Department of Toxic Substances Control

CalEPA California Environmental Protection Agency

A Holistic Vision for Vapor Intrusion: DTSC's New Approach & Public Workshop Insights

CALIFORNIA LAND RECYCLING CONFERENCE

SEPTEMBER 17, 2025

TOPICS!

- HERO Note Updates
- Holistic Approach to VI
- Q&A

HERO Note Updates…What's New?

- **HERO HHRA Note 1**, April 2025. Recommended DTSC Default Exposure Factors for Use in Risk Assessment at California Hazardous Waste Sites and Permitted Facilities
- **HERO HHRA Note 3**, April 2025. DTSC-Modified Screening Levels
- **HERO HHRA Note 10**, April 2025. Toxicity Criteria

https://dtsc.ca.gov/human-health-risk-hero/

Select SL Updates
Air Commercial/Industrial

Analyte	Note 3 2022 Cancer	Note 3 2025 Cancer	Note 3 2022 Noncancer	Note 3 2025 Noncancer
Benzene	0.42	0.42	13	13
Toluene	--	--	1,300	1,800
Tetrachloroethylene (PCE)	2	2	180	180
Trichloroethylene (TCE)	USEPA RSLs and Note 5			
Vinyl Chloride	0.16	0.16	440	220
Chromium (VI)	0.000082	0.000082	0.44	0.13
Heptachlor	0.0094	0.0094	8.8	1.8
Hexachlorobenzene	0.024	0.024	14	0.18

