A Case Study: Cleanup Decision Making
Decision: Cleanup Needed

128(a) Funding Eligibility or
104 Brownfield Grant Award

Hire Env. Professional/Contractor
- Request for Proposal(s) (RFP)
- Negotiate Contract(s)

Develop Cleanup Documents:
- Cleanup Alternatives
- Cleanup Plan/Cost Estimate
- Supporting Documents (QAPP/FSP/H&SP)
- Reports

Establish Administrative Record

Add to Public Record

Public Participation:
- Community Involvement Plan
- Notice of planned cleanup
- Public comment
- Ongoing communication
Conduct Cleanup
- Oversight of field work
- Review data & reports

Cleanup Verification

Cleanup Certification

Post Cleanup Activities:
- Monitoring?
- Institutional/Eng. Controls?
- Final Report
- Reporting (Tribe, EPA, Public)

Complete Administrative Record

Update Public Record

Public Participation:
- Final meeting
- Report results of cleanup
- Need for eng. Or ICs
ACRONYMS
THEY ARE PART OF THE JOB*

- DQOs = Data Quality Objectives
- QAPP = Quality Assurance Project Plan
- HRS = Hazard Ranking System
- PRGs = Preliminary Remediation Goals
- RSL = Regional Screening Levels (TSLs?)
- TBA = Targeted Brownfield Assessment
- RCRA = ?

* Never trust an acronym
Concepts to Learn:

✓ Background Levels
✓ Screening Levels
✓ Site Exposure Pathways
✓ Data Quality Objectives (DQOs)
✓ Preliminary Remedial Goals (PRGs)

These all lead to:
✓ Final Cleanup Goals
Old Army Stockade Bldg.
Brownfields Grant Cleanup Project
2 TBAs Conducted by EPA Contractor
Historic Building from old Army Post days – important for Tribal History
Most recently used by the BIA for storage; Was a jail in the past.
Tribes wants to restore the building as a local Tribal Museum for tourists.
Setting: within 100 Ft. of a school and a head start Bldg.; In a residential area; no fence; parking for museum visitors will be next to the building.
Phase I Report listed suspected use of pesticides with Arsenic around the building.
Because previous Phase II sampling in the area had arsenic detections higher than usual, naturally occurring arsenic was suspected in this area. Two Phase II background samples were collected to determine actual naturally occurring background arsenic levels. The background sample with the lowest reading contained 8 mg/kg arsenic. The naturally occurring arsenic level documented for the area is 7 mg/kg arsenic (USGS 1984).
Where people work 40 hrs. a week (5 days)

Risk Assessment
Assumptions

RESIDENTIAL: WHERE PEOPLE LIVE AND PLAY, INCLUDING CHILDREN, 24/7/365.

INDUSTRIAL: Where people work 40 hrs. a week (5 days)
Substance Name: Arsenic
Phase II: Screening Levels for Soil Possible Screening Levels:

- Screening Criteria for the Hazard Ranking System (HRS)* = 3 times background

- EPA Regional Screening Levels: = EPA Region 9 Preliminary Remediation Goals (PRGs)
  - Industrial = 1.6 mg/kg (c)
  - Residential = 0.39 mg/kg (c)

- SCRM-RDSC = 23 mg/kg

SCRM = Superfund Chemical Data Matrix
RDSC = Reference Dose Screening Concentration
c = Cancer
US EPA REGION 9 PRELIMINARY REMEDIAL GOALS (PRGs) (Mg/Kg)

ARSENIC
RESIDENTIAL SOILS

<table>
<thead>
<tr>
<th>Cancer Risk = 1E-06</th>
<th>Chronic HQ = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>soil-inhale</td>
<td>soil-dermal</td>
</tr>
<tr>
<td>5.90E+02</td>
<td>4.50E+00</td>
</tr>
</tbody>
</table>

Scientific Notation: 3.90E-01 = 0.39 mg/kg
### ARSENIC

**INDUSTRIAL SOIL**

<table>
<thead>
<tr>
<th></th>
<th>Cancer Risk = 1E-06</th>
<th>Chronic HQ = 1</th>
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<tbody>
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<td>soil-inhale</td>
<td>1.30E+03</td>
<td>1.50E+03</td>
</tr>
<tr>
<td>soil-dermal</td>
<td>9.60E+00</td>
<td>3.10E+02</td>
</tr>
<tr>
<td>soil-ingest</td>
<td>1.90E+00</td>
<td>2.60E+02</td>
</tr>
<tr>
<td>combined</td>
<td>1.60E+00</td>
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<tr>
<td>soil-inhale</td>
<td>1.60E+00</td>
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<td>soil-ingest</td>
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<td>combined</td>
<td>2.50E-01</td>
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</tbody>
</table>

\[1.60E + 00 = 1.6 \text{ mg/kg}\]
Anatomy of Risk-Based Environmental Cleanups

- VOCs
- SVOCs
- Inorganics
- Pesticides
- PCBs

- People
  - Especially sensitive populations
- Animals &/or Plants
  - Sensitive Ecological Areas (wetlands, surface water bodies, etc.)

