TestAmerica

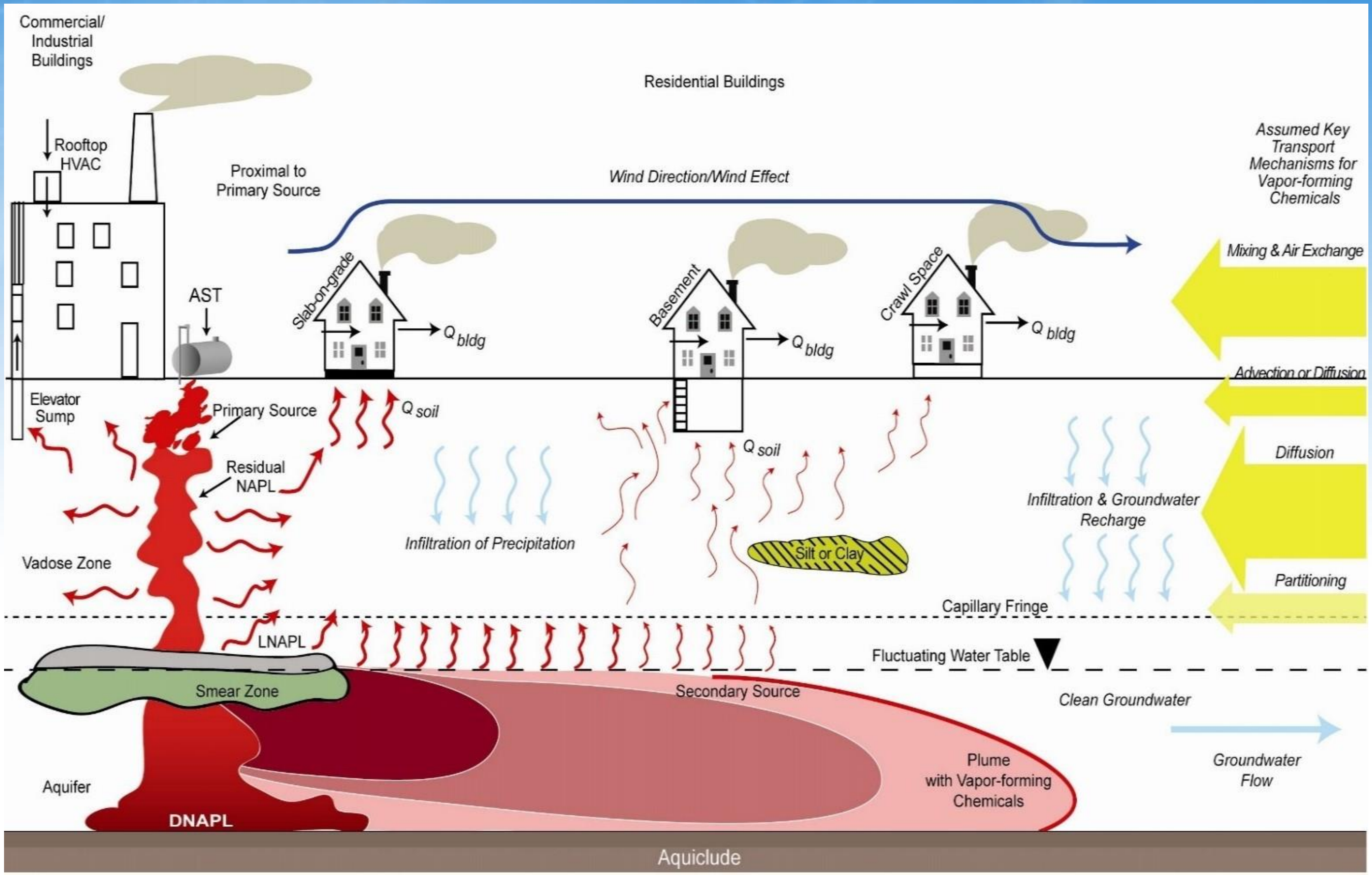
THE LEADER IN ENVIRONMENTAL TESTING

Vapor Intrusion: Improving Data Quality Using Today's Guidance and Best Practices

