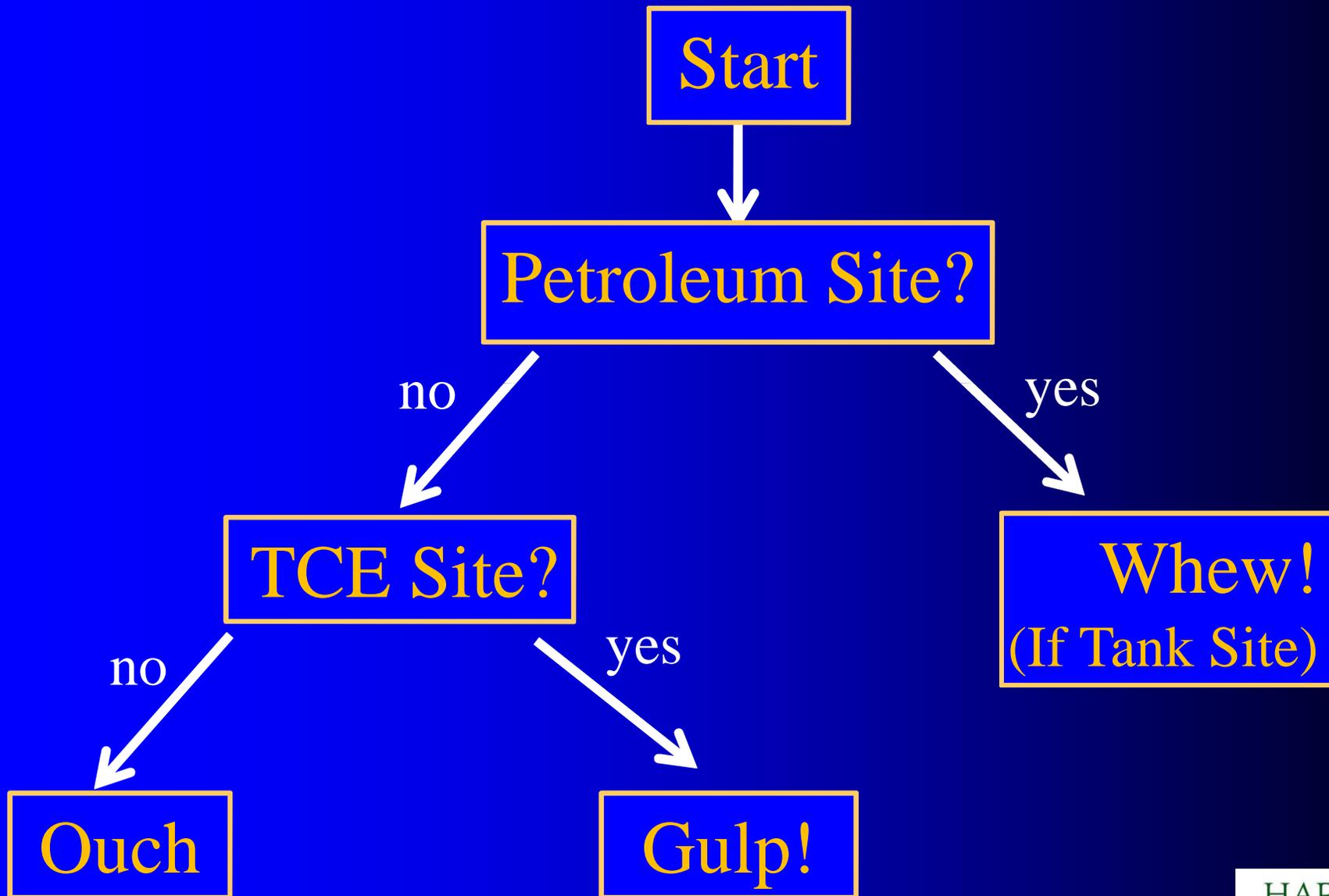


The VI World According to Hartman



EPA Guidance Updates

(Release Date: 2014?)