Pathways: Soil, Surface Water, Ground Water & Air
Routes: Ingestion, Inhalation & Contact

Modified after Mike Charles, IEPA, 2012
### Pathways

There are 5 Pathways by which Contamination can leave a Brownfields Site

<table>
<thead>
<tr>
<th>Air Pathway</th>
<th>Soil Pathway</th>
<th>Surface Water Pathway</th>
<th>Groundwater Pathway</th>
<th>Biological Pathway</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. smoke from burning trash;</td>
<td>1. workers at a site;</td>
<td>1. runoff to a stream, lake, or wetland;</td>
<td>1. contaminated liquids soaking into the soil and flowing away in a groundwater plume.</td>
<td>1. rodents and vermin;</td>
</tr>
<tr>
<td>2. landfill gases; methanol and vapors;</td>
<td>2. people recreating on a site;</td>
<td>2. storm runoff to a storm drain</td>
<td>2. seeps to surface water</td>
<td>2. mosquitos;</td>
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<tr>
<td>3. particulate matter, dust</td>
<td>3. people walking across a site.</td>
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<td>3. molds</td>
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</table>
Example for Old Building and Utility Tunnels - Conceptual Site Model

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<tbody>
<tr>
<td>Friable Asbestos in Building</td>
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<td>Soil</td>
<td>Ingestion</td>
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<td>Friable Asbestos in Utility Tunnels</td>
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<tr>
<td>Tunnels Exposed During</td>
<td>Basement Soil</td>
<td></td>
<td>Soil and Ground-</td>
<td>Ingestion</td>
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<td>Dermal</td>
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<td></td>
<td>Demolition Debris Containing Friable Asbestos</td>
<td>Subsurface Soil</td>
<td>Infiltration/Percolation</td>
<td>Ingestion</td>
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- **Completed Pathway**
- **Possible complete pathway**
- **Incomplete Pathway**
Example of Auto Maintenance Garage - Conceptual Site Model

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<tbody>
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<td>Building Materials</td>
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<td>Soil</td>
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<td>Dermal</td>
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<td>Demolition Debris</td>
<td>Dust</td>
<td>Transport</td>
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<tr>
<td>Hydraulic and other</td>
<td>Basement Soil</td>
<td>Subsurface Soil</td>
<td>Infiltration/Percolation</td>
<td>Soil and Ground-</td>
<td>Ingestion</td>
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<tr>
<td>Pesticides, Solvents, and other</td>
<td>Building Drains</td>
<td></td>
<td></td>
<td>Soil and Surface Water</td>
<td>Ingestion</td>
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<td>Physical Hazard</td>
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</tbody>
</table>

- Completed Pathway
- Possible complete pathway
- Incomplete Pathway
DISCUSSION QUESTIONS:

1) What kind of “exposures” could occur at this site?

2) Who would be the “receptors”?

3) What Phase II Screening Level is appropriate for this Site?

Or

Which Screening Level is more representative of the Tribe’s intended redevelopment or reuse of this site?
A document that describes the technical and quality activities of an environmental data operations project that should be implemented to ensure that the results of the work performed will satisfy the data user’s needs.
It is a good idea!

and

it is required when using EPA Grant funds to conduct sampling and generate environmental data.
Usually Written by your Contractor
BUT
It should be a “Team Effort”

US EPA Review Required!
Data Quality Objectives

(DQOs)
What are DQOs?

- Planning Tool
- Cost Management
- Decision Identification
- Clear Goals
- Contingency Planning
Where are the DQOs?
They are in the QAPP

Who Drafts the DQOs?
The Phase II Contractor doing the Sampling
{TBA or your Contractor(s)}

Who Approves the DQOs?
the Tribe (TRP)*
DEFINE THE BOUNDARIES OF THE STUDY AREA

What are the spatial (property) boundaries of the study area?

✓ Property lines known?
✓ Property Access?
✓ one or multiple areas?
✓ media boundaries?
What is the most cost-effective design that is expected to meet the data quality objectives?