Units in µg/m^3

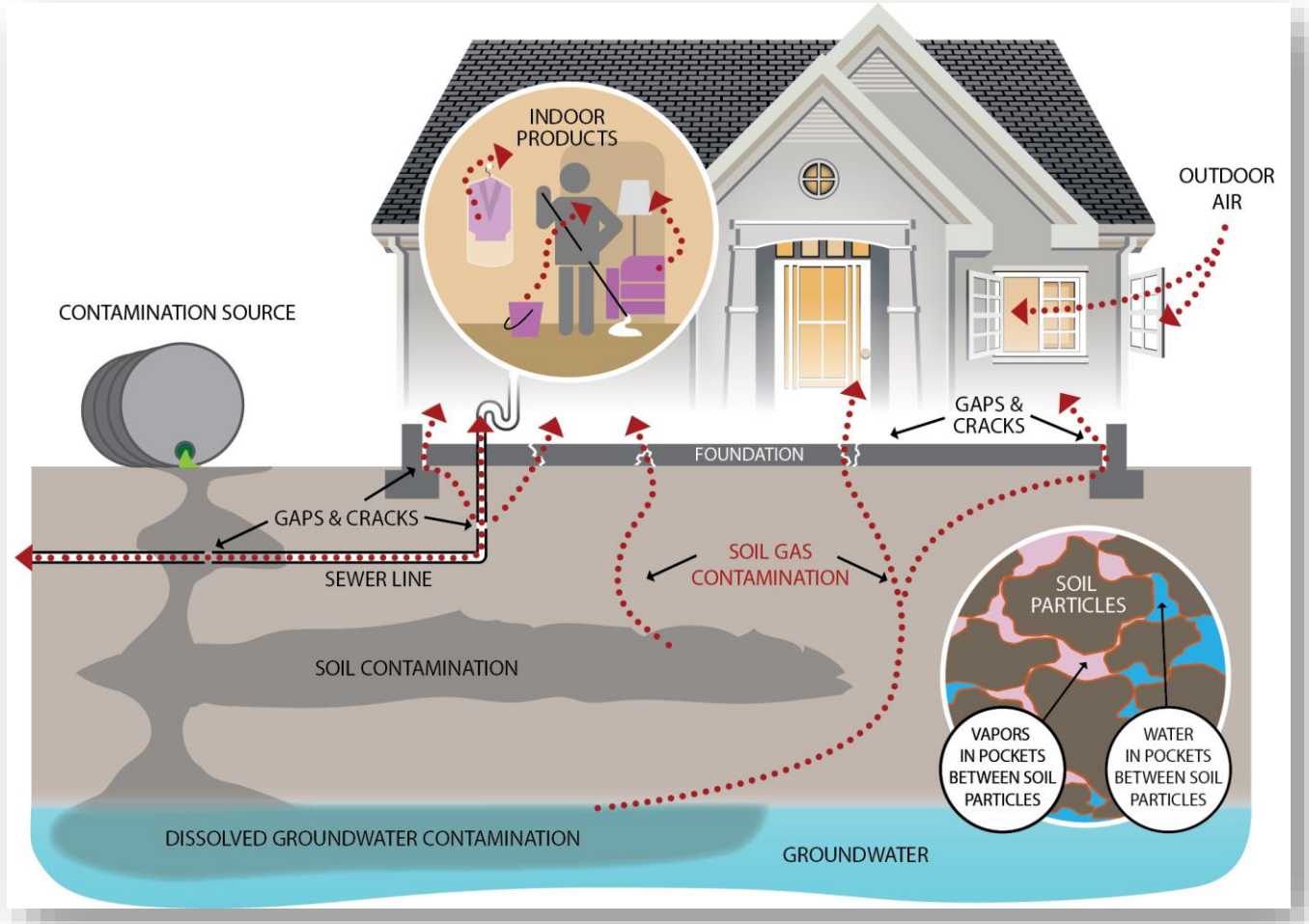
Vapor Intrusion Basics

Vapor Intrusion: migration of chemicals in vapor phase into buildings

Sub-Slab Soil Vapor: vapors immediately below building's sub-slab foundation

Soil Vapor: vapors within the vadose zone

Attenuation Factor: Ratio between sub-slab and indoor air concentrations.

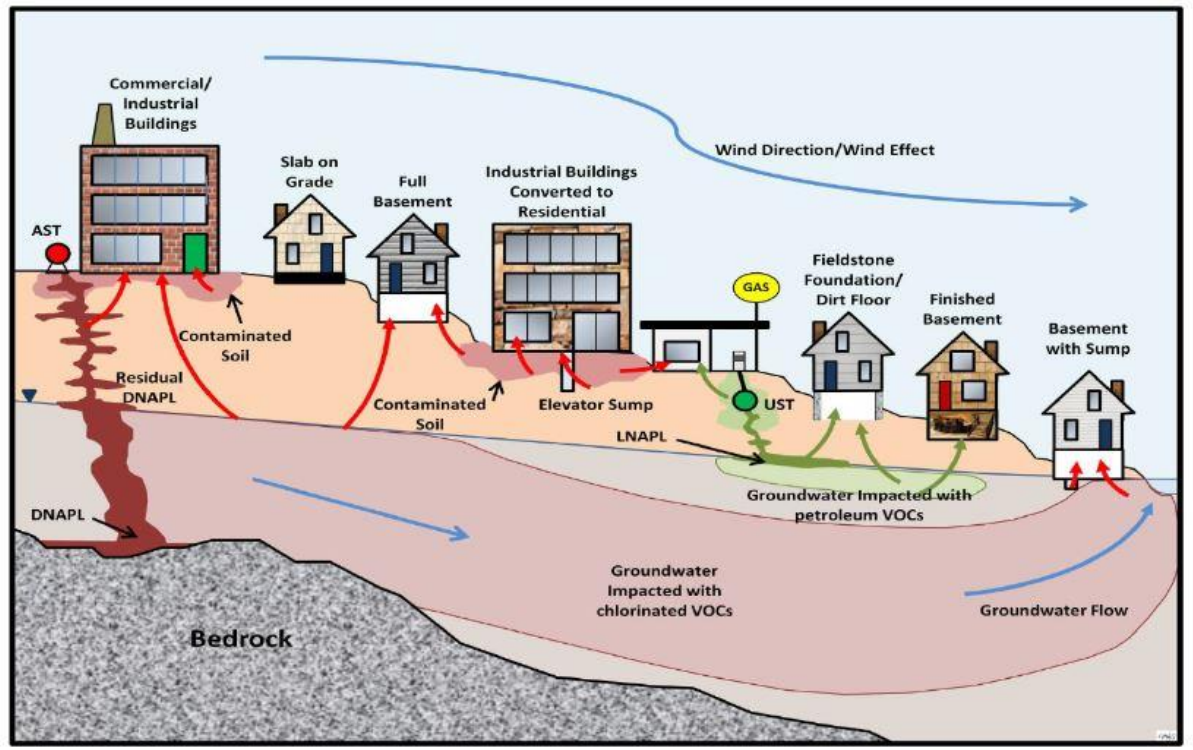


Common Themes of VI Success Stories:

