

Health Workshop

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Leadership for a Healthy Arizona

Outline

- Cancer registry review
- ATSDR review of vapor intrusion data, an example of a Health Consultation

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Cancer Registry Review

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Cancer Registry Review

- Update of the 1990 report
- M52 age adjusted cancer rates compared to Arizona age adjusted rates
- Cancers reviewed that have been associated with TCE exposure
 - Liver
 - Kidney
 - Lung
 - Non-Hodgkin lymphoma
 - Leukemia
 - Testicular
 - Cervix
 - Prostate
- Additional cancer reviewed at the request of community members
 - Thyroid

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Study Area

- Approximately the same study area
 - Includes additions to the East of the original study area to accommodate changes in US Census block group boundaries that occurred from year 1980 to year 2000.
- Bounded by
 - Thomas road on the North,
 - 32nd Street on the West,
 - Van Buren on the South, and the
 - Crosscut Canal and 68th Street on the East

Data Use

- The ACR receives case reports from Arizona
 - Hospitals
 - Clinics
 - Physicians
 - Pathology labs
- Duplicate data is merged with reports from other facilities providing care for the same patient
- Cases are reviewed for quality to ensure completeness and accuracy



Data Use

- 300 data items including
 - Demographics
 - Cancer data
 - Staging
 - Treatment
 - Follow-up of cancer status
 - Written justification for codes used
- Population Denominator for M52 study area
 - Year 2000 Census block groups



Geocoding and Age Adjustment

- All cases from the M52 study area were geocoded to the address level
- **Age-adjustment** is a process used to
 - Compare incidence and mortality rates over time or
 - Among geographic areas or
 - Populations that have different age distributions
 - Eliminate the **confounding effect** of age when comparing rates

Table 5: M52 Study Area Age Adjusted Invasive Cancer Case Rate Comparison With The State of Arizona

| Motorola at 52nd Street Neighborhood Cancer Incidence By Selected Primary Site For Diagnosis Years 2001 – 2006 | | | | | State of Arizona Cancer Incidence By Selected Primary Site For Diagnosis Years 2001-2006 | | | |
|--|------------|-----------------------------|------------------------|------------------------|--|------------|-----------------------------|---------------------------|
| Primary Site | Case Count | Age Adjusted Incidence Rate | Lower Confidence Bound | Upper Confidence Bound | Primary Site | Case Count | Age Adjusted Incidence Rate | Conclusion |
| Kidney | 20 | 10.64 | 5.94 | 15.33 | Kidney | 4,692 | 13.53 | No Significant Difference |
| Liver | 15 | 7.63 | 3.72 | 11.54 | Liver | 1,854 | 5.35 | No Significant Difference |
| Lung | 94 | 48.77 | 38.79 | 58.74 | Lung | 20,372 | 58.12 | No Significant Difference |
| Leukemia | 16 | 7.16 | 3.56 | 10.76 | Leukemia | 3,461 | 9.93 | No Significant Difference |
| Non-Hodgkin Lymphoma | 26 | 12.04 | 7.31 | 16.78 | Non-Hodgkin Lymphoma | 5,479 | 15.81 | No Significant Difference |

Table 5: M52 Study Area Age Adjusted Invasive Cancer Case Rate Comparison With The State of Arizona

**Motorola at 52nd Street Neighborhood Cancer Incidence
By Selected Primary Site
For Diagnosis Years 2001 – 2006**

**State of Arizona Cancer Incidence
By Selected Primary Site
For Diagnosis Years 2001-2006**

| Primary Site | Case Count | Age Adjusted Incidence Rate | Lower Confidence Bound | Upper Confidence Bound | Primary Site | Case Count | Age Adjusted Incidence Rate | Rate Comparison Value |
|---------------------------|------------|-----------------------------|------------------------|------------------------|------------------|------------|-----------------------------|---------------------------|
| Thyroid | 16 | 5.95 | 2.84 | 9.06 | Thyroid | 3,423 | 10.16 | M52 Low Cancer Rate |
| Prostate | 84 | 104.43 | 81.96 | 126.89 | Prostate | 20,255 | 124.52 | No Significant Difference |
| Testicular | 5 | ----- | ---- | ---- | Testicular | 885 | 2.63 | No Comparison Made |
| Cervix | 6 | ---- | ---- | ---- | Cervix | 1,224 | 7.30 | No Comparison Made |
| All Cancer Sites Combined | 673 | 334.73 | 308.99 | 360.46 | All Cancer Sites | 142,871 | 411.05 | M52 Low Cancer Rate |

