WGWA Annual Meeting

Conceptual Site Model Development for Vapor Intrusion

Presenter: Brian Hennings
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Presentation Outline

- What is a Conceptual Site Model (CSM)
- Why have one
- Components of the CSM
- Use of CSM for Vapor Intrusion Pathway Screening
- Use of CSM for Planning Sample Collection
- Updating the CSM
- Resources
What is a Conceptual Site Model?
Example Conceptual Site Model

*Image courtesy of Interstate Technology Regulatory Council (ITRC), from Vapor Intrusion Pathway: A Practical Guideline, (ITRC, 2007)
Why Have a CSM?

- Organized way to visualize site characteristics
- May identify data gaps
- Communication with stakeholders
- Agency requirement
- Useful summary for completion of vapor intrusion pathway screening
Components of a good CSM

- Incorporates Previous Site History
- Building Use and Construction
- Neighboring Properties (BRRTs)
- Soil & Groundwater Contamination (BRRTs/FOIA)
- Site Specific Geology and Hydrogeology
- Utility Corridors
- Identify Receptors
- Complexity of CSM match Site Complexity
Components of a good CSM

CONCEPTUAL SITE MODEL CHECKLIST

The information included in this checklist may be useful for developing a site-specific conceptual migration model and in planning soil gas sampling. The investigator may use this checklist to compile information for each site.

Utilities and Process Piping

☐ Locate and map out all underground utilities near the soil or groundwater impacts. Pay particular attention to utilities that connect impacted areas to occupied buildings.

☐ Locate and map out all underground process piping near the soil or groundwater impacts.

Buildings (Receptors)

☐ Locate and map out existing and potential future buildings.

☐ Identify the occupancy and use of the buildings (e.g., residential, commercial). You may need to interview occupants to obtain this information.

☐ Describe the construction of the building including materials (e.g., wood frame, block), openings (e.g., windows, doors), and height (e.g., one story, two story, multistory). Determine whether there is an elevator shaft in the building.

☐ Describe the foundation construction:

*Image courtesy of Interstate Technology Regulatory Council (ITRC), from Vapor Intrusion Pathway: A Practical Guideline, (ITRC, 2007)
Components of a good CSM

- Site History
- Contaminants
- Subsurface Conditions

Conceptual Site Model
Hypothetical Site
Example Graphical CSM #1
Example Graphical CSM #2

- Commercial
- Residential
- Sand and silt
- Clay
- DNAPL
Example Graphical CSM #3

Commercial

Residential

Sand and silt

Clay
Using the CSM for Vapor Intrusion Pathway Screening

- Identify the type of contaminant
- Is the source of contaminated vapor in the vadose zone or groundwater
- What is the extent of contaminated groundwater
- Are there vapors in utility corridors and who are the receptors of the utility corridors
- Historical migration pathways (buried streams)
Petroleum VI

Commercial

Residential

>5 ft. >5% O₂

Impacted Soil

Petroleum Vapors Present in Utility Corridor?

Sand and silt

Clay

DNAPL

>5 ft.

>30 ft.

Benzene <1,000 ppb
Chlorinated VI

CVOC Vapors Present in Utility Corridor?

>100 ft.

Commercial

Residential

Impacted Soil

Sand and silt

CVOCs < Enforcement Standard

Clay

DNAPL
The Vapor Pathway may be screened out based on separation distances. If not, use the CSM to identify data gaps:

- Document O₂ concentrations in vadose zone (possibly CO₂, CH₄)
- Collect additional soil or groundwater samples
- Develop top of clay/confining layer contours
- Collection of vapor samples in targeted locations (utility corridors)
- Additional information required to evaluate future use
Petroleum VI

Petroleum Vapors Present in Utility Corridor?

Sand and silt

>5 ft.
>5% O₂

>30 ft.

Benzene <1,000 ppb

Commercial

Residential

DNAPL

Impact Soil

Clay
Update the CSM
Resources

- Regulators – WDNR Staff, WDHS, USEPA, Other State Agencies
- Organizations/Websites – ITRC, API
- Websites
  - [http://www.clu-in.org](http://www.clu-in.org) (USEPA Clean-Up Information)
- LinkedIn® Groups
- Conferences/Seminars – FET, WGWA, AWMA, AEHS
- Recent Publications
  - WDNR RR-986: Sub-Slab Vapor Sampling (July 2014)
  - ITRC PVI-1: Petroleum Vapor Intrusion (October 2014)
Questions?

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