- Robust CSM supported by adequate site-specific data
- Subsurface contaminant concentrations are:
  - Stable to decreasing
  - Low
  - Do not suggest an ongoing on-Site source or significant groundwater contamination
- Source addressed
- Indoor air test results below SLs
- VIMS and long-term stewardship may be required

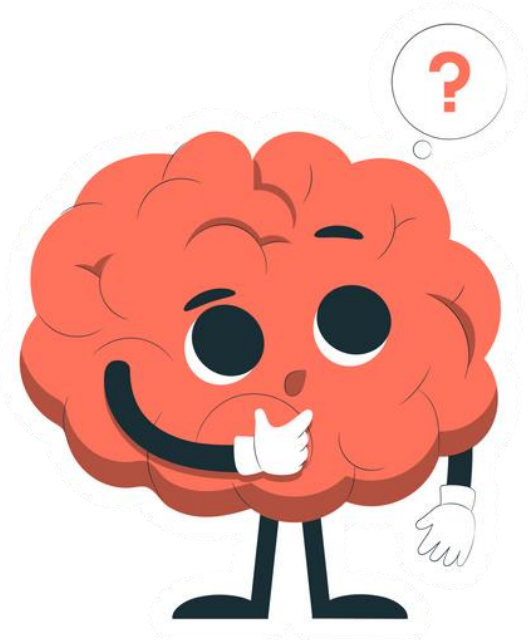
Elements of the CSM

- Source of contamination
- Contaminants of Concern
- Environmental media
- Transport mechanisms
- Exposure pathways
- Receptors



Courtesy of MASSDep – *This illustration portrays the potential for vapor intrusion on different types of properties.*

Evaluating VI



- Sample data is more reliable than modeling
- Samples closer to receptors are more representative of exposure
- Vapor behavior is complicated, manage the uncertainty
- Use conservative assumptions to protect human health

VI Toolbox

Proposed Roadmap	Site Investigation	Interim Remedial Measures - Source Removal	Full-Scale Remediation	Long Term OM&M

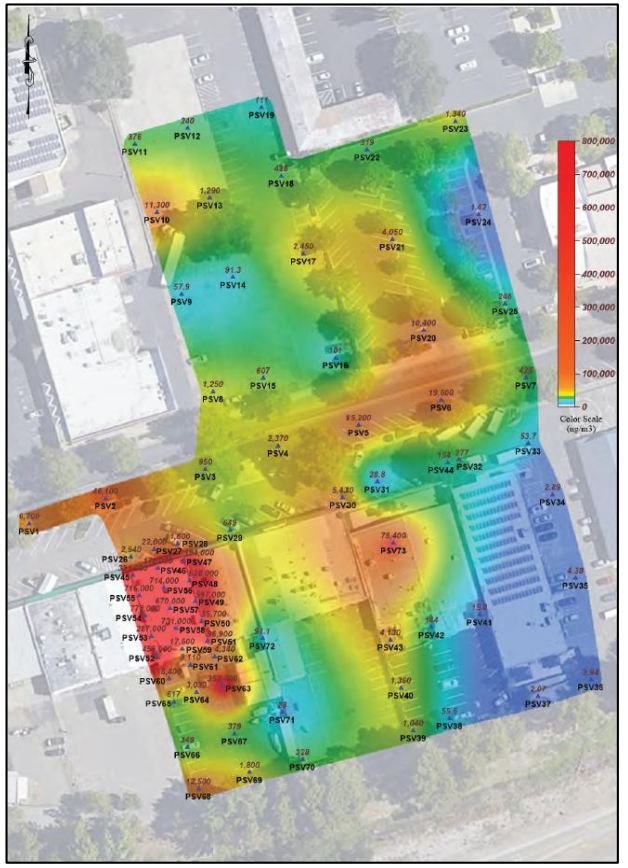
Key Tools	• High-Res Site Characterization
	  • Passive soil vapor
	  • In-situ vertical profiling tool
	  • Real-Time monitoring
	  • Indicators/Tracers/Surrogates
	• Strategic permanent vapor probes/GW wells
	• Indoor Air Sampling
	  • Passive Sampling
	  • Legacy methods
	  • Real-Time sampling
	• Risk-Based Decision Making
	• Short-Term Vapor Mitigation
	  • Air purifiers
	  • Fans
	  • Venting
		• Source Removal:
		  • Excavation
		  • Soil Vapor Extraction
		  • Injections
		  • Thermal
		• Protection of Human Health:
		  • Short-Term Vapor Mitigation
		 