Limitations

- Place of residence at time of diagnosis
 - Some people move in just prior to diagnosis
 - Some people move out prior to diagnosis
- A majority of persons in Arizona and Maricopa county tend to live in the same house less than five years.
- The last year of complete data ready for comparative analysis is the 2006 diagnosis year.



Example of a Health Consultation using Vapor Intrusion Data

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What is a Health Consultation?

- Specific public health issue
- Current exposures to toxic material
- A way for ADHS to **provide health information** and to **make recommendations** for actions to protect the public's health

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Data Used in Vapor Intrusion (VI) Studies

| | Demonstrate VI Pathway & Differentiate Sources | Evaluate Potential Health Effects | Determine Background Levels (Influences Clean-Up) |
|-------------|--|-----------------------------------|---|
| Soil gas | X | | |
| Ambient Air | X | X | X |
| Indoor Air | X | X | |

Vapor Intrusion

- VOC's present in many household items
- Use soil gas, ambient, indoor air to determine if Vapor Intrusion is a pathway
- If PCE is found at a high level in both indoor and ambient air, Vapor Intrusion may not be suspected as a pathway

| Soil Gas | Ambient | Indoor | Vapor Intrusion? |
|----------|---------|--------|------------------|
| X | - | X | Yes |
| - | X | X | No |
| - | - | X | No |

Vapor Intrusion Data

- EPA
 - Tasked with determining whether the vapors come from the contaminated site
 - Risk Assessment – broad evaluation
 - Clean-up driven to protect health and environment

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ATSDR/ADHS Health Consultation

- Focus:

- What are people actually breathing?
 - indoor air data
 - ambient air data
- Are current exposures affecting Health?
- Evaluate the health impact regardless of source

- Considers

- Soil gas data to identify the pathway
- Are there other sources?