Taryn McKnight – Client Relations Manager

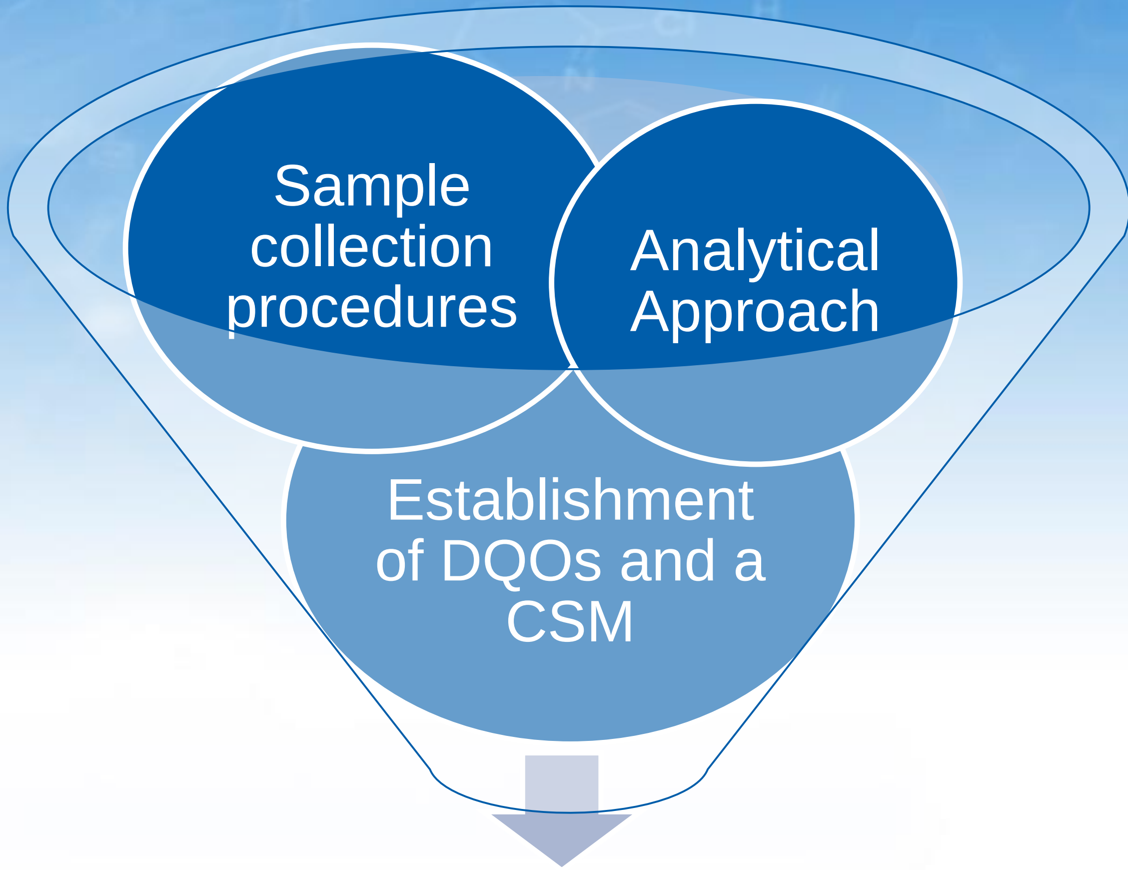
Volatile chemicals from the subsurface intrude into overlying buildings.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING



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

Quality Inputs



Vapor Intrusion Assessment

Risk or No Risk?

Final VI Guidance

OSWER Publication 9200.2-154

OSWER TECHNICAL GUIDE FOR ASSESSING AND MITIGATING THE VAPOR INTRUSION PATHWAY FROM SUBSURFACE VAPOR SOURCES TO INDOOR AIR

FINALLY!

U.S. Environmental Protection Agency

Office of Solid Waste and Emergency Response

June 2015

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

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TABLE 1-2
DIRECTORY TO ADDITIONAL UPDATES IN THIS TECHNICAL GUIDE PUBLICLY IDENTIFIED BY OSWER (EPA 2010B)

Topics to Be Updated, Including References to the Draft VI Guidance	Location Within This Technical Guide
Observational data since 2002 indicates that the "single line of evidence" approach with site-estimated attenuation factors is generally not appropriate for external soil gas samples.	Section 6.4.4 and Appendix A
Experiences since 2002 illustrate the value of collecting indoor air samples earlier in the investigations. The "indoor air last" approach has been updated, which will allow more flexibility in the sequencing of subsurface and interior/indoor sample collection.	Sections 6.3.4 and 6.3.6
The portions addressing background contamination have been updated. EPA also updated with more specific methodologies for evaluating and/or decision-making and managing background contamination.	Sections 6.3.5, 7.4 and 7.6
The portion of this Technical Guide focusing on testing indoor air has been updated to allow more flexibility in the duration of sampling to take advantage of other sampling durations and methods.	Section 6.4.1
The Draft VI Guidance allows site-specific decisions to be made based on indoor air concentrations in a relatively few representative buildings. This portion of this Technical Guide has been updated to increase the confidence that the approach fully addresses building-by-building variability.	Sections 6.2.2 and 7.8