- EPA (OSWER & Superfund)
 - Multiple lines of evidence (i.e., more time & expense)
 - Preference for soil gas near source (bad for HCs!)
 - Longer indoor air sampling period (7 to 21 days)
 - Fixed Att factor of 0.03 for shallow SG (~15x drop)
 - Sub-slab Att factor 0.03 (3.3x increase)
 - Modeling no longer an exit

Comment Period Ended 6/24/13

<http://www.epa.gov/oswer/vaporintrusion>

Allowable Benzene in GW

1e-6 cancer risk level

- New OSWER Guidance:

$$0.31 \text{ ug/m}^3 / 0.001 = 0.31 \text{ ug/L} / 0.2 = 1.5 \text{ ug/L}$$

- EPA-OUST Exclusion Value: 5000 ug/L

OSWER ~3300 times lower than OUST!!

Current OUST Guidance Sends you to OSWER
For Screening Levels!!

New TCE Standard

(As of October 2011)

- Residential (1e-6 cancer risk)
 - Indoor Air cancer: 0.43 ug/m³ (down from 1.2 ug/m³)
 - Indoor Air non-cancer: 2.1 ug/m³ **Short-Term Exposure?**
- Commercial/Industrial (1e-6 cancer risk)
 - Indoor Air: 3.0 ug/m³ (down from 6.1 ug/m³)
 - Indoor Air non-cancer: 8.8 ug/m³
 - **But if Pregnant employees, then 2.1 ug/m³ could apply**

New PCE Standard (As of March 2012)

- Residential (1e-6)
 - Indoor Air cancer: 9.4 ug/m³ (up from 0.41 ~22x !!)
 - Indoor Air non-cancer: ~47 ug/m³
- Industrial (1e-6)
 - Indoor Air: ~47 ug/m³ (up 22x)
 - Indoor Air non-cancer: 175 ug/m³

CA-EPA Ignored new PCE Standard

CA Agencies

- CA-DTSC/OEHHA/Water Boards
 - New VI Guidance (10/2011) & Soil Gas Advisory (4/2012)
 - Finally adopted RAGS Part F in May 2013!
 - Means that commercial CHSLs no longer correct
- EPA Region 9
 - Adopted Higher Value for PCE
- SF-RWQCB
 - ESLs updated in February 2013
- SWQCB
 - Low Threat Closure Policy – **How to Handle TPH Sites?**

DTSC VI Guidance Changes

- Preference for Sub-slab Samples for Cl-VOCs
- Collect Exterior SG Samples At Source
- Repeated Sampling of Soil Gas
- Raising Sub-slab AF to 0.05 (5x stricter)
- Can now measure permeability, diffusivity and radon for attenuation factor

Defers to LUFT Manual for Petroleum HCs (p.38)

Soil Gas Allowed Levels

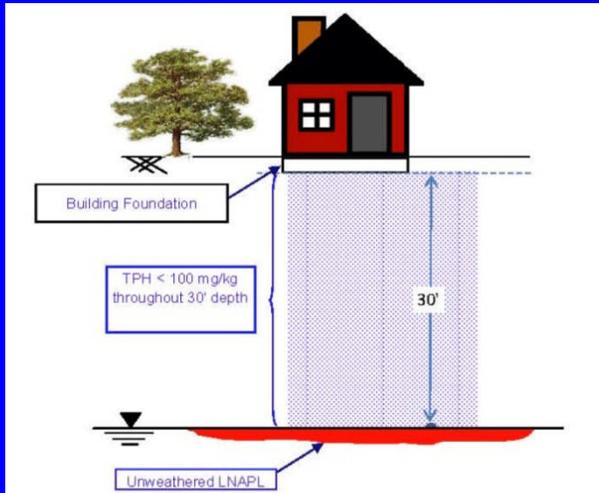
PCE in Soil Gas, Residential Receptor (1e-6 risk)

	RBSL (ug/m ³)
DTSC Sub-slab	8.2
CHHSL	180
DTSC – 5' soil gas	205
EPA Sub-slab proposed	313
EPA R9 – 5' soil gas proposed	313
EPA R9 – 5' soil gas now	4,700

