Interpreting Vapor-Intrusion Data with Radar Plots

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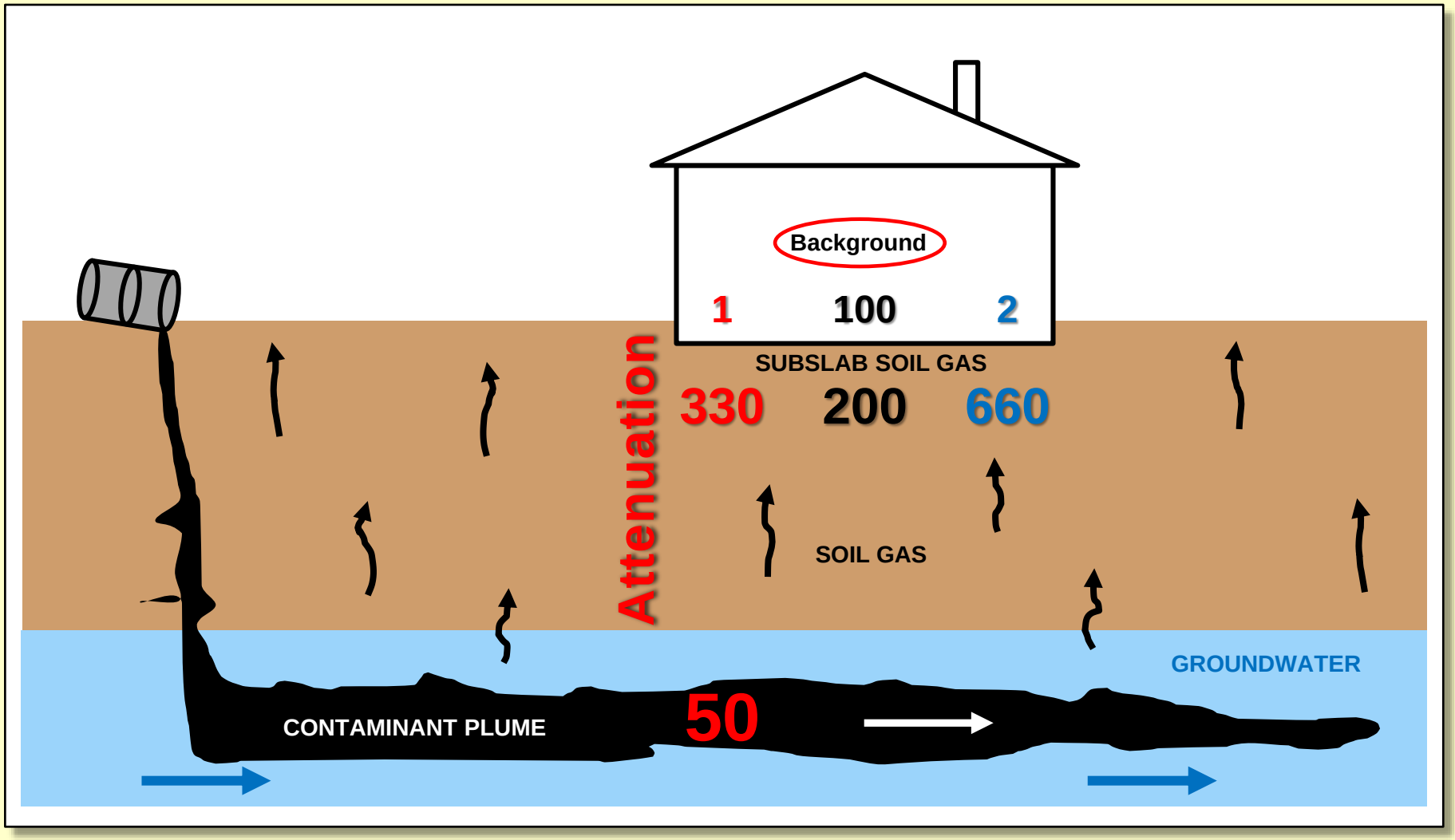
Presented at the Battelle
Fourth International Symposium on Bioremediation
and Sustainable Environmental Technologies

Miami, Florida
May 22-25, 2017

Vapor Intrusion CSM



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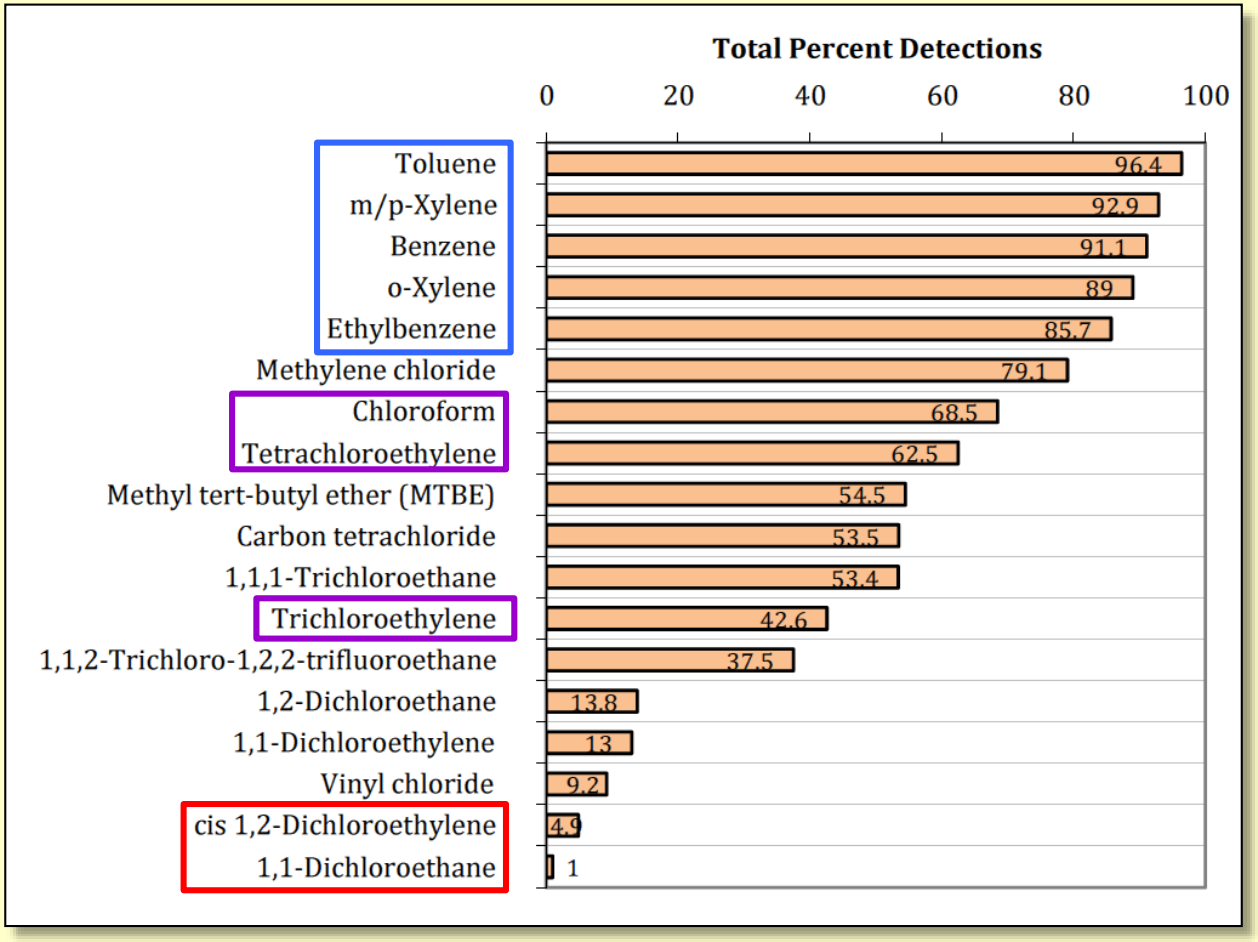
Background VOCs