Page 15, Table 1-2
Note important updates to Indoor Air Testing

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

Key Recommendation Highlights

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Limit analyses to chemicals of concern

- Section 6.4

Assess the VI pathway using multiple lines of evidence

- Sections 6.3, 7.1 & 7.2

Generally support the decision to collect indoor air data

- Section 6.3.4 & 6.4.1

Consider collecting multiple rounds of indoor air samples

- Section 7.4

Document objectives and methods in a VI workplan

- Section 6.2

Conceptual Site Model (CSM) & Data Quality Objectives (DQOs)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Section 2.0
The CSM will help guide the DQOs

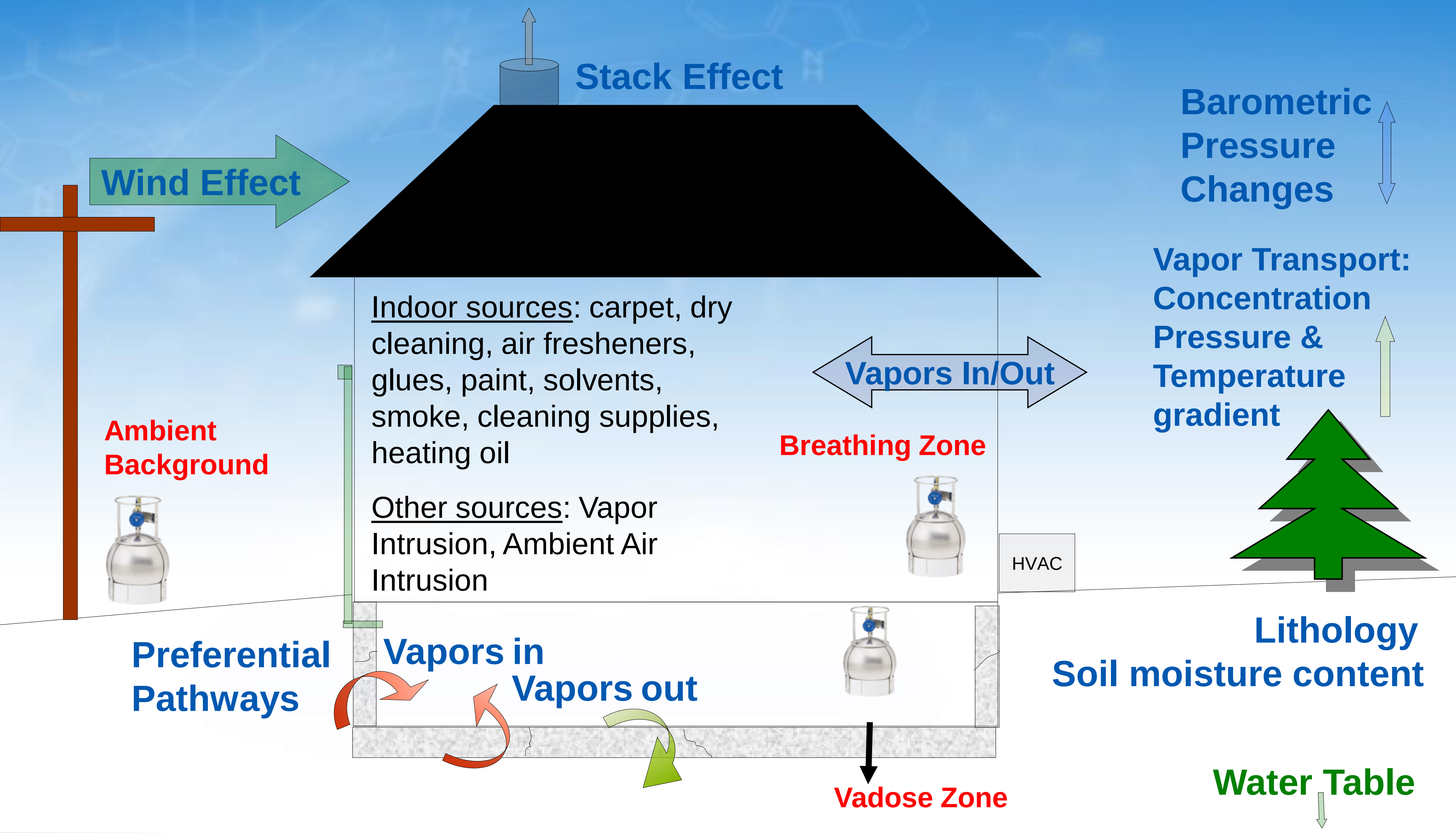
Considerations:

- Site conditions & historical data
- Compounds of concern & anticipated concentrations
- Screening levels
- Sampling protocols

Involve the lab early on

“A CSM integrates all lines of site-specific evidence into a three dimensional conceptualization of site conditions…” Section 2.0

Vapor Intrusion: Impacts to Data



Multiple Lines of Evidence

	Chemistry	Geology	Hydrology	Weather	Building	Biology
Vapor Intrusion More Likely	High Source Conc., Highly Volatile and Toxic Compounds	Vertically Fractured Media, Coarse-Grained, Uniform Stratigraphy	Low Moisture Content, Shallow Water Table, Large Water Table Fluctuations	Heating Season, Falling Barometric Pressure, Heavy Rains, Strong Winds	Cracked Slab, Sumps, Partial Slabs, Low Air Exchange Rate, Tall Buildings in Cold Climates	Non-Degradable compounds or Degradable PHCs and Anoxic Conditions
Vapor Intrusion Less Likely	Low Source Conc., Less Volatile and Toxic Compounds	Horizontal and Laterally Extensive Fine-Grained Layers with High Moisture Content	Thick Capillary Fringe, Deep Water Table, High Moisture Content	Increasing Barometric Pressure, Minimal Wind, Moderate Temperature	HVAC System with Positive Pressure, High Air Exchange Rate, Intact Slab	Degradable PHCs and Oxygen-Rich Conditions

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

Indoor Air Sampling

Pros

- Actual concentration, no attenuation
- Relatively quick, no drilling
- Less spatial variability

Section 6.4.1
“A potential shortcoming of indoor air is background”

Cons

- Working with the “Homeowner”
- Access agreements
- Removal of interior sources
- ***<u>Contribution from unknown indoor sources</u>***

Per EPA: Collect indoor samples and compare with controls: sub slab, ambient, lines of sight evidence

Indoor Air: Active or Passive

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Active Sampling Considerations

- CoCs
- Screening Levels
- Litigious site?

Passive Sampling Considerations

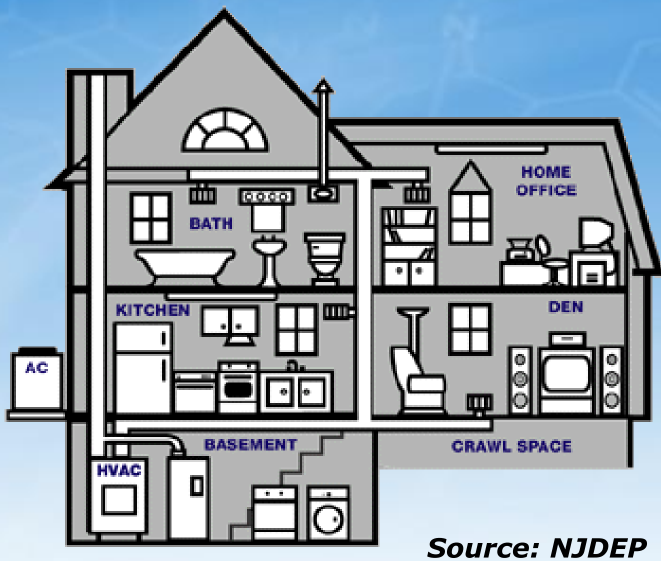
- Desire for long term monitoring
- Environmental conditions
- Target analyte list and RLs

Per EPA - Collect indoor samples and compare with controls:

- Sub slab, ambient, lines of sight and building evidence
- Passive samplers "*their use may grow…*"

Section 6.4.1
"A potential shortcoming of indoor air is background"