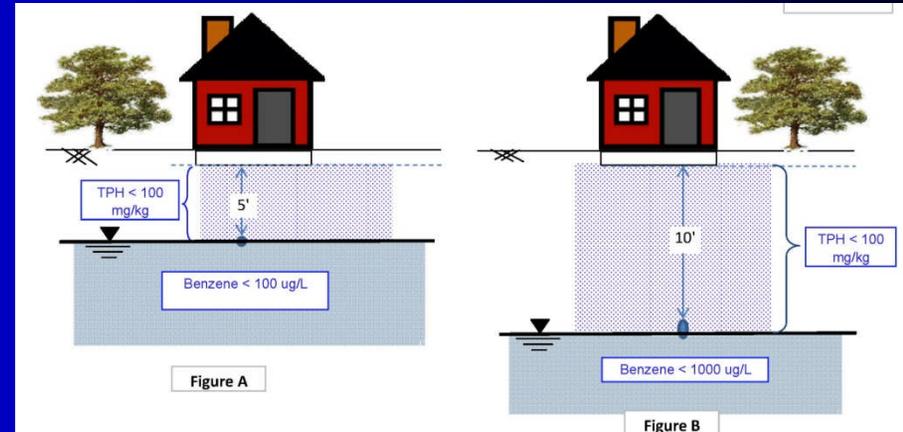
DTSC Soil Gas Advisory Changes

- Sampling
 - Purge volumes: include dry bentonite
 - Equilibration times: 2 hours for tubes, ? for probes
 - Leak check specifications: report at VOC RL
- Analysis
 - Methods 8021, 8260, TO-14, TO-15, TO-17 ok
 - Naphthalene preferred by TO-17
 - Syringes & tedlar bags ok to use (in lieu of canisters)

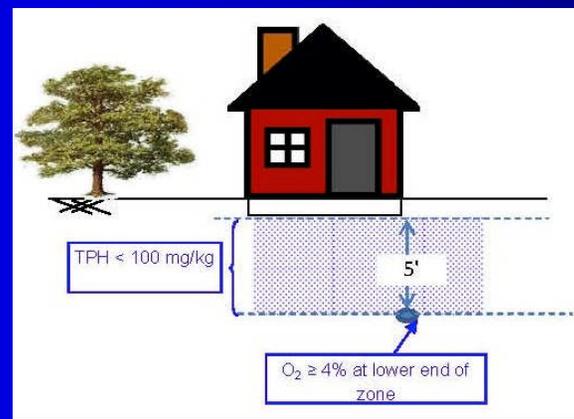
Low Threat Closure Policy VI Scenarios



LNAPL: 30'



Dissolved: 5' or 10'



Dissolved with O₂

Low-Threat Closure Policy

Site Screens Out from VI Pathway if:

- If 30' of Biozone, NAPL screens out
 - Vertically & horizontally
- If 10' of Biozone, benzene up to 1000 ug/L
- If 5' of Biozone, benzene up to 100 ug/L

Bioattenuation zone: TPH-soil < 100 mg/kg

Note: O₂ not Required

Low-Threat Closure Policy

The Power of Oxygen

If oxygen in soil gas >4%:

- Separation distance drops from 10' to 5' for benzene up to 1,000 ug/L
- Soil gas SLs increase by 1000x!

TPH-soil required for all scenarios but O₂ not

Low-Threat Policy: A VI Pathway Game Changer

- Active Service Stations Excluded
- Sampling
 - Soil phase TPH needed from two depths
 - O₂ in soil gas
- Soil Gas VOC Analysis
 - Needed at all?
 - Benzene, ethylbenzene & naphthalene only
 - No longer worry about TPH??

VI Assessments Much Simpler & Less Expensive

Soil Gas Allowed Levels

Benzene in Soil Gas, Residential Receptor, 1-6 Risk

	RBSL (ug/m ³)
DTSC Sub-slab	1.6
CHHSL	37
DTSC – Step 5	42
CA Low-Risk Policy: O ₂ <4%	85
CA Low-Risk Policy: O ₂ >4%	85,000

Ambient levels: 1 to 10 ug/m³