Ubiquitous In Background

Probably Vapor Intrusion

Figure from USEPA 2011, Background Indoor Air Concentrations, EPA /530/R-10/001

Multiple Lines of Evidence (MLE)

"multiple locations and depth intervals"

"from more than one sampling event"

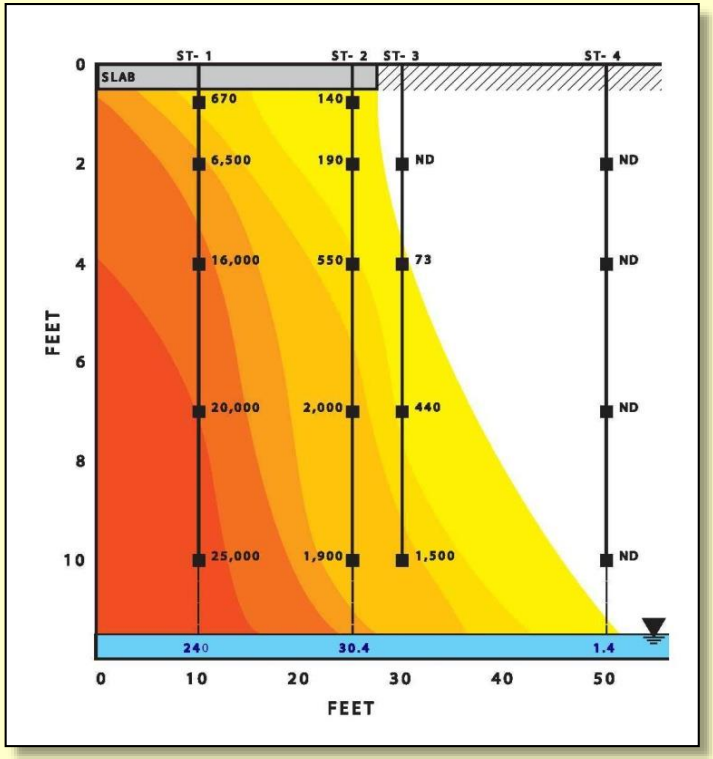


Figure from EPA 600 R09-073, 2009

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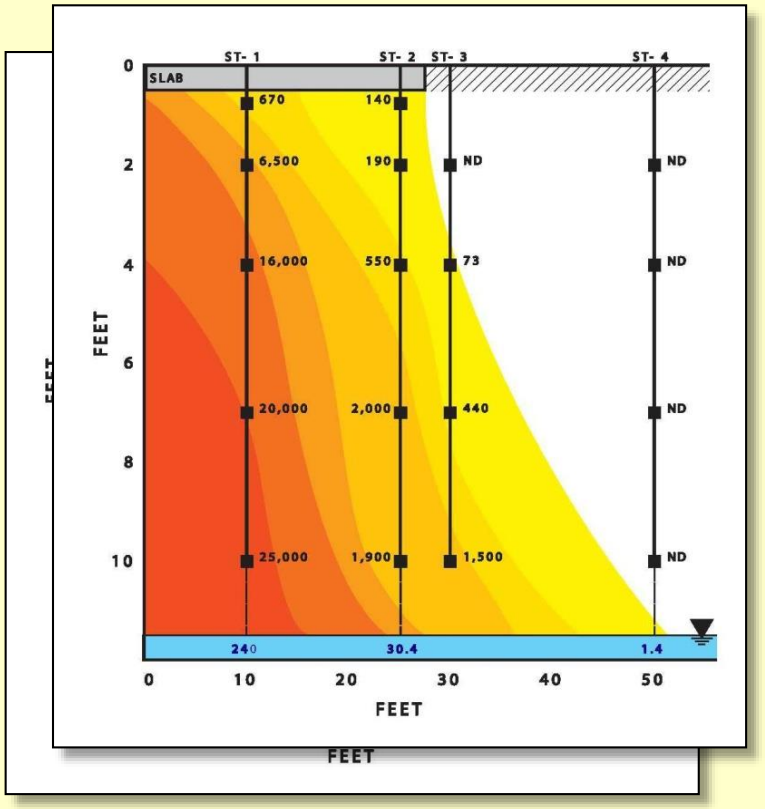

