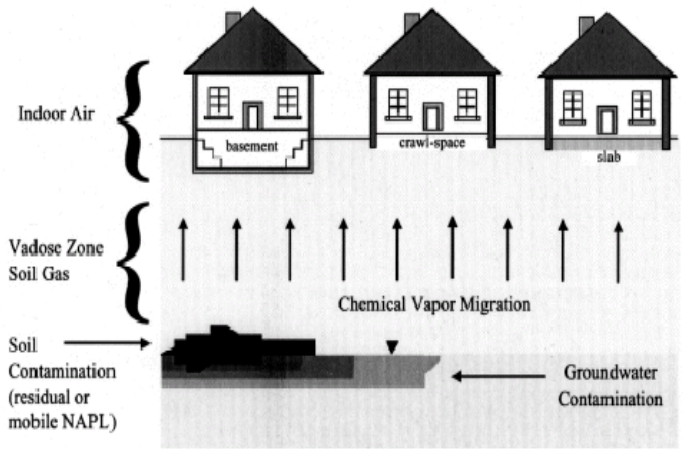
Vapor Intrusion and TCE Update

US Army Corps of Engineers

Environmental and Munitions Center of Expertise

Vapor Intrusion



- Nov. 2006: Army Interim Policy for VI issued
  - Release into environmental media gives Army authority to respond under CERCLA
  - Vapor intrusion does not include emissions arising solely from inside the building

Vapor Intrusion Guidance

- Dec. 2001: EPA issues RCRA guidance for VI
- Nov. 2002: EPA issues OSWER draft guidance for VI, supercedes RCRA guidance
- Summer 2007: States they will be adopting process very similar to ITRC (if not the document itself)

Compile Site Information

- Develop Data Quality Objectives
- Develop Conceptual Site Model

Tier 1 - Primary Screening

- Determine if volatile and toxic chemicals are present (see Table 1).
- Determine if inhabited buildings are, or in the future could potentially be, located near subsurface contaminants.
  - If toxic volatile chemicals are present and current, or future, human exposure is suspected, proceed with screening.
- Determine if potential risks warrant immediate action.
  - If immediate action does not appear to be necessary, proceed to secondary screening.

Tier 2 - Secondary Screening

Question 4

- If indoor air data are available, compare to appropriate target concentration (Table 2a, b, or c).
  - If indoor air data exceed the target concentration proceed to Question 6.
- Determine if there is any potential for contamination of soils in the unsaturated zone.
  - If contamination of the unsaturated zone is suspected, assess soil gas data.
  - If contamination of the unsaturated zone is <u>not</u> suspected, assess groundwater data.
- Compare soil gas or groundwater data to appropriate target concentration (Table 2a, b, or c).
  - If groundwater data exceed the target concentration, assess soil gas data.
  - If soil gas data exceed the target concentration proceed to Question 5.
- Determine if data are adequate to characterize the site and support an assessment.
  - If adequate data are not available, develop a sampling and analysis plan that satisfies the established data quality objectives.
- Determine if site conditions, or data limitations, would preclude the use of generic attenuation factors used in Tables 2a, b, and c.
- If appropriate data do <u>not</u> exceed target media concentration, pathway is considered to be incomplete.

Question 6

- Determine if there is any potential for contamination of soils in the unsaturated zone.
  - If contamination of the unsaturated zone is suspected, assess soil gas data.
  - If contamination of the unsaturated zone is <u>not</u> suspected, assess groundwater data.
- Compare soil gas or groundwater data to appropriate target concentration (Table 3a, b, or c).
  - If groundwater data exceed the target concentration, assess soil gas data.
  - If soil gas data exceed the target concentration proceed to Question 6.
- If adequate data are not available, develop a sampling and analysis plan that satisfies the established data quality objectives.
- Determine if site conditions, or data limitations, would preclude the use of scenario-specific attenuation factors used in Tables 3a, b, and c.
- If appropriate data do <u>not</u> exceed target media concentration, pathway is considered to be incomplete.

Tier 3 - Site Specific Pathway Assessment

Question 8

- Determine if the nature and extent of contamination has been adequately characterized to identify the buildings that are most likely to be impacted.
  - If no, develop a sampling and analysis plan that satisfies the data quality objectives.
- Compare sub-slab soil gas or indoor air data to appropriate target concentration.
  - If sub-slab data exceed target concentration, assess indoor air data.
- Determine whether or not site data meet data quality objectives and background/ambient sources have been adequately accounted for.
- Determine if exposure pathway is complete.