			• Establish Cleanup Goals (LOEs)
			• Source Polishing
			• Address Down-gradient Plume
			• Install of Long-Term Mitigation Measures
			• Operation, Maintenance, & Monitoring (OM&M)
			  • Including performance monitoring
				• OM&M for Both Long-Term Remedies and Mitigation Measures:
				  • Routine Monitoring
				  • Legacy Sampling Methods
				  • Real-Time Monitoring
				  • Passive Indoor Air

VI Toolbox

Proposed Roadmap	Site Investigation	Interim Remedial Measures - Source Removal	Full-Scale Remediation	Long Term OM&M
Applying LOEs From SVIG to Holistic Approach	• Contaminant Characteristics • Subsurface Conditions • Building Characteristics • Other Methods (site-specific) - Continuous monitoring - Controlled pressure method (CPM) - Indicators/tracers/surrogates - Mathematical modeling - Passive soil gas sampling - Other sub-slab methods	• Contaminant Characteristics • Subsurface Conditions For Vapor Mitigation: • Building Characteristics • Other Methods	• Contaminant Characteristics • Subsurface Conditions For Vapor Mitigation/OM&M: • Building Characteristics • Other Methods • Building Ventilation (CCR Title 24/ASHRAE)	• Building Characteristics • Other Methods • Building Ventilation (CCR Title 24/ASHRAE)

High Resolution Site Characterization

- High-resolution site characterization (HRSC) uses scale-appropriate sample density to **quickly** define contaminant nature and extent and subsurface lithology to support **more effective** site investigation and remediation. It includes (but is not limited to):
  - Passive soil vapor sampling
  - Vertical profiling
  - Discrete zone sampling



Strategic Sampling

- Make data-driven decisions:
  - Targeted placement of permanent soil vapor and/or sub-slab vapor probes and groundwater wells
  - Depth intervals for vapor implants and/or well screens
  - Targeted indoor air sampling

Multiple Lines of Evidence (LOEs)

- To support straying from the default 0.03 attenuation factor during screening
- To support if mitigation and/or remediation is needed
- If so, to support remedial strategies
- To establish cleanup goals/action levels
- To support case closure

Low VI Potential or Low Uncertainty	Lines of Evidence	High VI Potential or High Uncertainty
Detailed	Site History	**Insufficient**
Complete	Site Characterization	**Incomplete**
Absent	Non-Aqueous Phase Liquid	**Present**
Low	Environmental Persistence	**High**
Stable	Contaminant Plume	**Migrating**
Fine Grained; High Moisture	Subsurface Soil Conditions	**Coarse Grained; Low Moisture**
Far	Proximity to Contaminated Media	**Near**
Absent	Preferential Pathways	**Present**
Occupied spaces above open air garage	Building Design and Construction	**Dirt Floor Basement**
Intact	Foundation Integrity	**Compromised**
Over Pressurized		**Under pressurized**
Indoor as Warm as Outdoor	HVAC	**Indoor warmer than outdoor**
High Ventilation		**Low ventilation**
Not Usable to Rule out VI	Radon Concentrations	**Indoor Air > Outdoor Air**
Supported by CSM and Verified	Modeling	**No Empirical Data**
Short	Remediation Timeframes	**Long**
Controlled	Off-Site Source Contamination	**Uncontrolled**

Flavors of No Further Action

- **No Further Action** – Unrestricted land use and unlimited exposure.
- **Low Threat Closure** – Water Board may close the case if contaminants are naturally attenuating and unlikely to pose an unacceptable threat.
- **Certified Remedy with Land Use Control** – Annual inspections and Five-Year Reviews.
- **Remedy Construction Complete** – Remedy is constructed and operating as designed with long term operation and maintenance.
- **Suitable to Occupy** – Cleanup and mitigation are functioning such that proposed occupants of the property will not be exposed to unacceptable risks.

Thank you!

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