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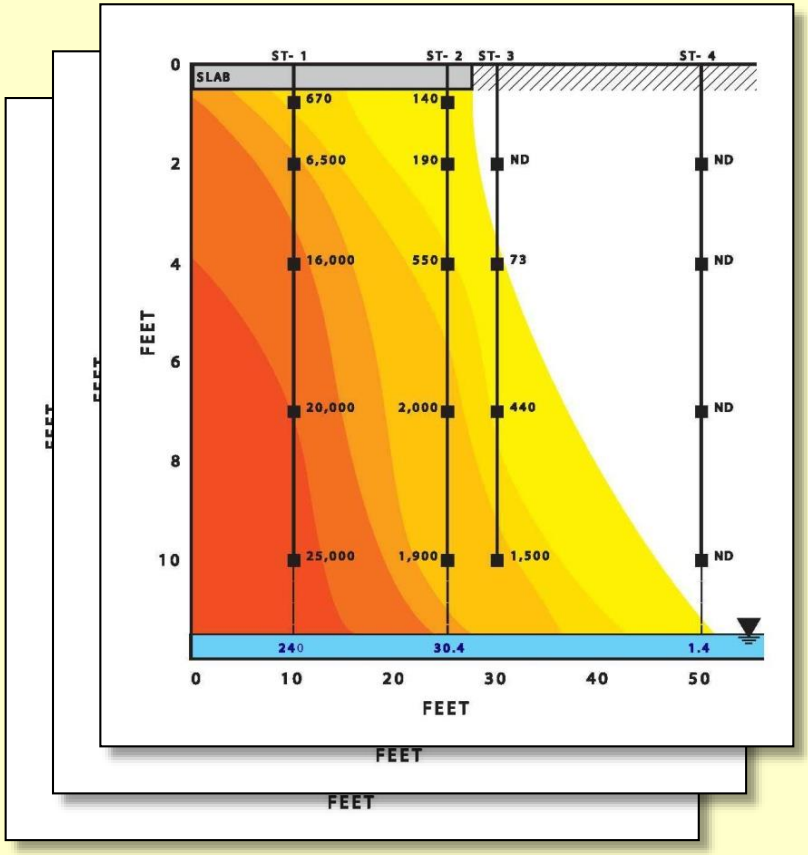

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