Background Contamination



Source: NJDEP

- Consumer Activities
- Household Products
- Building Materials
- Outdoor Air

Section 6.3.5
Identify & Evaluate Contributions from Indoor & Ambient Sources

Common Household Contaminants

Acetone	Formaldehyde
Benzene	n-Heptane
Bromomethane	n- Hexane
2-Butanone (MEK)	Methylene chloride
Chlorobenzene	Methyl isobutyl ketone
Chloroethane	Methyl tert butyl ether
Chloroform	Styrene
Cyclohexane	1,1,2,2-Tetrachloroethane
1,4-Dichlorobenzene	Tetrachloroethene (PCE)
Dichlorodifluoromethane	Toluene
1,1-Dichloroethane	1,1,1-Trichloroethane
1,3-Dichloropropene	Trichloroethene (TCE)
Ethylbenzene	Xylenes, total

http://www.state.nj.us/dep/srp/guidance/vaporintrusion/

Sub Slab Sampling

Pros

- Resolve indoor sources
- Assess if VI pathway is complete
- Use to assess potential VI risk

Cons

- Method is intrusive, drilling
- Access agreements
- ***Substantial spatial variability under the slab***

Section 6.4.3
"There may be substantial spatial variability in sub-slab soil gas"

Per EPA: Collect multiple samples to address spatial variability and multiple rounds to address temporal variability

Soil Gas Sampling

Pros

- Provides an estimate of vapor concentrations
- Can be performed without entering the structure

Cons

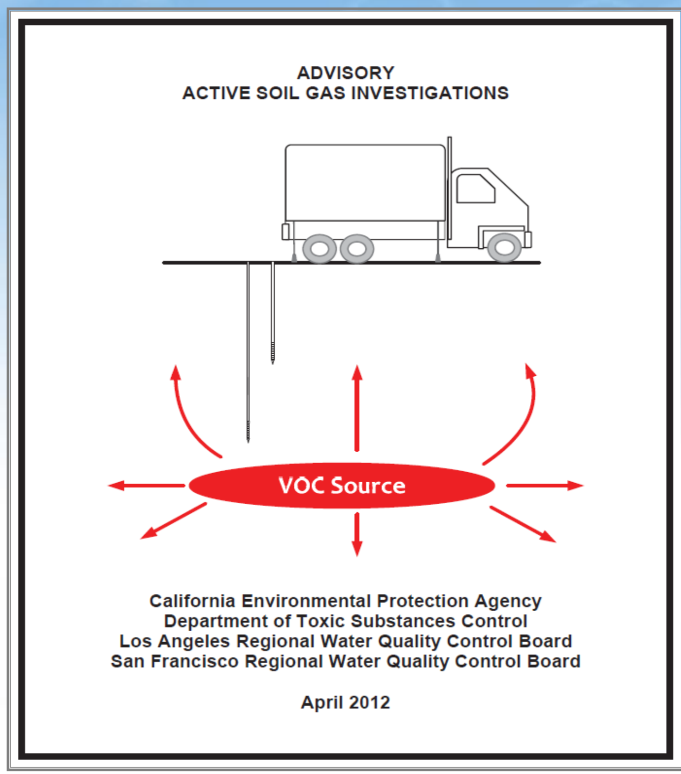
- Significant spatial variability
- May not be representative of vapor concentrations under buildings

Section 6.4.4 “individual exterior soil gas samples cannot generally be expected to accurately estimate sub-slab or indoor air concentrations”

Per EPA: “Several rounds of sampling are generally recommended, particularly…”

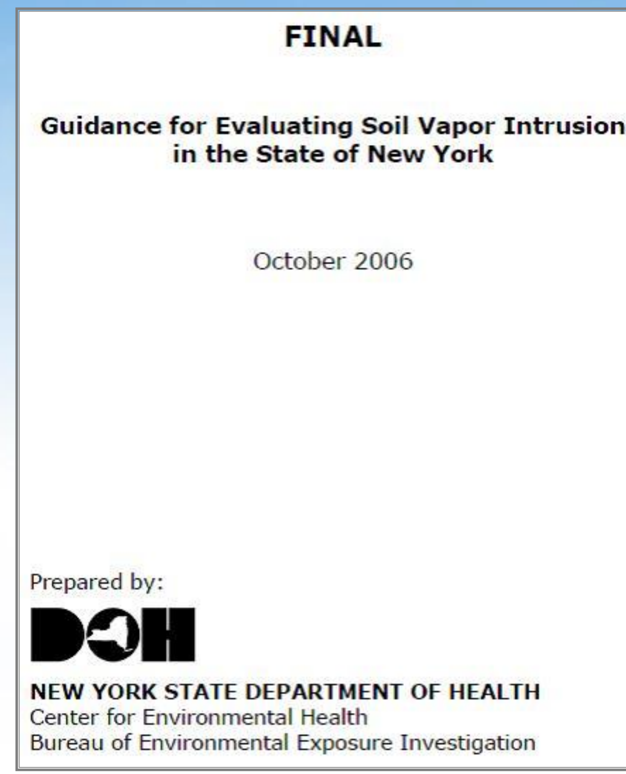
Modified from: Rick Ehrhart, RCRA Corrective Action, EPA Region 6