Figure 2. Schematic flow diagram: evaluation process recommended in guidance.

Vapor Intrusion Guidance

- Jan. 2007: Interstate Technology Regulatory Council (ITRC) issues VI Pathway: A Practical Guide
- Aug. 2007: Tri-Services issues draft VI Handbook, final projected Jan. 2008
- Oct. 2007: California issues law requiring VI assessment during cleanup and also for new construction projects
- DoD likely to address policy aspects in next version of DERP Mgt. Guide

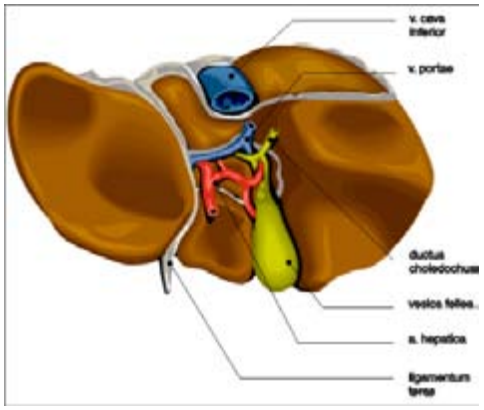
Multiple Lines of Evidence: Number used site-specific

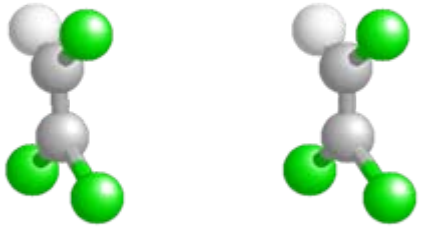
- Site history and geology; building use
- Ground water
- Soil gas sub-slab soil gas
- Crawlspace data
- Indoor air
- Outdoor air
- Tracer compounds
- Chemical ratios
- Modeled concentrations

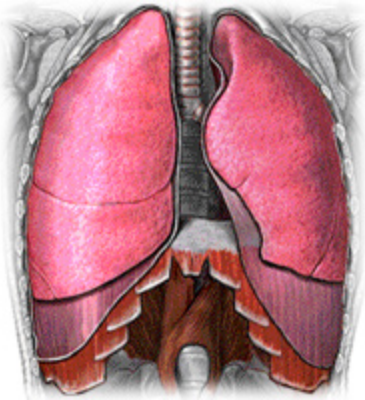
TCE Background

- 1974 TCE MCL set at 5 µg/L
- Late 1980s: IRIS withdraws cancer potency factors from database
- August 2001: EPA released draft risk assessment that has never been finalized nor withdrawn
  - Draft carcinogenic potency factor is 67-fold more potent than withdrawn factor (or the CalEPA slope factor)
  - Draft risk assessment criticized in public comment
  - Range of slope factors with little guidance for use; most default most conservative
- Despite increased potency MCL is still within protective risk range (6×10^{-5}, adult drinking 2 L/day)
- NAS report was released July 2006
- New IRIS values not expected until at least 2010

Why Is TCE Problematic?







