Environmental Law Institute

Soil Vapor Intrusion

September 6, 2012

Mark Distler – *O'Brien & Gere*

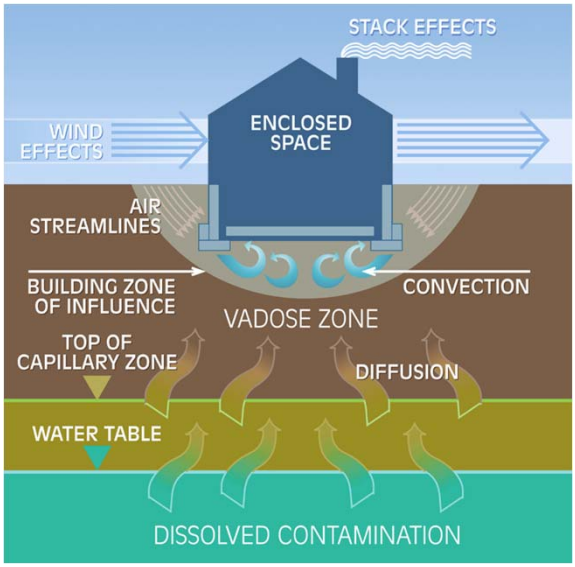
O'BRIEN & GERE

Topics

- Vapor Intrusion Overview
- Typical Vapor Intrusion Investigations
- Indoor Air Screening Levels & Background
- Federal Guidance & Tools

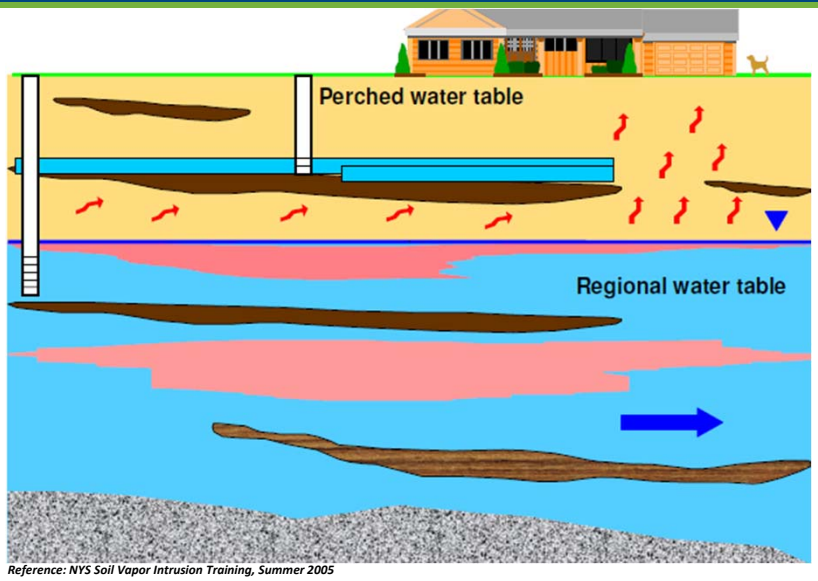
Vaprōtect®
360° VI RESOURCE

What is Vapor Intrusion?



O'BRIEN & GERE

How Does It Happen?



Reference: NYS Soil Vapor Intrusion Training, Summer 2005

O'BRIEN & GERE

Typical VI Investigation

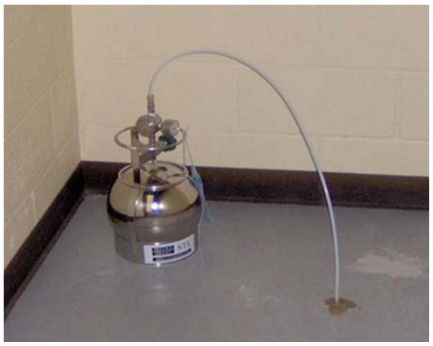
- Site conceptual model
  - Sources of soil vapor
  - Subsurface utility corridors
  - Co-mingled plumes
  - Background soil vapor (vapor extrusion, vehicles)

Analyte	Median	75th	90th	95th
Benzene	2.2	9.6	29	91
Toluene	12	54	110	420
Ethylbenzene	1.6	8.8	25	61
m,p-Xylene	4.7	22	65	240
o-Xylene	1.8	8.1	25	65
1,2,3-trimethylbenzene	0.4	1.3	2.4	4.9
1,2,4-trimethylbenzene	1.9	8.3	39	88
1,3,5-trimethylbenzene	0.8	1.9	10	26
Naphthalene	0.6	1.4	7.4	16

Source: *EEANY MGP Database*

Typical VI Investigation (cont'd)

- Proceed directly to mitigation OR
- Investigation
  - Soil vapor at property boundary and/or near building
  - Sub-slab vapor
  - Indoor air (chemical inventory)