Schlage Lock Company

Security, Colorado

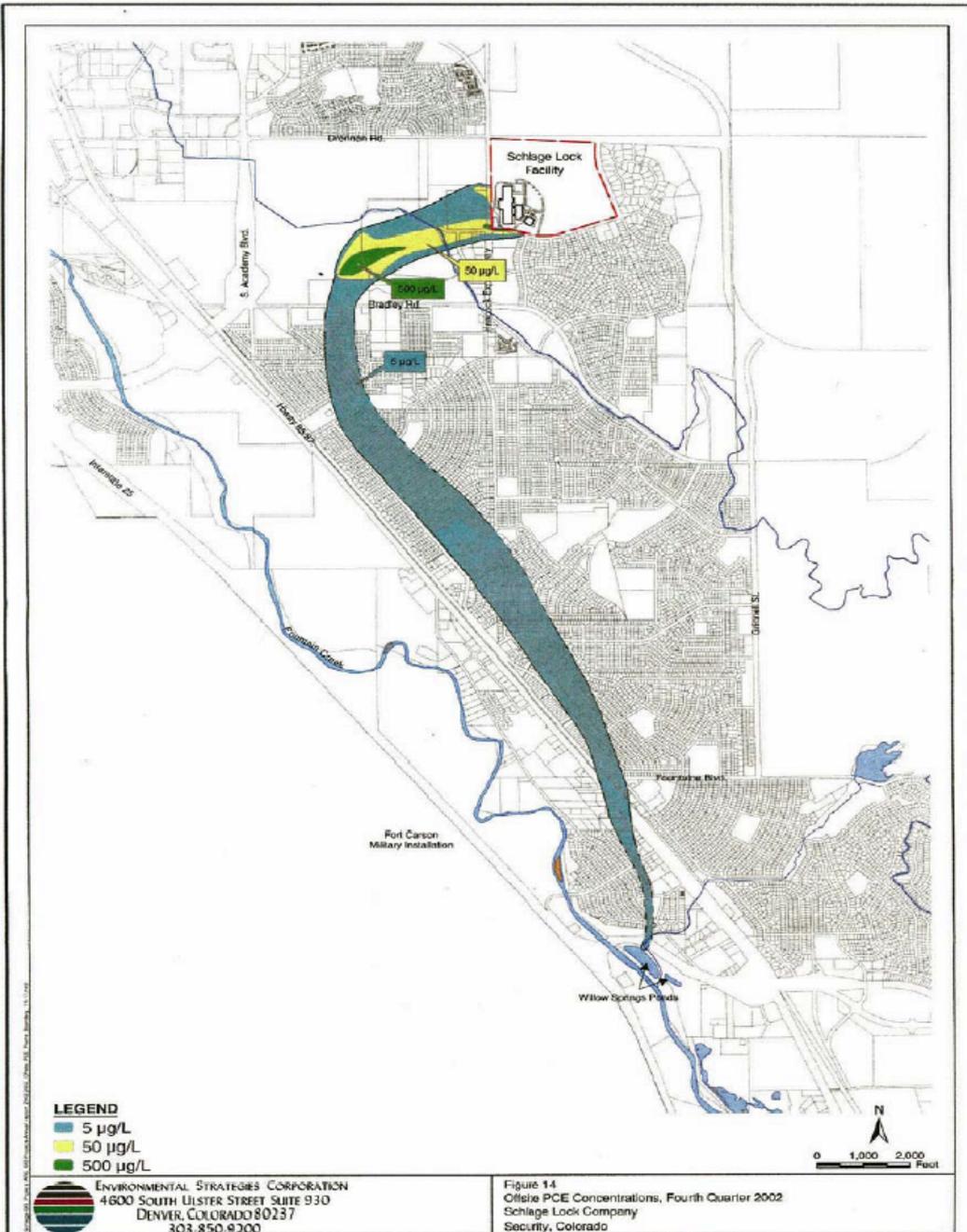
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Example 1: Schlage Lock Company (SLC), Colorado

- Manufacturing facility in Security, CO
- Late 1980's, PCE discovered in subsurface soil on their property
- PCE migrated to the aquifer used for drinking water for three surrounding communities
- 1st Health Consultation (2006) looking at Vapor Intrusion
 - 2000, 2001 data

Figure 1. Approximation of PCE plume in the Widefield Aquifer (based on 2002 data)



SLC Background

- 4.5 mile long plume
- Remedial Measures
 - Two SVE systems
 - Two groundwater recovery and treatment systems
- Groundwater Contamination
 - PCE concentrations ranged from roughly 50 ppb to over 1,000 ppb at peak in 1999
 - In 2004, concentrations ranged from roughly 10 ppb to roughly 800 ppb