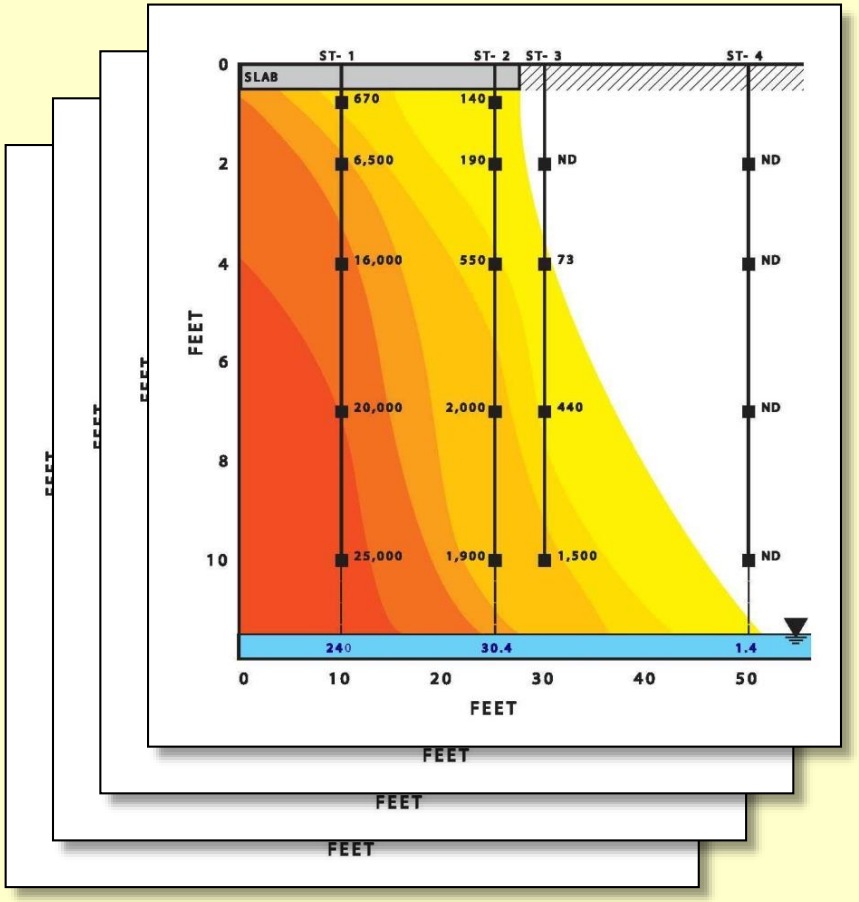
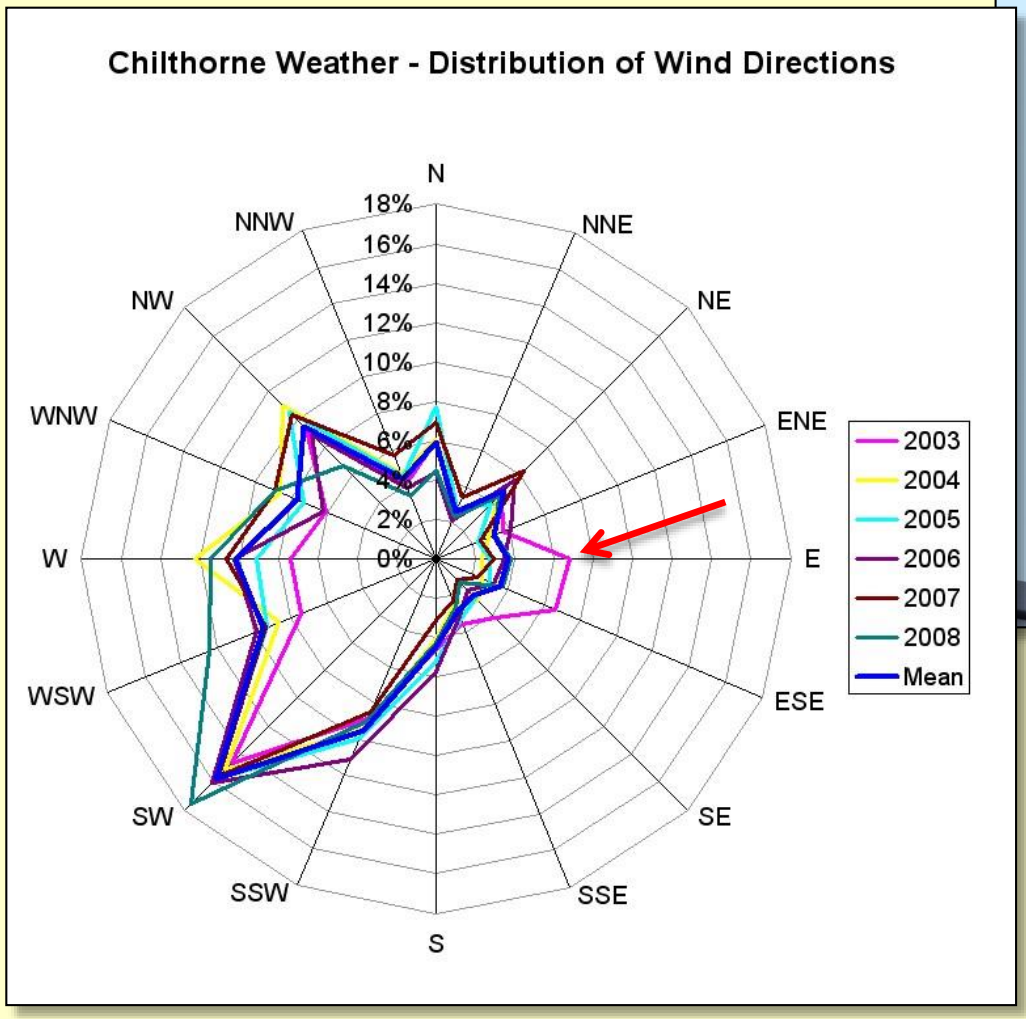
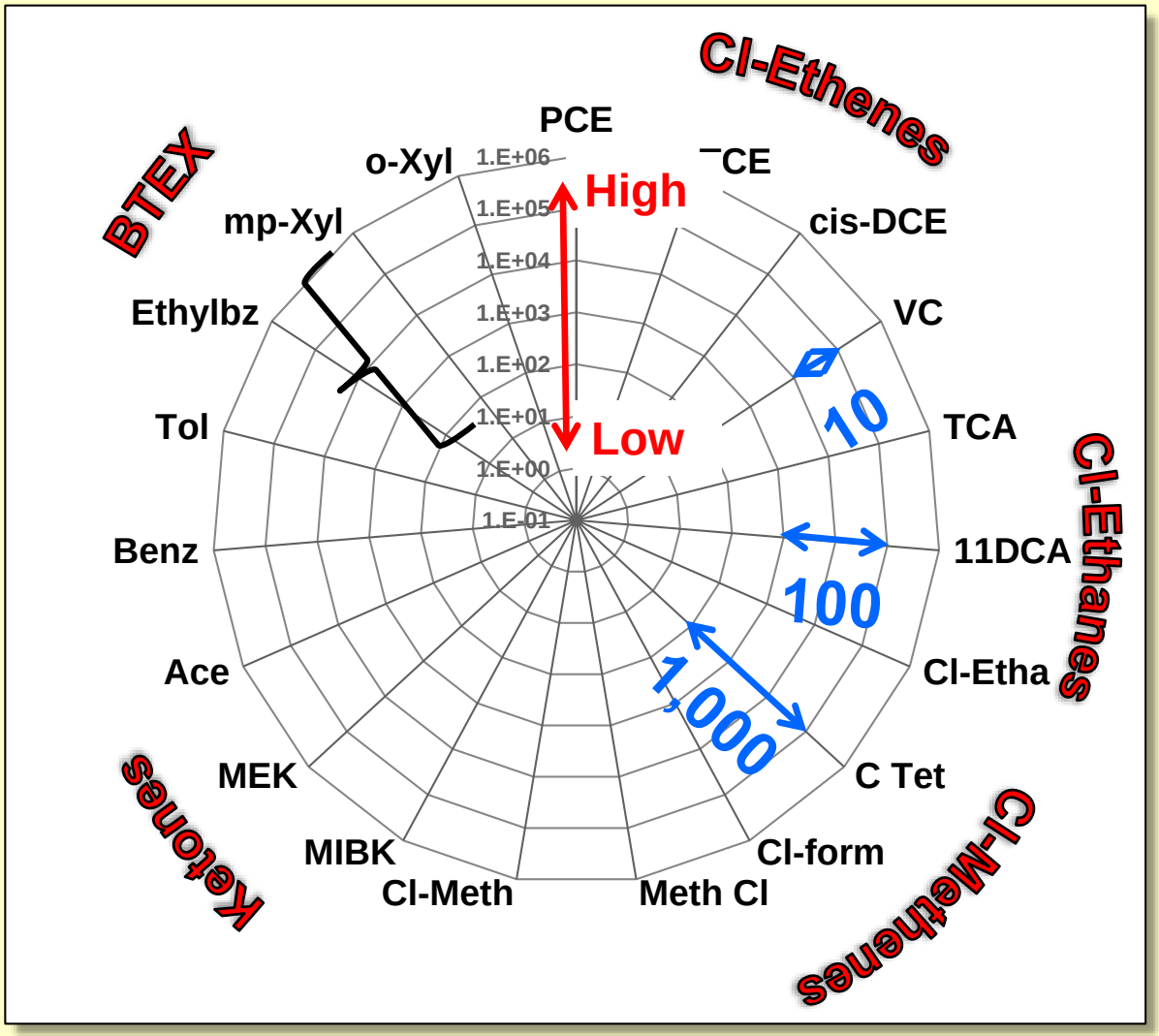