Soil Gas/Sub Slab Sampling Guidance


ADVISORY
ACTIVE SOIL GAS INVESTIGATIONS

California Environmental Protection Agency
Department of Toxic Substances Control
Los Angeles Regional Water Quality Control Board
San Francisco Regional Water Quality Control Board

April 2012


FINAL

Guidance for Evaluating Soil Vapor Intrusion in the State of New York

October 2006

Prepared by:

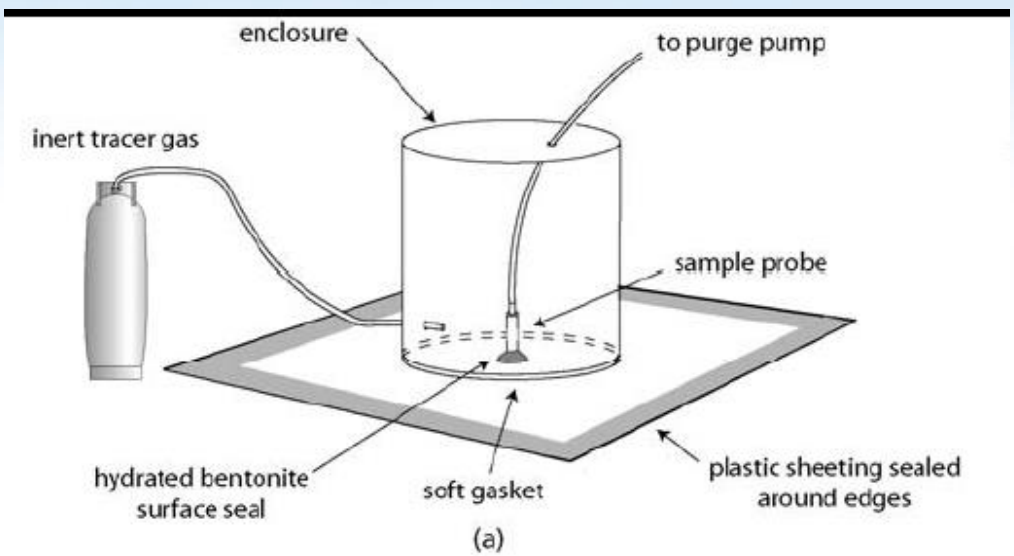
NEW YORK STATE DEPARTMENT OF HEALTH
Center for Environmental Health
Bureau of Environmental Exposure Investigation

http://www.dtsc.ca.gov/SiteCleanup/upload/VI_ActiveSoilGasAdvisory_FINAL_043012.pdf
https://www.health.ny.gov/environmental/investigations/soil_gas/svi_guidance/docs/svi_main.pdf

Leak Check Considerations

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

- Liquid (qualitative) or Vapor (quantitative)
- Shroud
- Field or Laboratory analysis
- Reporting limit requirements
- Estimated values exceed the calibration range



Section 6.4.4 “a reliable seal of the annulus between the probe and the probe housing and leak testing for the seal are generally recommended”

https://www.health.ny.gov/environmental/investigations/soil_gas/

Field Quality Control Samples

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Field Duplicates

Requires the use of a "T-fitting" or "Co-locator"

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Media Certification and Management

Segregated for cleaning

- Low level (ambient & indoor)
- Source level (soil gas)

Certification

- Batch or individual
- Leak check

Gauges

- Initial & final vacuum ranges

EPA Indoor Air Screening Levels

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Regional Screening Level (RSL) Resident Ambient Air Table (TR=1E-6, HQ=0.1) November 2014

= ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; J = New Jersey; O = EPA Office of Water; F = See FAQ; E = Environmental Criteria and
juide Section 5; L = see user guide on lead; M = mutagen; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; * = where: n SL < 100X c SL; ** = where n
= noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 0.1
Analyte	CAS No.	Carcinogenic SL TR=1.0E-6 (ug/m^3)	Noncarcinogenic SL HI=0.1 (µg/m^3)
ALAR	1596-84-5	5.5E-01	
Acephate	30560-19-1		
Acetaldehyde	75-07-0	1.3E+00	9.4E-01
Acetochlor	34256-82-1		
Acetone	67-64-1		3.2E+03
Acetone Cyanohydrin	75-86-5		2.1E-01
Acetonitrile	75-05-8		6.3E+00
Acetophenone	98-86-2		
Acetylaminofluorene, 2-	53-96-3	2.2E-03	
Acrolein	107-02-8		2.1E-03
Acrylamide	79-06-1	1.0E-02	6.3E-01
Acrylic Acid	79-10-7		1.0E-01
Acrylonitrile	107-13-1	4.1E-02	2.1E-01
Adiponitrile	111-69-3		6.3E-01
Alachlor	15972-60-8		
Aldicarb	116-06-3		
Aldicarb Sulfone	1646-88-4		
Aldicarb sulfoxide	1646-87-3		

http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/resair_sl_table_01run_November2014.pdf

Target Analyte Lists - Volatile?

The primary focus of Vapor Intrusion = Volatiles

- Not everyone agrees what constitutes a VOC
  - SVOCs
  - Metals
  - Pesticides/PCBs
- Require sorbent/filter methods TO-13A, TO-10A, 6010

U.S. EPA VISL Calculator

From the new guidance:

6.5.2 EPA developed VISLs for human health protection that are generally recommended, medium-specific, risk-based screening-level concentrations…

These VISLs calculated are based on:

- Current toxicity values (OSWER's EPA 2003).
- Physical-chemical parameters for vapor-forming chemicals
- EPA-recommended approaches for HHRA (EPA 2009c, 2014a)

Methodology

VOCs: TO-15, TO-17

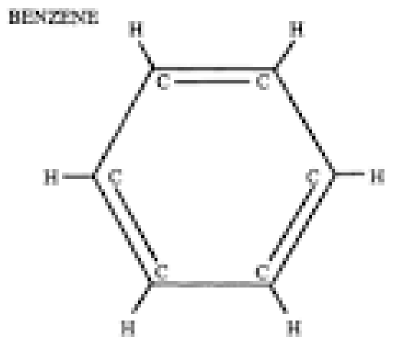
Hydrocarbons: TO-15, TO-3

Fixed Gases: ASTM D-1946

SVOCs: TO-13A, TO-17

Diesel Range: TO-17

Carbon Range Speciation: MA APH



EPA Method TO-15

FAQs:

EPA Method TO-15 was written for the determination of VOCs in ***ambient air*** collected in specially-prepared canisters and analyzed by GC/MS at concentrations ***above 0.5 ppbv***.

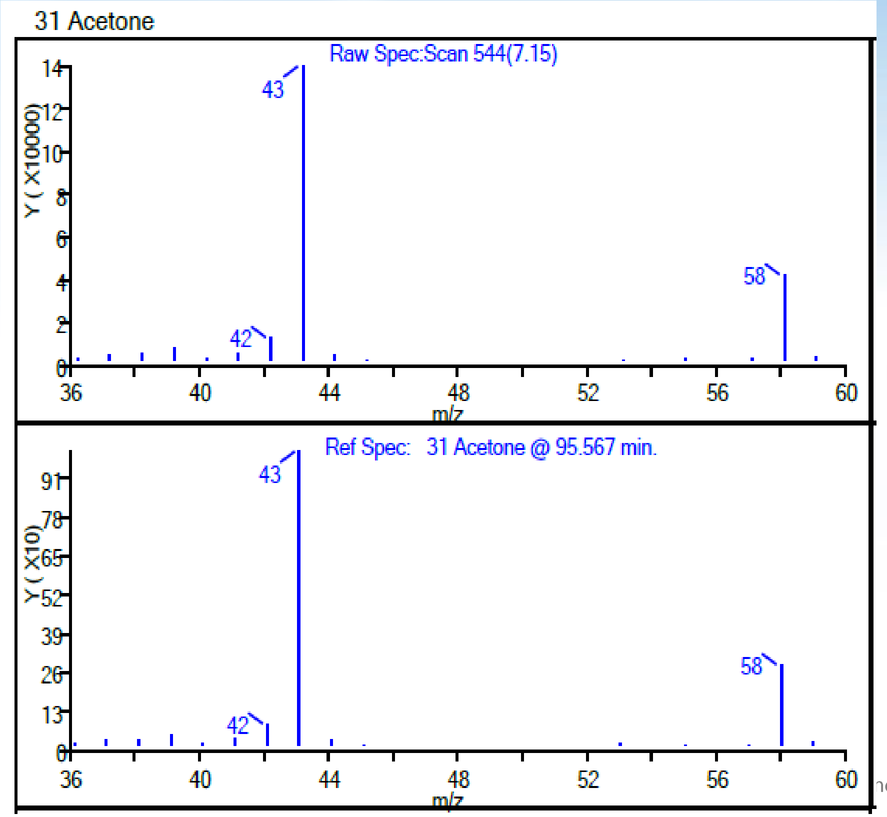
Method TO-15 is appropriately applied to **only a subset of the 97 Title III VOCs**, therefore a standard TO-15 list was not established.

