

Vapor Intrusion Updates

VAP CP Training
October 7, 2013

US EPA Draft Vapor Intrusion Guidance



OSWER Draft VI Guidance

- EPA External Review Draft – April 2013
 - *Applicable to any site pursuant to CERCLA or RCRA, EPA's brownfield grantees, or state agencies with delegated authority*
- Addresses risk management or exposure mitigation methods exclusively for indoor air from subsurface sources



Improvements from 2002 (office of inspector general recommendations)

- Multiple lines of evidence approach
- Updated toxicity values/VISL calculator
- Petroleum hydrocarbons are different!
- Preemptive mitigation
- O&M guidance and termination of mitigation systems, use of institutional controls
- Applicability to superfund five year reviews



Additional Documents

- VISL calculator
- VI supplemental guidance to the five-year review guidance
- Technical Support Documents
 - Background values
 - Attenuation factor data base
 - Conceptual site model scenarios
 - Sampling and analysis methods**
 - Mitigation systems



Major Changes

- List of COCs
 - COCs without inhalation toxicity are excluded from VISL
 - Meets the criteria of “vapor-forming”
 - $MW < 200 \text{ g/mol}$; vapor pressure $> 1 \text{ mm Hg}$, or $HLC > 10E-05 \text{ atm-m}^3/\text{mol}$
 - pure component vapor concentration exceeds the indoor air target risk level if the vapor source is in soil. For ground water, the saturated vapor concentration must exceed the target indoor air risk level.



Major Changes

- Considerations for non-residential buildings and exposure scenarios
- Emphasis on soil gas survey
- Modeling is being eliminated as an exit ramp
- “EPA does not recommend modeling as the only line of evidence to screen out a site” – Guidance sets some strict boundaries on the use of J&E.



Attenuation Factors – for risk-based screening

- GW – $1E-03$ (1,000 times) – *no change*
- GW - $5E-04$ (2,000 times) – *new specific value for fine-grained vadose zone soils (laterally extensive)*
- Sub-slab - $3E-02$ (33 times) – *was .1 (10 times)*
- Near source exterior soil gas - $3E-02$ (33 times)
- *was .01 (100 times) for “deep” soil gas*
- Crawl space- 1.0 - *no change*

VISL

- User enters the scenario, risk information, and select chemicals - VISL calculates target values for groundwater, soil gas, and indoor air. The tool calculates target values for cancer risk (including mutagenic-mode-of-action) and noncancer hazard. It is designed to correctly handle chemicals such as trichloroethylene (which has cancer risk from both the standard and mutagenic modes of action), and vinyl chloride (which uses a special cancer risk equation).



VISL

- Uses RSL Database – watch for updates
- Not particularly intuitive at first
- Navigation guide is part of the workbook.
- Unlock screen – visl (lower case)
- Forward risk calculators for GW, Soil Gas, Indoor Air (enter concentrations)
- GW temperature correction!



Caution!

- Recommended attenuation factor not on the VISL!

Generic Attenuation Factors:

Source Medium of Vapors

Groundwater

Symbol

AFgw_R

Value

0.001

Sub-Slab and Exterior Soil Gas

AFss_R

0.1



Mitigation Strategies

- Sub slab depressurization
- Ventilation
- Vapor Barriers
- Evaluate Effectiveness
 - Visual inspections
 - Fan operation
 - Pressure differential – across the slab/quarterly
 - Indoor air sampling



Petroleum Sites

- US EPA Office of Underground Storage Tanks (*OUST*) – Guidance for Addressing Petroleum Vapor Intrusion At Leaking Underground Storage Sites. April 2013
- Recognize biodegradation potential of hydrocarbon sites
- Use VI guidance for petroleum release sites mixed with CERCLA/RCRA CHC release



Petroleum Hydrocarbons (PHC)

Biodegrade readily
under aerobic conditions

Degradation usually produces CO_2 ,
 H_2O , and sometimes CH_4 and
other simple hydrocarbons