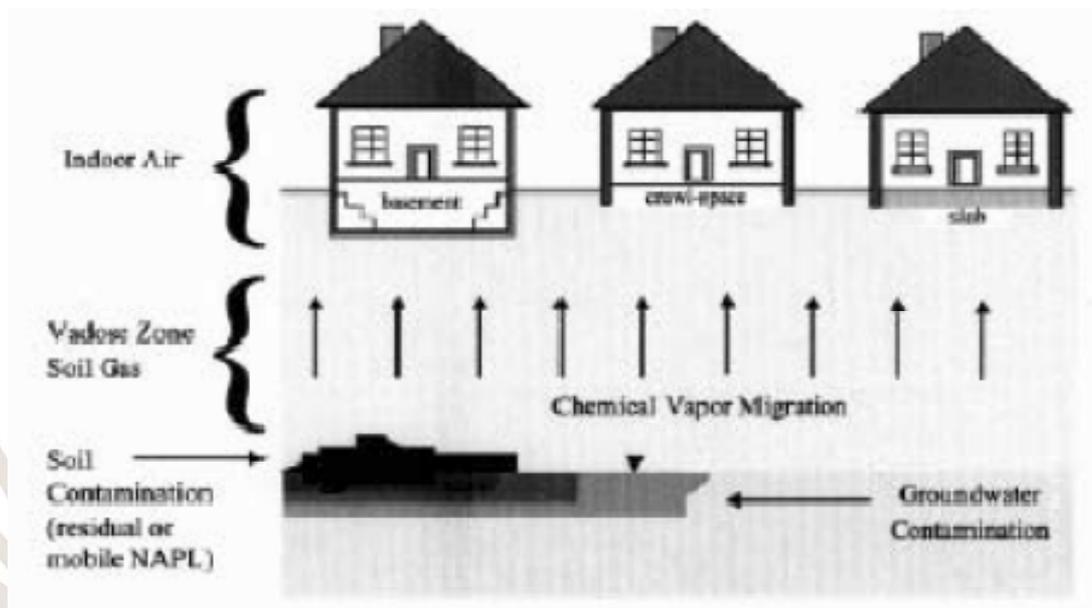
Community Health Concerns

- Safety of the drinking water supply (addressed in previous HC's)
- Possibility of PCE exposure causing brain cancer, lymphatic cancer or other types of cancer
- Possibility of PCE exposure resulting in respiratory problems
- The health of domestic dogs that have swam in a contaminated pond



Vapor Intrusion Pathway

- PCE is a Volatile Organic Compound (VOC)



Data Used

- Indoor air sampling
 - Buildings above areas where plume concentrations of PCE exceeded 50 µg/L
 - 30 indoor and 10 outdoor samples
 - Canisters placed at or near lowest point of the structure
- Chemical Survey & Residential Questionnaire
 - PCE is found in many household items

Toxicological Evaluation

- Toxic effects are dependant on
 - Route of exposure (breathing, drinking)
 - Duration of exposure (how many days/years)
- Exposure to PCE has been associated with neurological changes and liver and kidney toxicity