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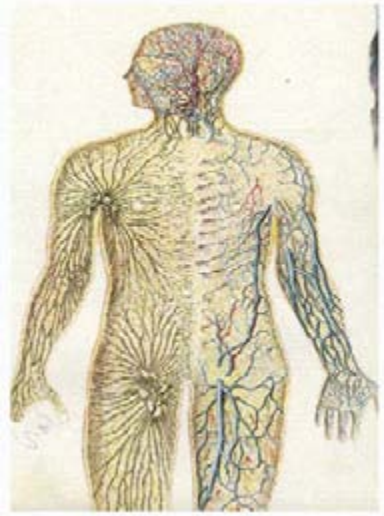
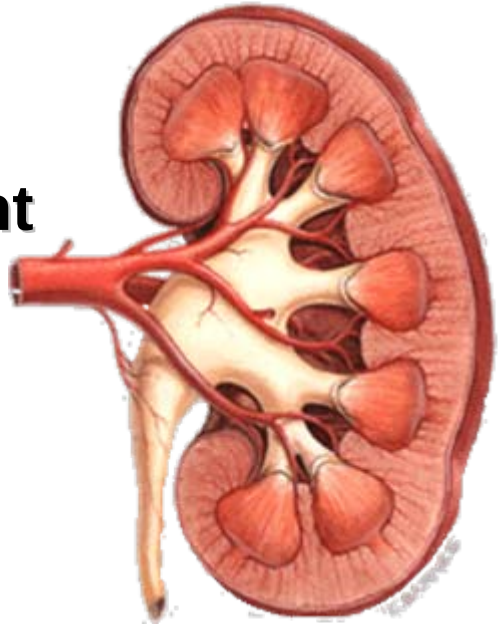
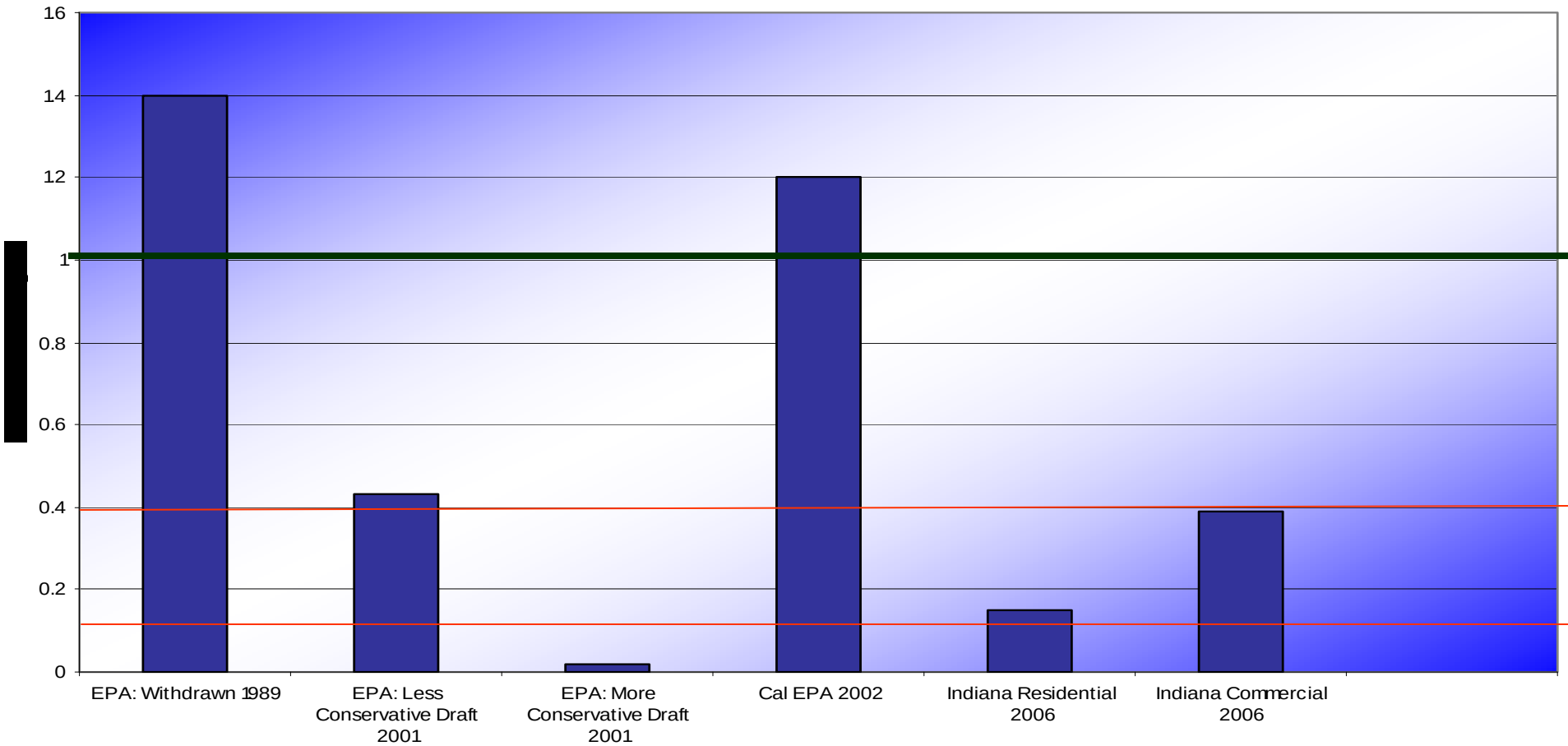


Disagreement on relevant effects in humans and concentrations at which they occur.