Figure from EPA 600 R09-073, 2009

Wind Roses Are Radar Plots



Arrangement of Compounds



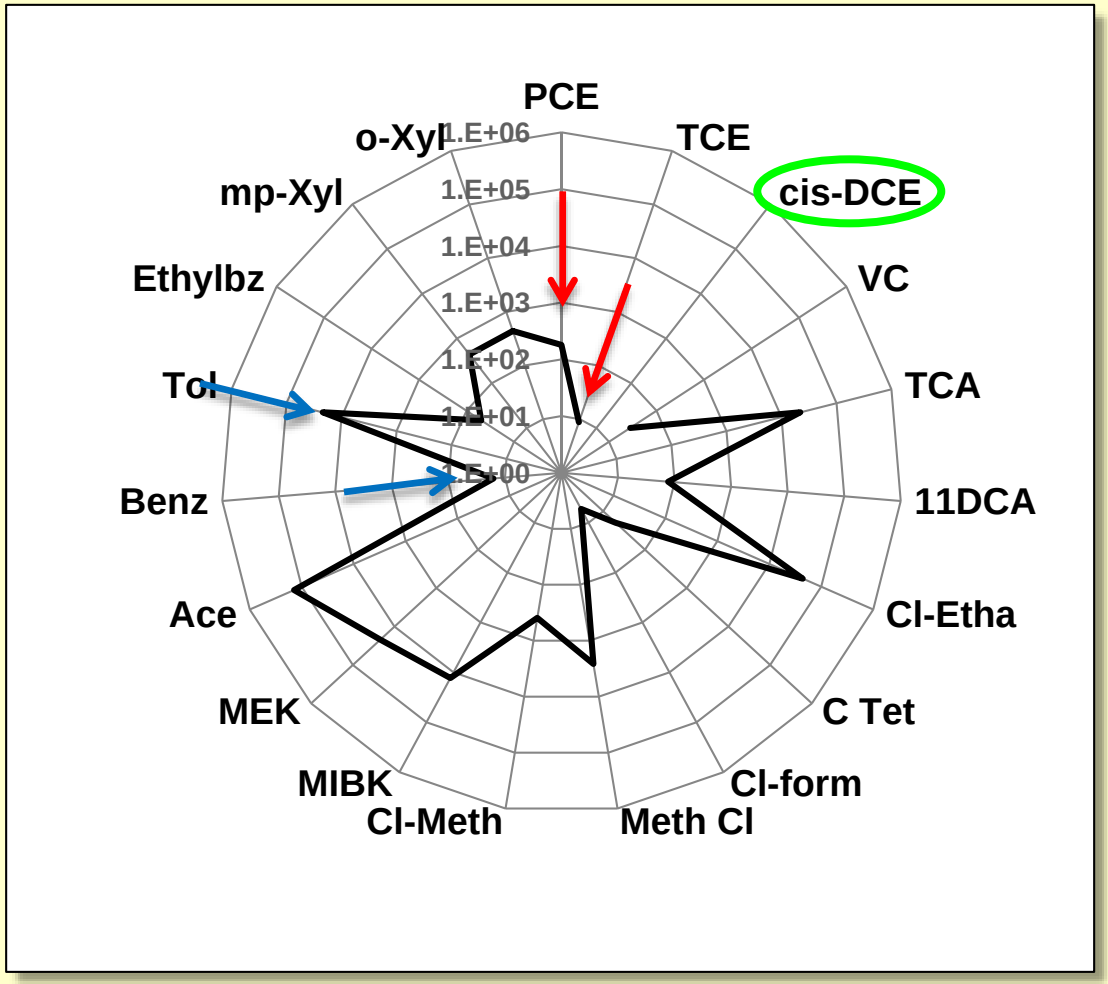
Spokes are VOCs

Circles are concentrations on a log scale

Distance from center is concentration

Each circle is a 10-fold difference

Plot of Indoor Air Targets



Indoor Vapor Intrusion Screening Levels (ug/m³) Commercial/Industrial

PCE 180

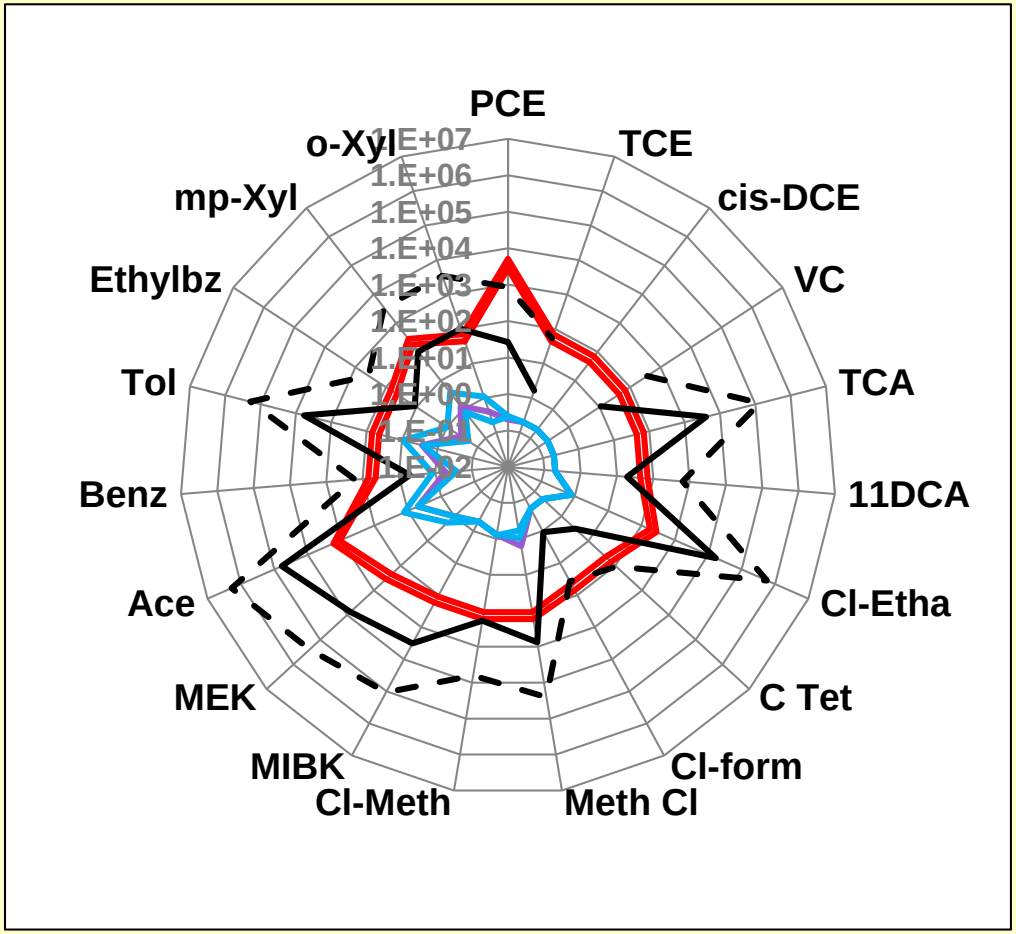
TCE 8.8

Benzene target ~ 1,000 times lower than toluene

cis-1,2-DCE (none)