Exposure Pathway

4. Exposure Route
(inhalation)

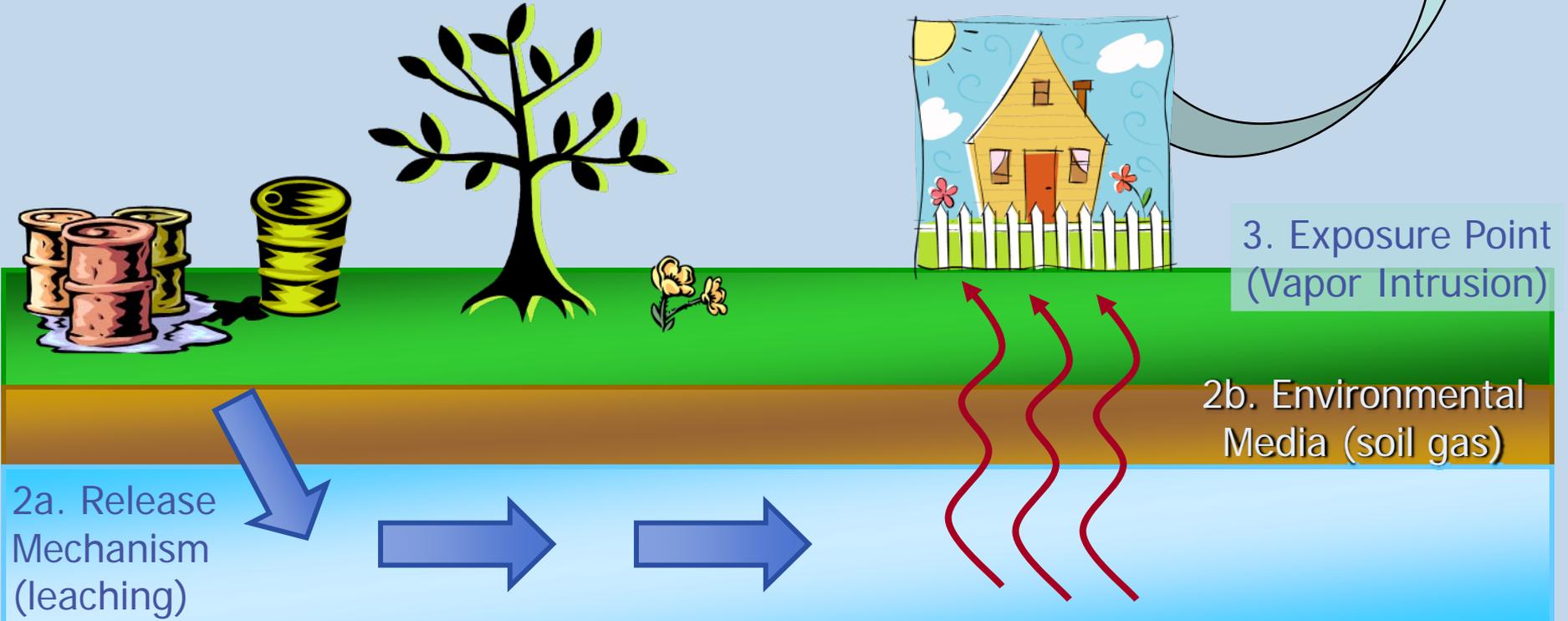


5. Potentially Exposed Population (residents)

3. Exposure Point
(Vapor Intrusion)

2b. Environmental Media
(soil gas)

2a. Release Mechanism
(leaching)



SLC Exposure Evaluation

- Exposure Scenario
 - Source: Schlage Lock Property
 - Media: Soil Gas from PCE-contaminated groundwater
 - Exposure Point: Indoor air
 - Exposure Route: Inhalation
 - Potentially Exposed Population: residents living above the plume