TCE in Air Concentrations at 10^{-6} Risk



Red lines: Detection limits scan and SIM mode
Green line: Mean outdoor air, EPA BASE study

Toxicity Value Selection

- OSWER 2003 Hierarchy
  - Tier 1 – IRIS
  - Tier 2 – EPA PPRTV, e.g., aldrin
  - Tier 3 – Other values e.g., TCE
- ECOS paper on toxicity values when none exist in IRIS (DoD, OSRTI, CalEPA)
  - Adopted by DoD Sept. 2007
    - Attachment 1 of Beehler memo “Actions in Response to Perchlorate Releases”
  - Parallels OSWER Hierarchy
  - Adds principles to identify Tier 3 values

TCE Toxicity Values

- Consensus approach explored by DoD and EPA
  - Parallel approach similar to perchlorate may be preferable
- EPA guidance endorsing Cal EPA toxicity values as Tier 3 source of toxicity values currently under intragency review

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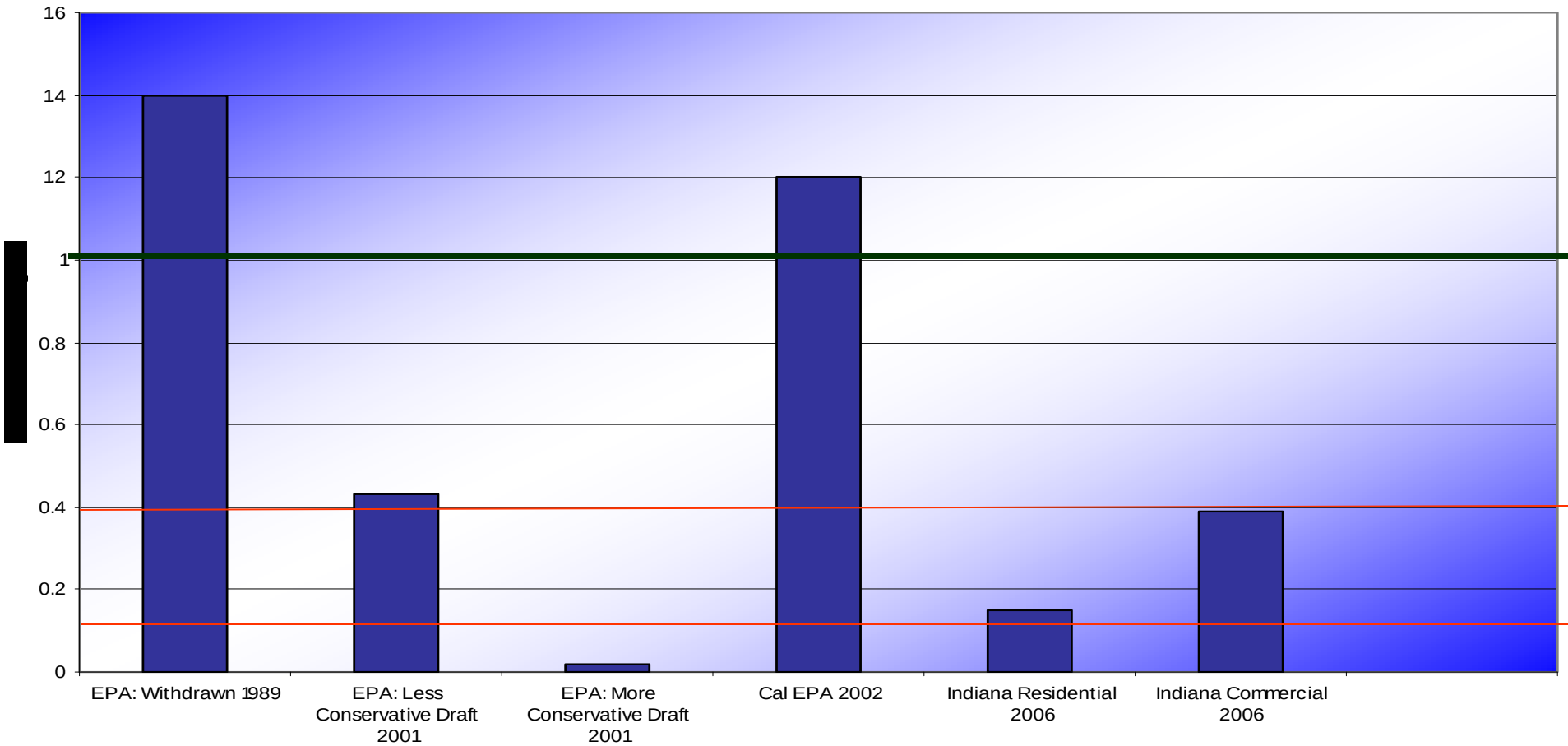

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