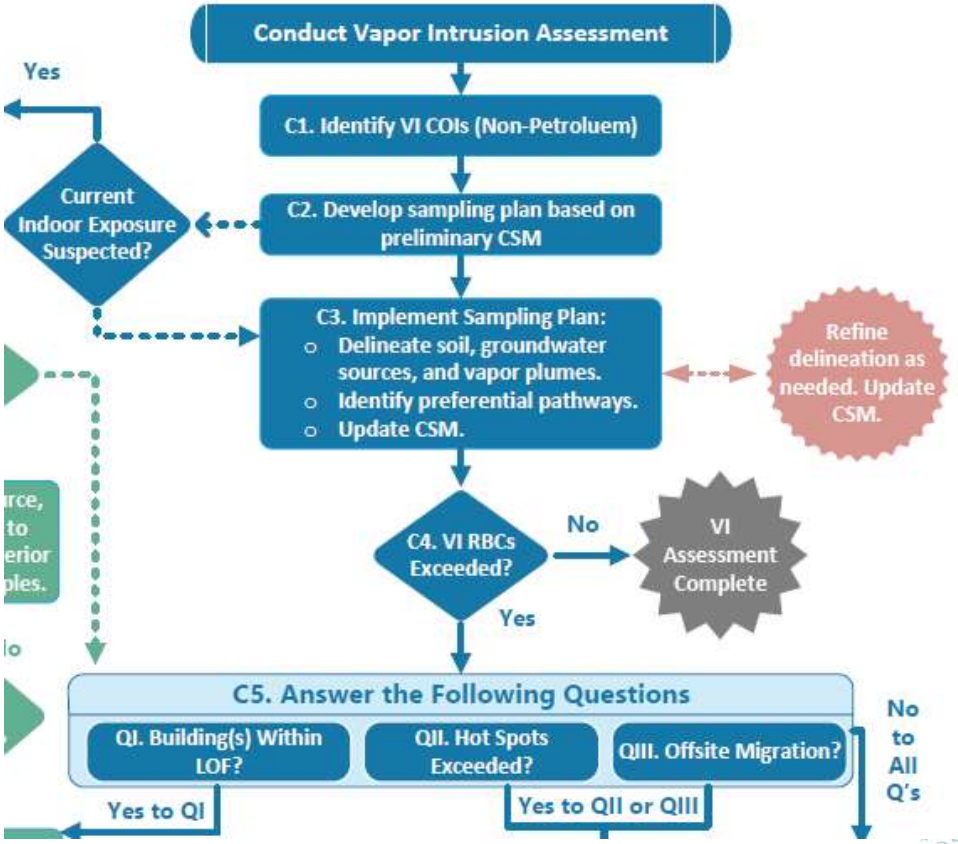
Site Characterization Expectations

- VI Conceptual Site Model – narrative and graphical with refinement
  - Inclusion of biodegradation at petroleum sites
  - Vertical and lateral inclusion zones (distance to structure)
- Routine collection of soil vapor data at potential VI sites
- Shallow and deep soil gas and delineation of vapor plumes



Flow Charts

- Separate flow charts for chlorinated VI, petroleum VI, residential heating oil tanks, and performance monitoring
- Biodegradation considerations included for petroleum VI and heating oil tank sites
- VI soil RBCs triggering soil vapor sampling are replaced with Level II soil matrix standards (80 ppm Gx, 500 ppm Dx)



Risk-Based Concentrations

- No change to RBC_{air}
- No conceptual change for RBC_{sv}; new AFs
  - values lower by a factor of 6
- Bigger impact for RBC_{wi} because of different approach for groundwater and new AFs
  - values lower by factors of 50 to 1000
- Interactive VI RBC spreadsheet (based on EPA VISL)

	A	C	D	E	G	H	I	J	K
1						HIDE		HIDE	
2		DEQ		Cleanup Program Acute Risk-Based Concentrations					
3									
4				RBCair		RBCsv			
5				Residential Acute RBC	Occupational Acute RBC	Residential Acute RBC	Residential Acute RBC	Occupational Acute RBC	Occupational Acute RBC
6									
7		CASRN	Chemical	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)
254		79-01-6	Trichloroethene (TCE, Trichloroethylene)	2.1	6.3	70	70	210	210
269									