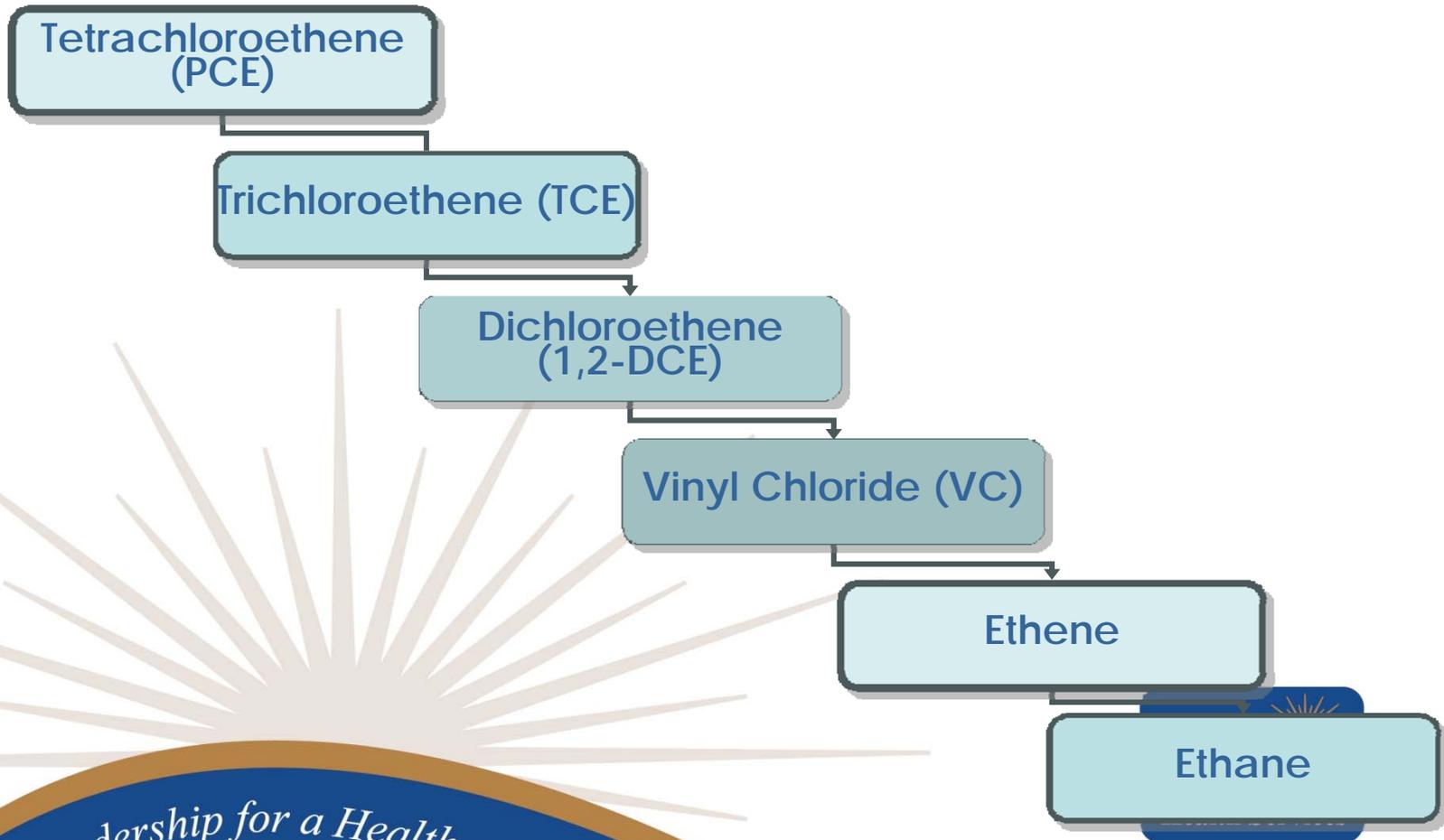


Exposure Evaluation

- Identifying Contaminants of Interest
 - Compare to health-based guidelines (HBGL)
 - Concentrations at or below HBGL's – not expected to result in adverse health effects
 - Concentrations above HBGL were retained for further analysis
 - However, exceeding the HBGL does not necessarily mean that the contaminant poses a public health hazard