US EPA CI VISL, version 3.5.1

Retail Site, Oklahoma City



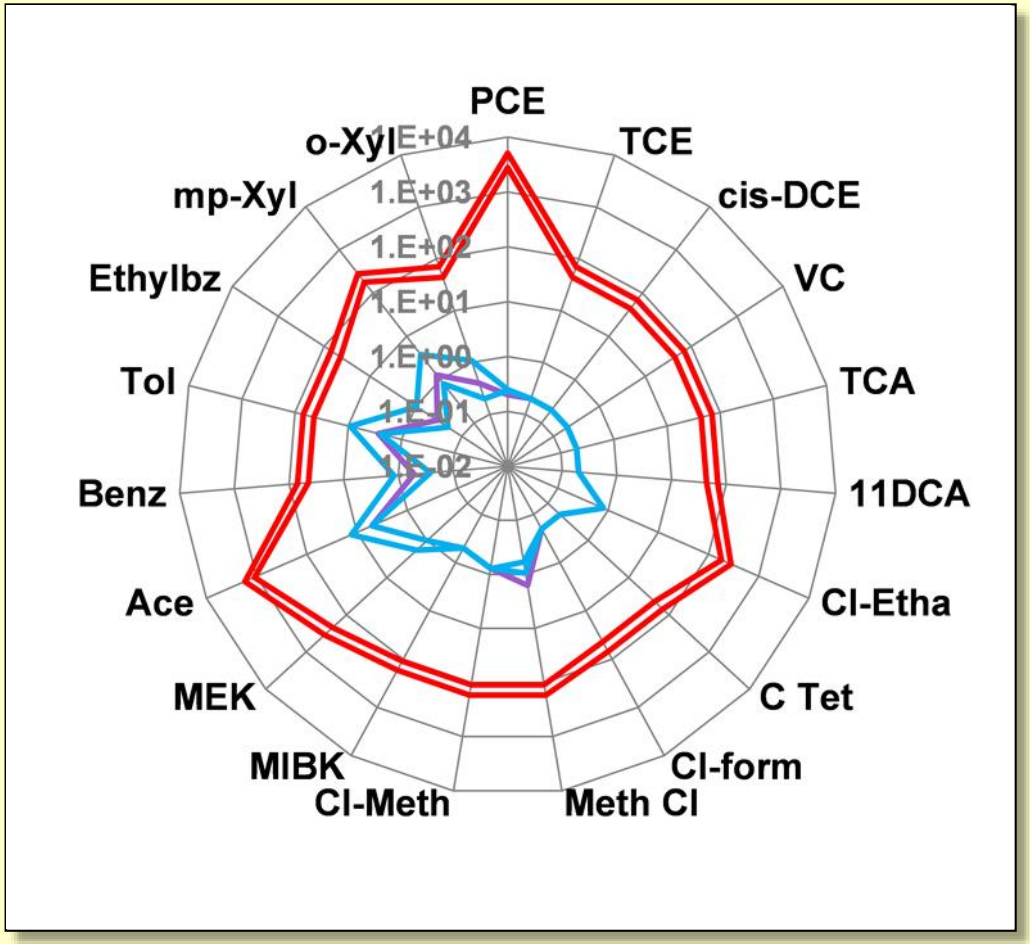
Indoor Air

Ambient Air

Soil gas

VISLs

Retail Site, Oklahoma City



Consistent Soil Gas

PCE, TCE, Cl-form > VISL

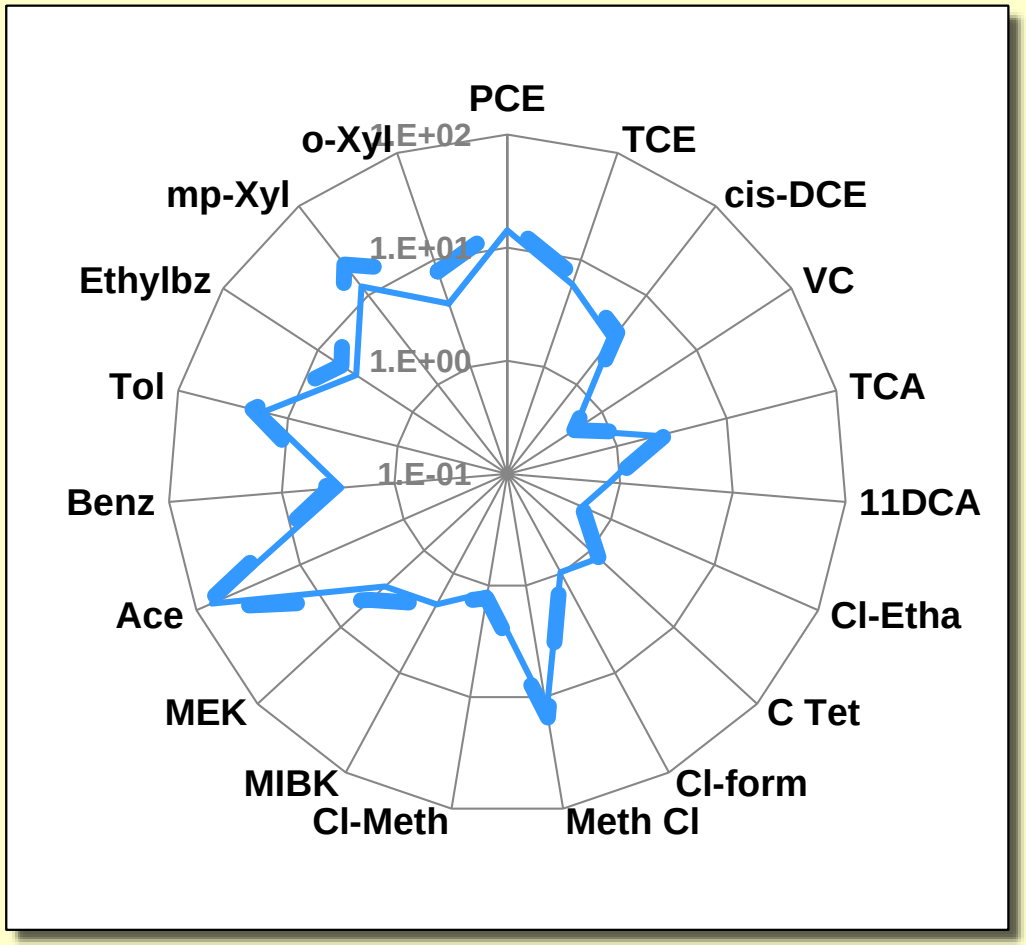
Indoor Air < VISLs, but Cl-form & Benz closest