LNAPL – less dense than
water, floats on groundwater
surface

Chlorinated Solvents

Biodegrade much more slowly
under anaerobic conditions

Degradation can produce toxic
degradation products

DNAPL – more dense than
water, sinks to the bottom of
the aquifer

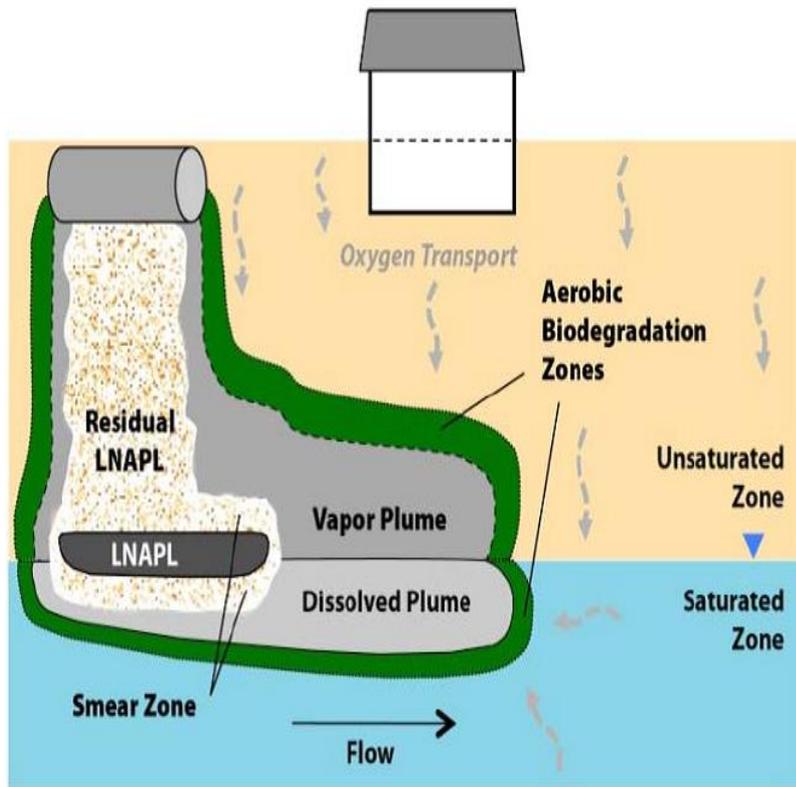


Figure 1. Typical petroleum hydrocarbon transport conceptual scenario

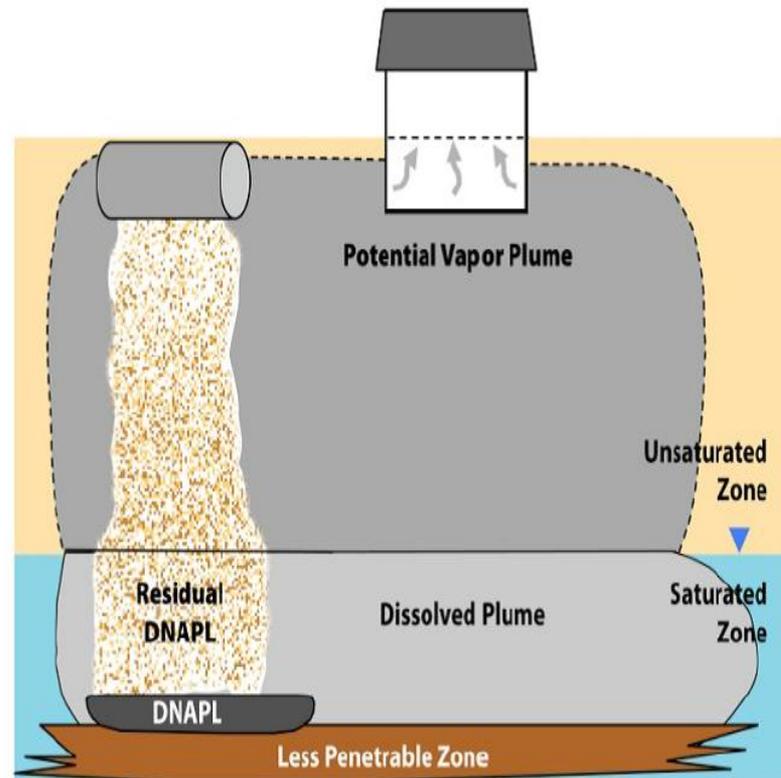


Figure 2. Typical chlorinated solvent transport conceptual scenario

Table 3 Required Vertical Separation Distance Between Contamination And Building Foundation, Basement, Or Slab.

Media	Benzene	TPH	Vertical Separation Distance (feet)*
Soil (mg/kg)	≤10	≤250	6
	>10 (LNAPL)	>250 (LNAPL)	15**
Groundwater (ug/L)	≤ 5,000	≤30,000	6
	>5,000 (LNAPL)	>30,000 (LNAPL)	15**

The thresholds for LNAPL indicated in this table are indirect evidence of the presence of LNAPL. These thresholds may vary depending on site-specific conditions (e.g., soil type, LNAPL source). Investigators may have different experiences with LNAPL indicators and may use them as appropriate. Direct indicators of LNAPL also apply; these include measurable accumulations of free product, oily sheens, and saturated bulk soil samples.

*Vertical separation distance represents the thickness of clean (TPH ≤ 100 mg/kg), biologically active soil between the source of PHC vapors (LNAPL, residual LNAPL, or dissolved PHCs) and the lowest (deepest) point of a receptor (building foundation, basement, or slab).

** EPA recommends that sub-slab monitoring be used to evaluate the risk of vapor intrusion whenever LNAPL is present in any sample and the vertical separation distance is less than 15 feet. When LNAPL is

Peer Review Comments - CHC

- More sites with VOCs will likely be “screened in” – no easy exit ramp (except mitigation)
- Does not answer OSHA level issues for certain facilities
- Non-cancer TCE can be near background values
- More guidance on the multiple lines of evidence approach
- Concern about O&M obligations
- Develop attenuation factors for commercial properties



Peer Review Comments - PVI

- Reference back to VI guidance from PVI guidance
- “same attenuation factors” make PVI assessment overly conservative
- Should apply to all petroleum releases, not just UST systems



Links

- <http://www.epa.gov/oswer/vaporintrusion/documents/vaporIntrusion-final-guidance-20130411-reviewdraft.pdf>
- <http://www.regulations.gov/#!docketDetail;D=EPA-HQ-RCRA-2002-0033>