TCE's Breakdown products in the environment

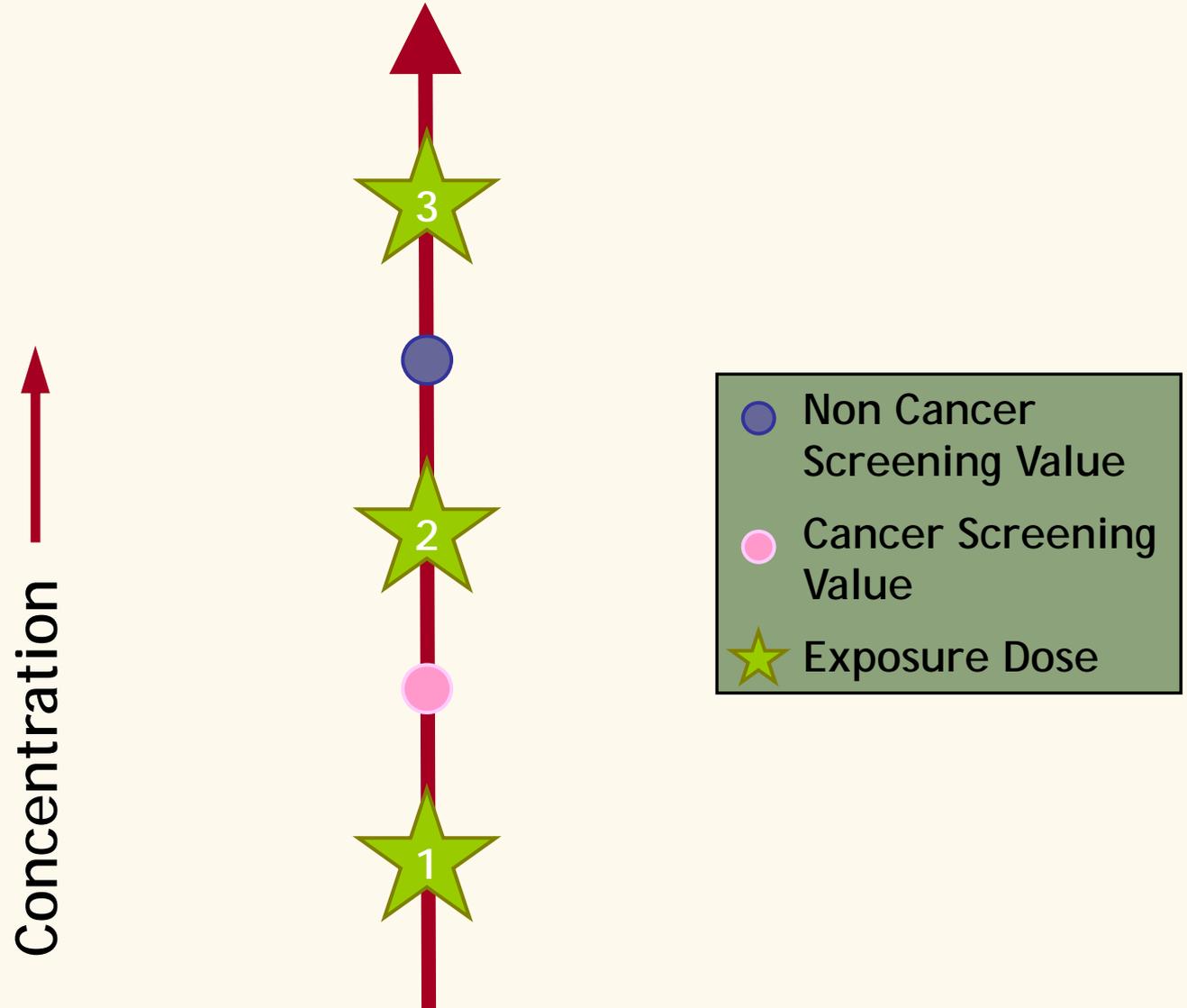


SLC – Additional Potential Contaminants

- PCE degradation products
 - Trichloroethylene (TCE)
 - Dichloroethylene (DCE)
 - Vinyl chloride (VC)
- Have not been found at an elevated level in the aquifer
- Not evaluated in the HC



Exposure Evaluation



SLC Screening

- Cancer Screening Value: $0.31 \mu\text{g}/\text{m}^3$
 - Cancer health effects
 - EPA's Region 3 Risk-Based Concentration (RBCs)
- Long Term Non-Cancer Screening Value: $300 \mu\text{g}/\text{m}^3$
 - Non-cancer health effects
 - ATSDR's Chronic Minimal Risk Level (MRLs)
- Maximum indoor air sample at Shlage Lock Site: $3.5 \mu\text{g}/\text{m}^3$

Health Consultation Conclusions for Non Cancer Health Effects

Hazard

- 1: Urgent Public Health Hazard
- 2: Public Health Hazard

- Health advisory
- Measures to stop or reduce exposures
- health education
- Health studies / surveillance

No Hazard

- 4: Not Expected to be a Public Health Hazard
- 5: No Public Health Hazard

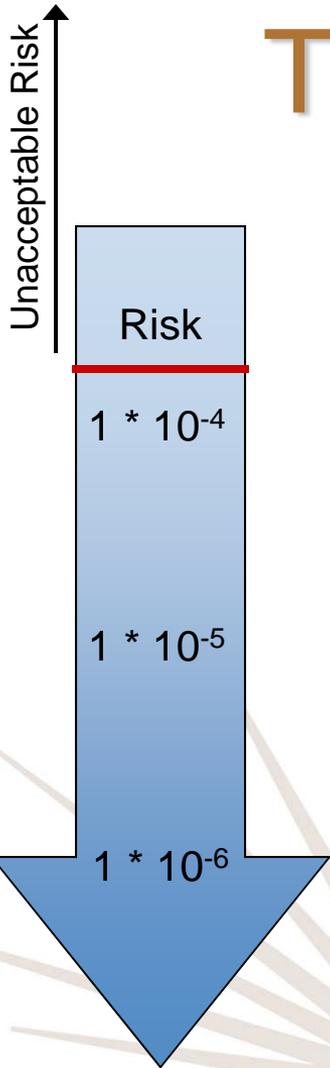
- Health education
- Possible health surveillance
- Measures to prevent future exposures

Unknown

- 3: Unable to Determine Whether there is a Public Health Hazard

- Further characterization of site-related exposures, where possible
- Health education
- Health studies / surveillance