Acceptable VI risk

Indoor ~ Ambient

Little or no relation between soil gas and indoor air

Former Aviation Mfg, Central OH



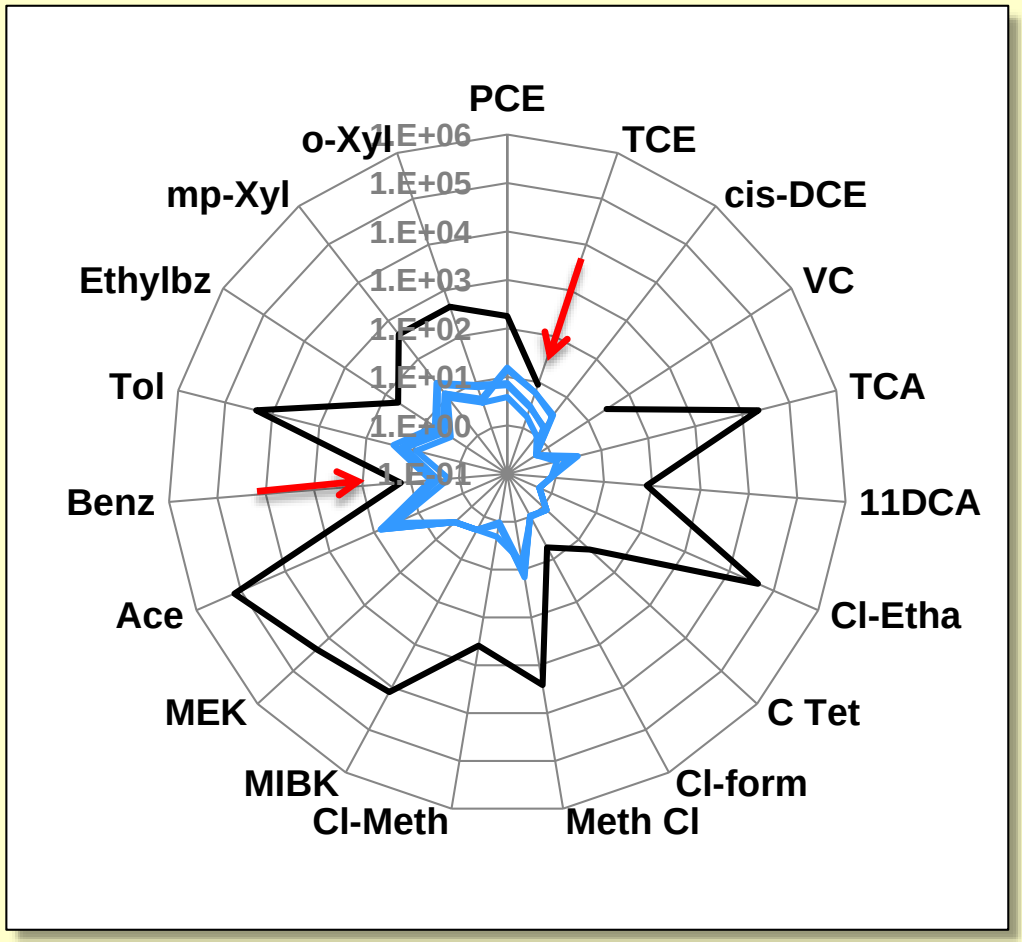
Indoor Air

Ambient Air

Indoor BTEX, PCE, TCE, DCE probably not from ambient

Indoor dupe looks good

Former Aviation Mfg, Central OH



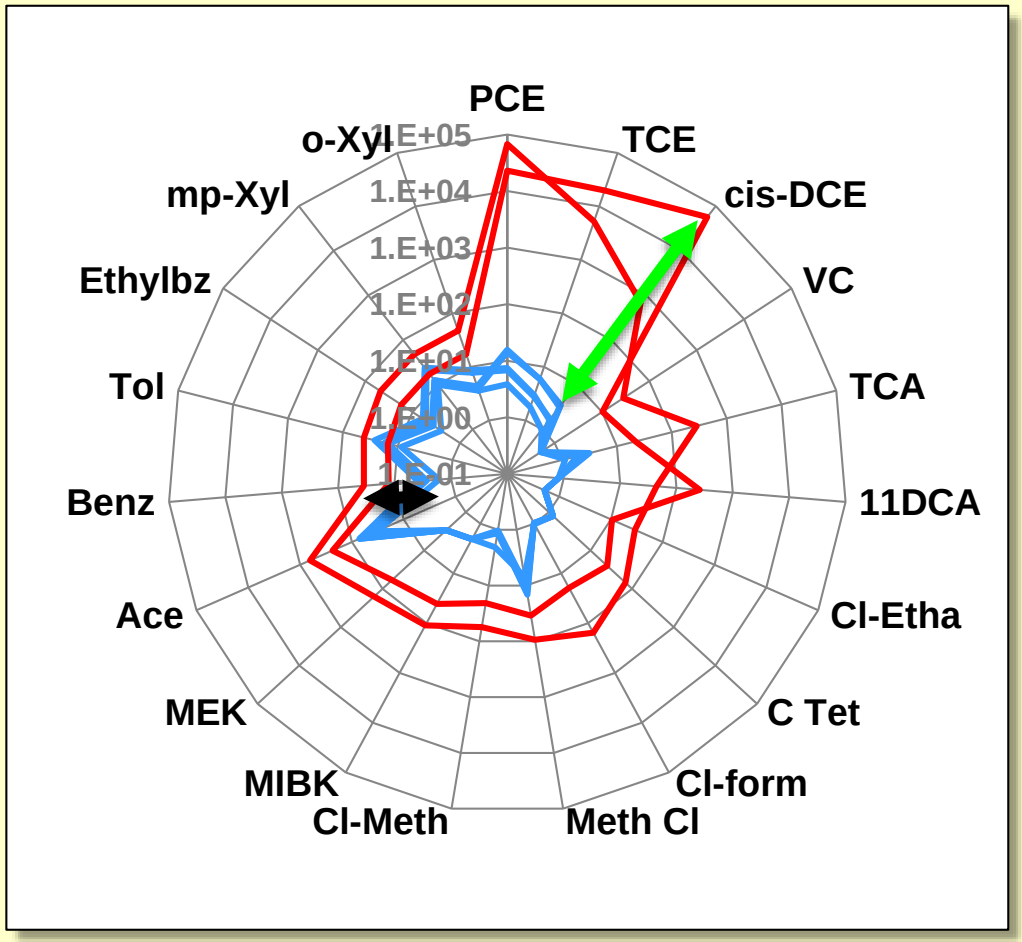
Indoor Air

IA VISL

Benzene & TCE drive risk

Vapor intrusion or background?