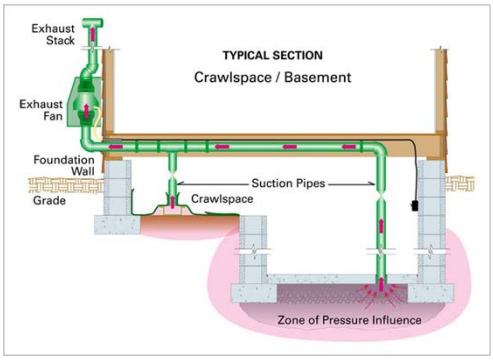


Typical VI Investigation (cont'd)

- Evaluate results
  - Compare to background levels
    - Indoor air sources
      - Household products
      - Building materials
      - Chemical handling / storage
    - Outdoor air sources
  - Compare to risk-based criteria
    - State guideline values
    - USEPA regional screening levels
      http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm
    - OSHA PELs not applicable
    - Site-specific HHRA

Typical VI Investigation (cont'd)

- Select follow-on action
  - Mitigate
  - Monitor
  - NFA
  - Remove indoor source
  - Re-sample
  - Routine slab inspections
- Post mitigation
  - Indoor air sampling
  - Routine inspections
  - Repairs
  - Electrical reimbursement



Example Indoor Air Screening Levels for TCE

Agency	Residential	Non-Residential
AGCIH	N/A	269,000
OSHA	N/A	537,000
New York	5	5
Colorado	1.6	1.6
Michigan	2.1	8.8
California	1.2	2.0
Connecticut	1.0	1.0
New Jersey	3	3
Pennsylvania	12	48
EPA Region III (RSL)[a]	0.43 (10^{-6})	3.0 (10^{-6})
Units: ($\mu g/m^3$)		

[a] Most state guidance levels predate EPA-NCEA toxicity assessment in September 2011.

Background Indoor Air Levels for TCE

Reference	75th or 90th Percentile	Maximum
TEAM (NJ) [1]	5.4 – 12	350
TEAM (CA) [1]	2.1 – 2.5	50
NHEXAS [1]	< 1.8 – 2.3	24-720
EXPOLIS (Int't.) [1]	0.9 – 29	41
NYSDOH ('97-'03) [2]	< 0.25	
NYSDOH ('89-'96) [2]	< 2.7	
EPA June 2011[3]	<RL-2.1	
[1] NJDEP, VI Guidance, June 2005 (range of 90th percentiles)		
[2] NYSDOH, VI Guidance, October 2006 (75th percentiles)		
[3] EPA 530-R-10-001 (range of 90th percentiles)		
Units: ($\mu g/m^3$)		

Federal Indoor Air Screening Levels

- Changes in Indoor Air Screening Levels Due to New EPA Toxicity Assessment (IRIS)

	Exposure Scenario	Previous Regional Screening Levels [RSLs] ($\mu g/m^3$)	New RSLs (April 2012) ($\mu g/m^3$)
PCE	Residential Exposure (Lifetime Cancer Risk = 10^{-6})	0.41	9.4
	Residential Exposure (Hazard Quotient = 1)	270	42
	Industrial Exposure (Lifetime Cancer Risk = 10^{-6})	2.1	47
	Industrial Exposure (Hazard Quotient = 1)	1,134	180
TCE	Residential Exposure (Lifetime Cancer Risk = 10^{-6})	1.2	0.43
	Residential Exposure (Hazard Quotient = 1)	10	2.1
	Industrial Exposure (Lifetime Cancer Risk = 10^{-6})	6.1	3.0
	Industrial Exposure (Hazard Quotient = 1)	44	8.8

Federal Guidance and Tools

- USEPA 2002 – OSWER Draft Guidance
  http://www.epa.gov/wastes/hazard/correctiveaction/eis/vapor/complete.pdf
  - Designed for RCRA, CERCLA, etc (not UST sites)
  - Screening tool
- OIG 2009
  http://www.epa.gov/oswer/vaporintrusion/documents/review_of_2002_draft_vi_guidance_final.pdf
  - Call for updated and final OSWER guidance
  - Finalize toxicity values for PCE and TCE in IRIS
- USEPA 2010 to present – wave of resources
  http://www.epa.gov/oswer/vaporintrusion/
  - Background Indoor Air Levels EPA 530-R-10-001
  - VI Database (attenuation factors, spatial, and temporal variability)
  - Mitigation approaches
  - VISL calculator
  - Superfund FAQs
    http://www.epa.gov/superfund/sites/npl/Vapor_Intrusion_FAQs_Feb2012.pdf

Other Guidance

- ITRC Jan 2007 http://www.itrcweb.org/Documents/VI-1.pdf
- ASTM Standard Practices
  - E2121-11 (mitigation)
  - D7648-12 (soil gas sampling / probe installation)
  - D7663-11 (sub-slab / near slab soil gas sampling)
  - E2600-10 (vapor encroachment screening / real estate transactions)
- DOD Jan 2009
  http://www.environmental.usace.mil/docs/DoD%20VI%20Handbook%20Final%20Jan%2009.pdf?sys page=Documents&id=129239