SIM vs. Full Scan

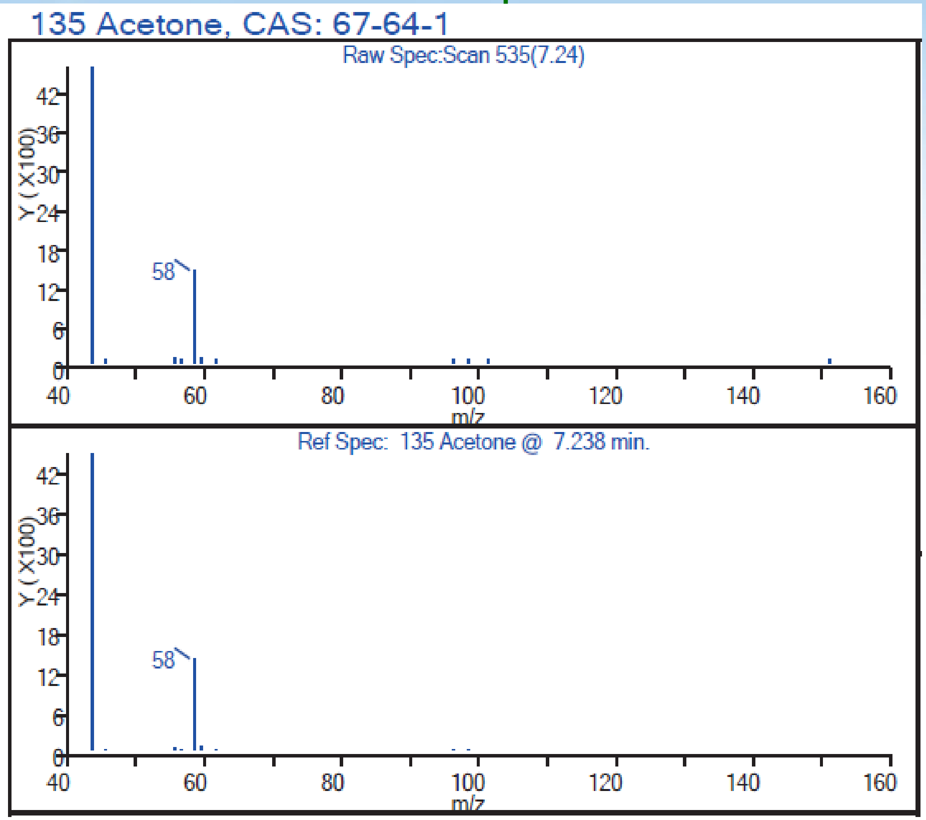
TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

"SIM" Selected Ion Monitoring – the process by which the instrument method is limited to detecting selected ions

Full Scan Spectra



SIM Spectra



TPH Risk

Coming soon… ITRC TPH Risk Guidance

- Effectively incorporate TPH data
- Provide states with consistent methodology

Summary

Do not take samples unless you have some idea of what the data is going to tell you

- Conceptual Site Model
- Multiple Lines of Evidence

Define your data quality objectives up front in a VI workplan

Teamwork with your laboratory up front will ensure less questions when you receive the data

Data quality is a function of the whole process: the project set up, the field sampling protocols, and the analytical protocols

Questions?

Taryn McKnight
taryn.mcknight@testamericainc.com