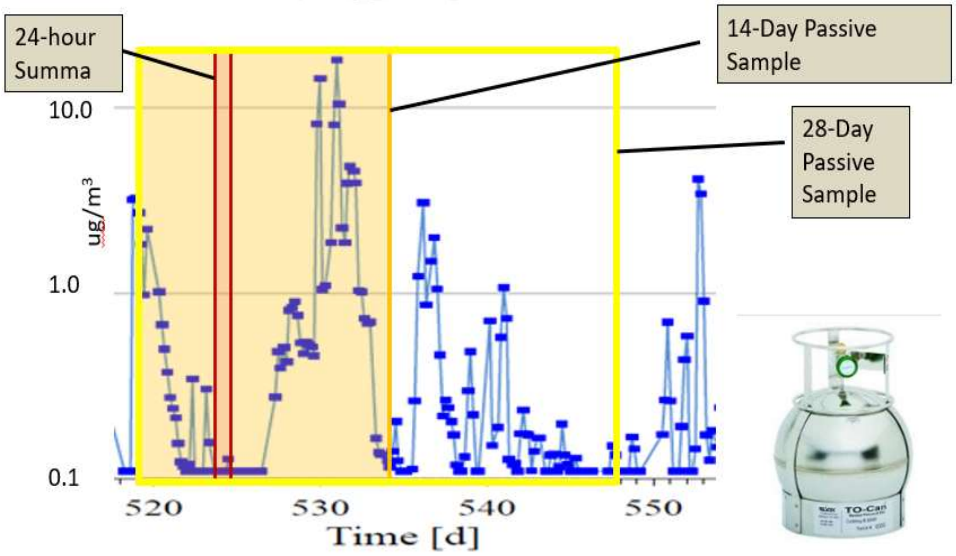
Acute RBCs

Site Exposure Scenario	TCE Indoor Air Action Level ($\mu g/m^3$)	TCE Subslab Soil Vapor Screening Level ($\mu g/m^3$)	TCE Groundwater Screening Level ($\mu g/L$)
OR Residential	2.1	70	9.2
WA Unrestricted/ Residential	2.0	67	8.6
OR Commercial	6.3	210	27
WA Workplace Commercial and Industrial	7.5	250	32

- RBC_{air} based on Cleaner Air Oregon
  - 100 chemicals
- Very important for chemicals like TCE with developmental effects
- Consistent with EPA and Washington
- Responses based on recommendations from EPA Region 9 and 10

Indoor Air Sampling

- Greater reliance on long-term passive sampling for characterizing indoor air levels at non-petroleum sites
- Consideration of acute exposure effects (*e.g.* TCE) and the need for higher resolution indoor air sampling
- Response matrix for indoor air exceedances – time-frame expectations for addressing unacceptable risk
- Inclusion of TPH as a routine indoor air contaminant of interest at petroleum VI sites



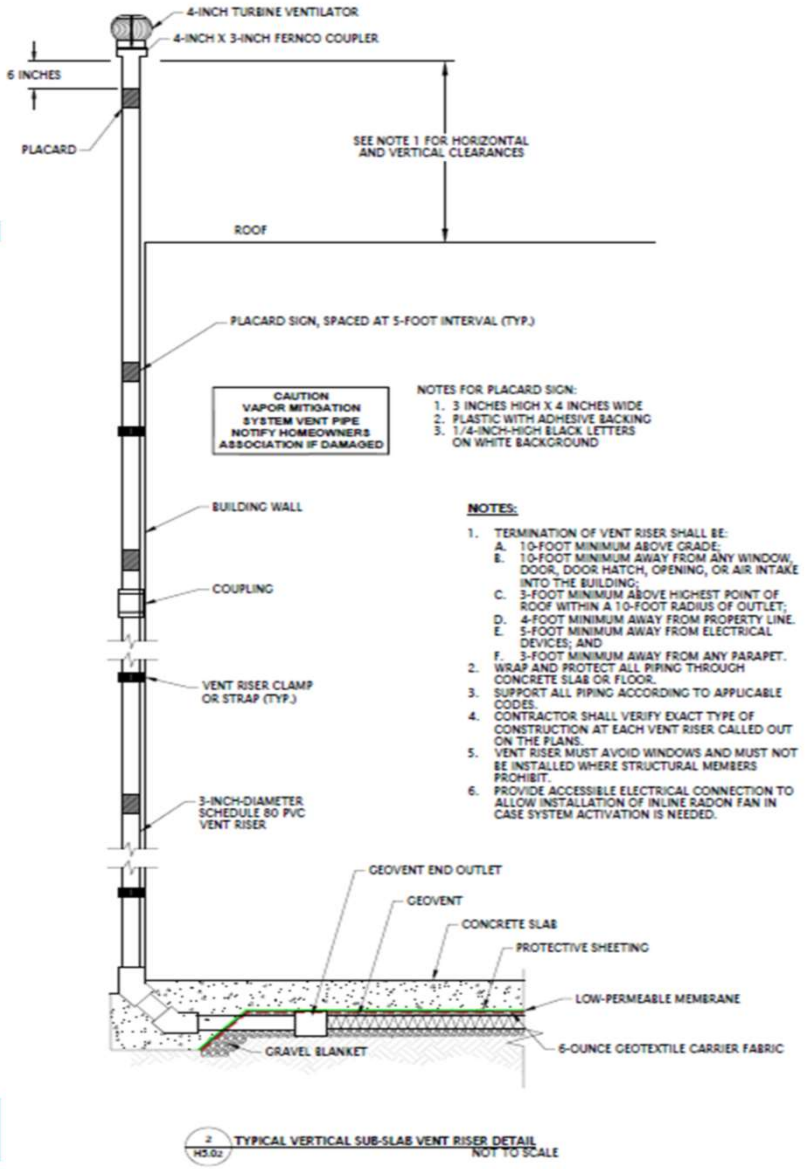
Remediation, Mitigation, and Performance Monitoring

- Remediation and/or Mitigation
- Prompt, Early/Interim or Final Remedies
- Technologies and Design Considerations
- Performance Monitoring
- Plans and Documentation
- Definition of ECs and ICs
- Professional Registrants and Certifications

Engage your Engineer!

Remediation, Mitigation, and Performance Monitoring

- Expectation to establish “New Normal” post-remedy (subsurface vapor rebound and re-equilibration)
- Expanded guidance on VI mitigation systems
- Performance expectations for mitigation systems - *consistent compliance with RBCs*
- Performance monitoring flowchart



Implementation

- New projects: use updated risk-based concentrations
- For projects currently underway: use updated RBCs on a case-by-case basis
- For completed and approved projects: reassessment may be performed on a case-by-case basis

Alternative Formats

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