Theoretical Cancer Risk



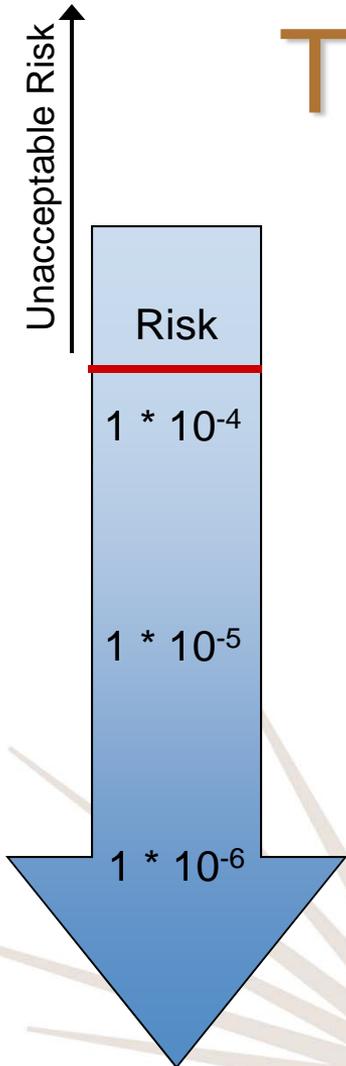
- Does not predict actual cancer rates
- Used to evaluate risk associated with exposures
- Everything we do in our lives, everything we eat can have a risk assigned to it
 - Increased risk
 - Not wearing a seatbelt
 - Smoking
 - Not using sunscreen
 - Decreased risk
 - Eating fruits and vegetables
 - Exercising



Risk Ratio Qualitative Descriptor

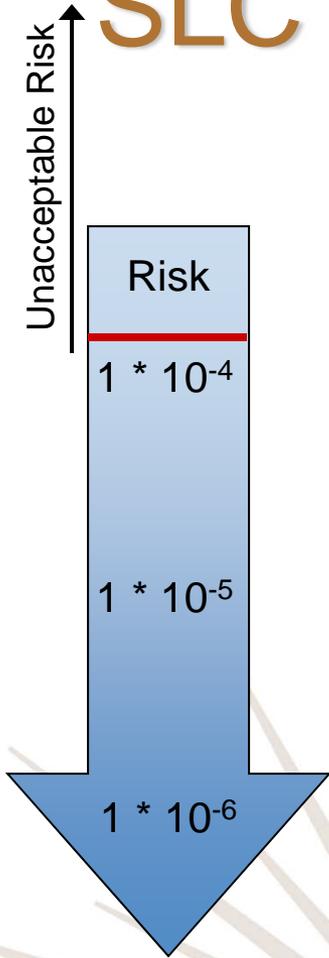
- equal to or less than one per million ($1 * 10^{-6}$)
- one per million to less than one per ten thousand ($1 * 10^{-5}$)
- one per ten thousand to less than one per thousand ($1 * 10^{-4}$)
- one per thousand to less than one per ten ($1 * 10^{-3}$)
- equal to or greater than one per ten ($1 * 10^{-2}$)
- very low
- less low
- very high
- moderate
- high

Theoretical Cancer Risk



- A mathematical equation is used to evaluate risk
- When is the calculated theoretical cancer risk level “too high”?
 - When the number is greater than $1 * 10^{-4}$ most toxicologists consider the cancer risk to be unacceptable

SLC Health Assessment – Cancer Health Effects



- Maximum indoor concentration: $3.5 \mu\text{g}/\text{m}^3$
 - Theoretical Cancer Risk $1.1 * 10^{-5}$
- Maximum outdoor concentration: $1.3 \mu\text{g}/\text{m}^3$
 - Theoretical Cancer Risk $4.2 * 10^{-6}$
- Highest estimated risk was lower than CDPHE's Risk Management Level ($5 * 10^{-5}$)

SLC Health Assessment – Non-Cancer Health Effects

- Non-Cancer Health Effects
 - Require larger dose to express adverse health effects
 - Comparison Value: $300 \mu\text{g}/\text{m}^3$
- Highest sample concentration ($3.5 \mu\text{g}/\text{m}^3$) was lower than the comparison value
- Non-Cancer Health Effects are unlikely to occur



Conclusions

- PCE concentrations are not likely to result in non-carcinogenic adverse health effects
- PCE concentrations are not likely to result in cancer health effects
- Unlikely for indoor air pathway to cause a public health hazard in the future
 - Remediation is continuing and the concentration of PCE in the aquifer appears to be decreasing
- Past exposures are an unknown public health hazard