Former Aviation Mfg, Central OH

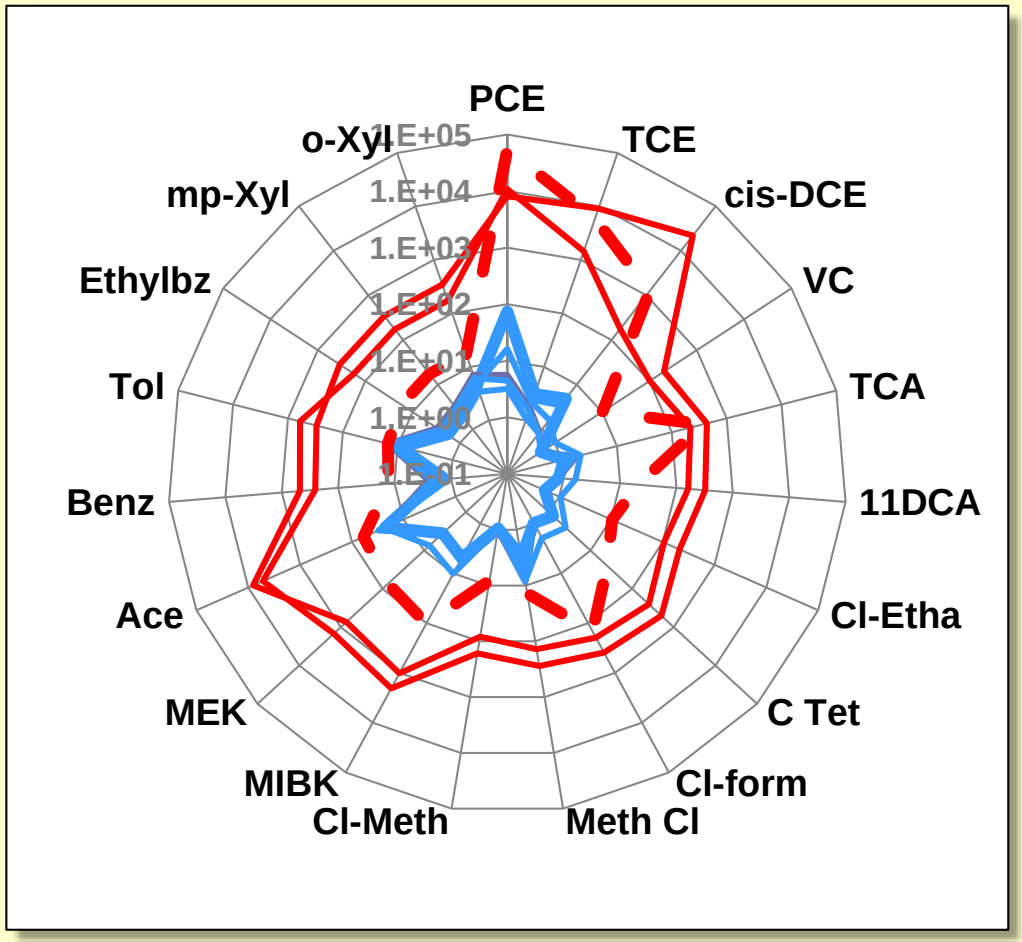


Indoor PCE, TCE, DCE<< Soil Gas

Cis-DCE, TCE, PCE AF ~ 0.0001

Benzene AF ~ 0.1. *Benzene mostly background!*

Former Aviation Mfg, Central OH



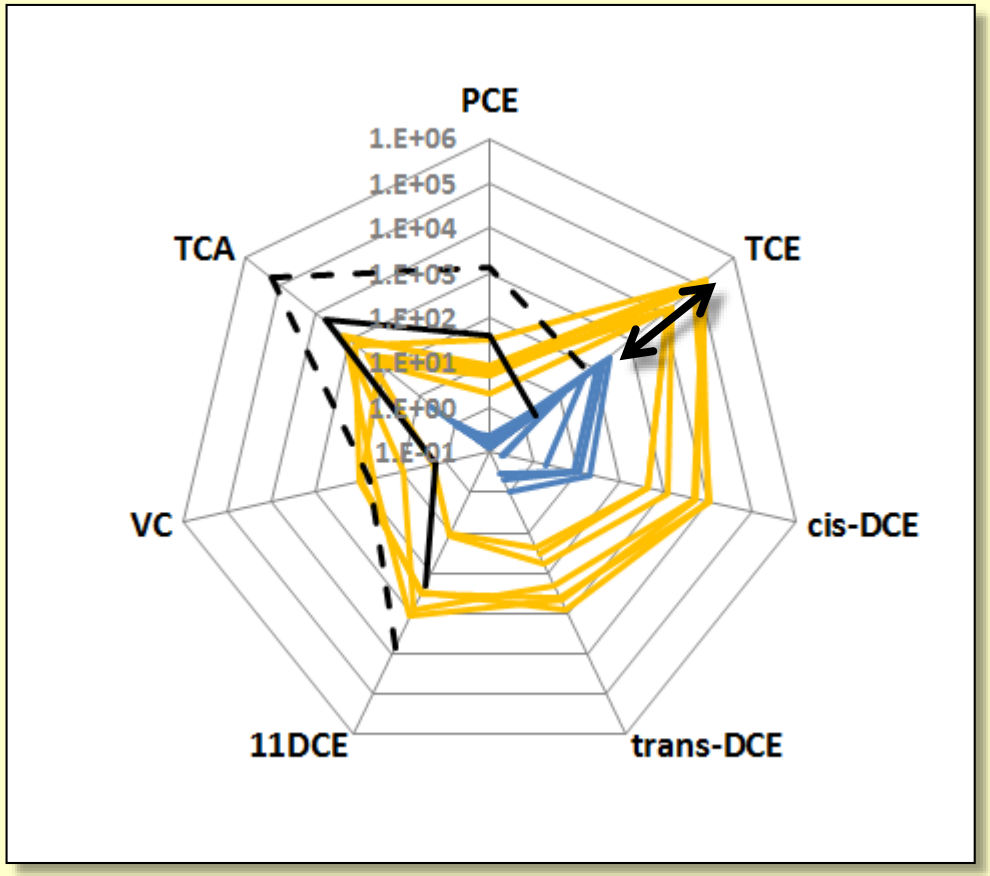
Indoor Air

Soil Gas

Soil-gas replicate very unlike primary

Probably Lab Problem

Behr Site - Dayton, Ohio



Data from US EPA / ATSDR investigation
Reporting levels unknown

Indoor TCE >> IA VISL

Subslab TCE & VC >> Subslab VISL

Subslab Soil Gas looks like Indoor Air Consistent Ratios

Deep Soil Gas looks like Indoor Air

Deep Soil Gas to Indoor AF approximately 0.003

Data from US EPA & ATSDR 2008, Behr VOC Plume Site, Dayton, Montgomery County, Ohio

Advantage of Radar Plots

- ✓ ***Relationships between samples are more clear***
- ✓ ***Appropriate for large data sets***
- ✓ ***Reduces need to calculate ratios***
- ✓ ***Made with conventional software***
- ✓ ***Plots are made quickly***
- ✓ ***Possible to compare different media***

QUESTIONS?

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