- Time & Budget realistic?
- Need to refine scope?
- Need to phase field work?
- Screening levels correct for the site?
DISCUSSION QUESTIONS:

What should the DQOs be?

• Area of Study?
• Media Sampled?
• How many Samples? (random, every sq.ft., every sq. yard, selected areas?)
• Data detection level?
• Budget adequate?
The TBA Phase II Assessment used 21 mg/kg (HRS) as the screening level to determine if there was a hazardous release of Arsenic at the site.

Discussion Questions:
• Was the HRS screening criteria appropriate for the site? If not- Why not?
• If not, what screening criteria should have been used?
• How could use of the HRS screening criteria been prevented?
Using the screening criteria for the **Hazard Ranking System (HRS)***, samples with levels less than 3 times the background level, or 21 mg/kg arsenic, would **not be considered a hazardous release.** (3 X 7 mg/kg = 21 mg/kg)

What were the Residential & Industrial PRGs?

*HRS used to rank sites for the Superfund (NPL)*
**Field XRF Data**

TBA Samples: Arsenic in Soils

- All four XRF samples had arsenic levels that exceeded the Industrial RSL
- All four XRF Samples exceeded the HRS screening level

Highest XRF Sample = 27 Mg/Kg

**Question:** Is cleanup of the soils needed? (Yes or No?)
Use of Screening Levels: TBA Phase II Report

“Screening levels should **not** be used as cleanup levels. Cleanup levels need to be determined through the performance of a risk assessment, which takes into account exposure pathway, affected population, toxicity, and exposure concentrations.”
## ARSENIC
### RESIDENTIAL SOILS

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<td>soil-dermal</td>
<td>4.50E+00</td>
<td>2.30E+01</td>
</tr>
<tr>
<td>soil-ingest</td>
<td>4.30E-01</td>
<td>2.20E+01</td>
</tr>
<tr>
<td>combined</td>
<td>3.90E-01</td>
<td></td>
</tr>
</tbody>
</table>

\[3.90E-01 = 0.39 \text{ mg/kg}\]
## ARSENIC INDUSTRIAL SOIL

<table>
<thead>
<tr>
<th></th>
<th>soil-inhal</th>
<th>soil-derma</th>
<th>skin-ingest</th>
<th>combined</th>
<th>Chronic HQ</th>
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<tbody>
<tr>
<td>Cancer Risk = 1E-06</td>
<td>= 1</td>
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<td>soil-inhal</td>
<td>1.30E+03</td>
<td>9.60E+00</td>
<td>1.90E+00</td>
<td>1.60E+00</td>
<td>1.50E+03</td>
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<tr>
<td>soil-derma</td>
<td>2.50E+01</td>
<td>3.00E-01</td>
<td>2.50E-01</td>
<td>2.50E-01</td>
<td>2.60E+02</td>
</tr>
</tbody>
</table>

1.60E + 00 = 1.6 mg/kg
DISCUSSION QUESTIONS:

1) Based upon the field data: Is a “Clean Up” of Arsenic in the soils needed?

2) Considering the Tribe’s intended reuse of the site: What kind of exposures should be considered for what kind of receptors?

3) Should the PRG be: Residential or Industrial level?

4) Should the PRG be: Chronic or Cancer level?

5) What should be the cleanup goal?
TBA Samples: Arsenic in Soils

Highest XRF Sample = 27 mg/kg

Highest Laboratory Sample = 9.2 mg/kg

Background = 7 to 8 mg/kg
2 Phase II Assessments were conducted by an EPA Superfund contractor and included soil sampling for Arsenic (an XRF was used for on-site sampling data and some samples were sent to a Lab.) Based upon the findings of the TBA Phase II Report:

- Arsenic levels in the soil did not exceed the Phase II Screening Levels.
- Phase II Report Conclusion: There is no hazardous release of Arsenic at the site.
DISCUSSION QUESTION: CLEANUP OF ARSENIC IN SOILS NEEDED?

- Highest Laboratory Arsenic Level = 9.2 mg/kg
- The background sample with the lowest reading contained 8 mg/kg arsenic.
REVIEW:
Based upon the findings of the TBA Phase II Report there is no hazardous release of Arsenic at the site.

QUESTIONS:

- Was the HRS screening criteria appropriate for the site?
- If not, what screening criteria should have been used?
- How could use of the HRS screening criteria been prevented?
- Is a soil cleanup needed?
- Is making a cleanup decision easy?