Source Removal- Policy and Practice in the FDEP

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Distinction Between Policy and Practice

- Policy- Address Source of Contamination as Primary Remedial Target
- Practice is Limited by Numerous Constraints
  - Lithology- Heterogeneity, Impermeability
  - Access- Many Sites Still Active, Little Space
  - Cost-Need to Strike Balance
  - Safety- Fire/Explosion; Stray Voltage

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The Trick is Determining
(in Advance)
When Source Removal is
Achievable Under the Existing
Constraints

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The Florida Drycleaning Solvent Cleanup Rule Gives the FDEP the Authority to Focus on Source Area Contamination and Allow Natural Attenuation to Address Peripheral Contamination

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Natural Attenuation

- Natural Attenuation Default Concentrations
- Evidence of Natural Attenuation
- Focus on Biological Attenuation
- Time Limit to Achieve Site Cleanup Target Levels

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Source Removal Strategy

- Begins During Assessment
  - -DNAPL Assessment is Much more Detailed and Intensive
  - -Focus on Suspect Areas
    - DC Machine
    - PCE Storage Areas
    - Septic Tank/ Drainfield
    - “Out Back” (A Perennial Favorite)

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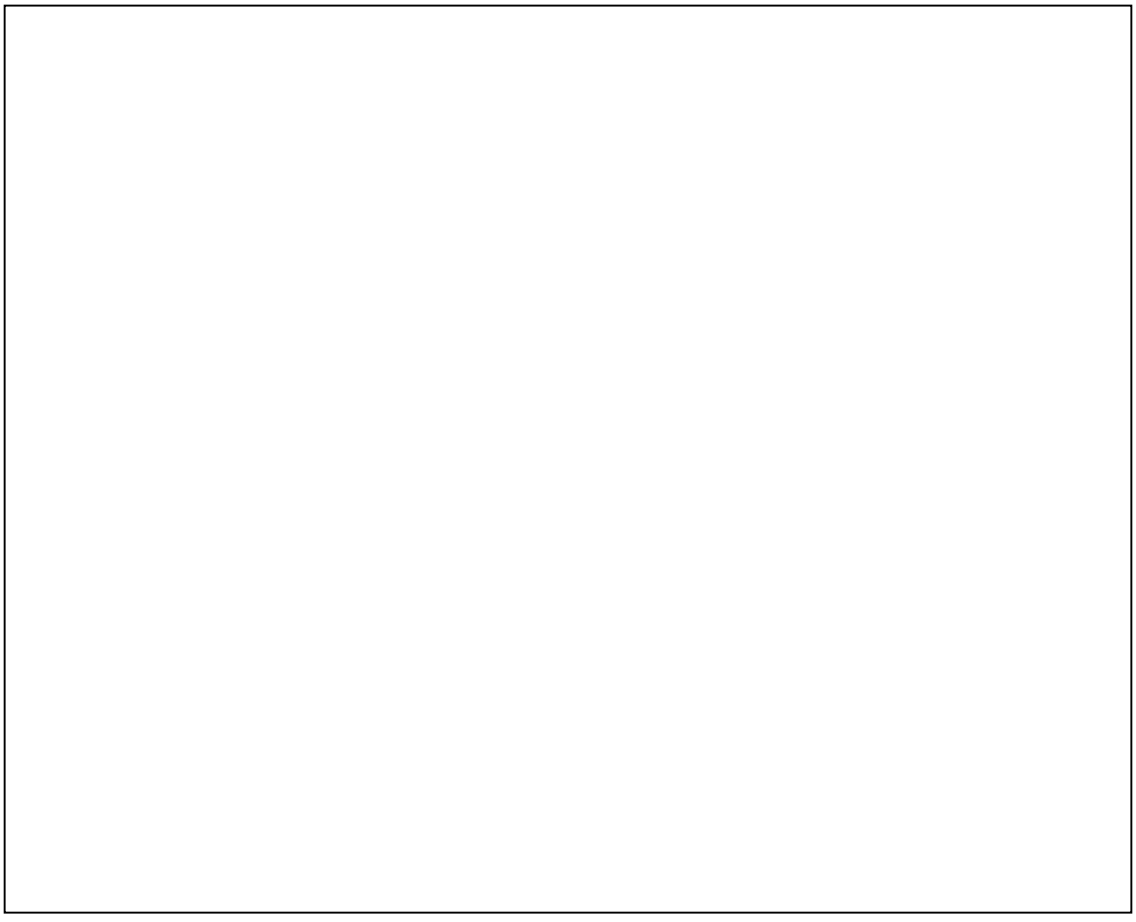

High Density Sampling

Provides an Accurate Picture of Contaminant Distribution

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High Density Sampling

- Cluster Wells
- Multi-Level Samplers
- High-Frequency Soil Sampling
- Tracer Tests
- Remote Sensing (LIF, Raman, CPT)

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Remedy Selection

- ISCO- Losing Favor
- Cosolvent Flushing
- Co-Oxidation- New Technology
- Excavation-Vadose and Saturated Zones

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Pilot Testing

- Cosolvent Flushing
  - Containment of Cosolvent
  - Remedy Effectiveness
  - Effectiveness of Fluid Treatment

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Pilot Testing

- ISCO
  - Rebound…and Rebound…and Rebound….
  - Soil Oxidant Demand
  - Plume Displacement
  - Trace Metal Contamination

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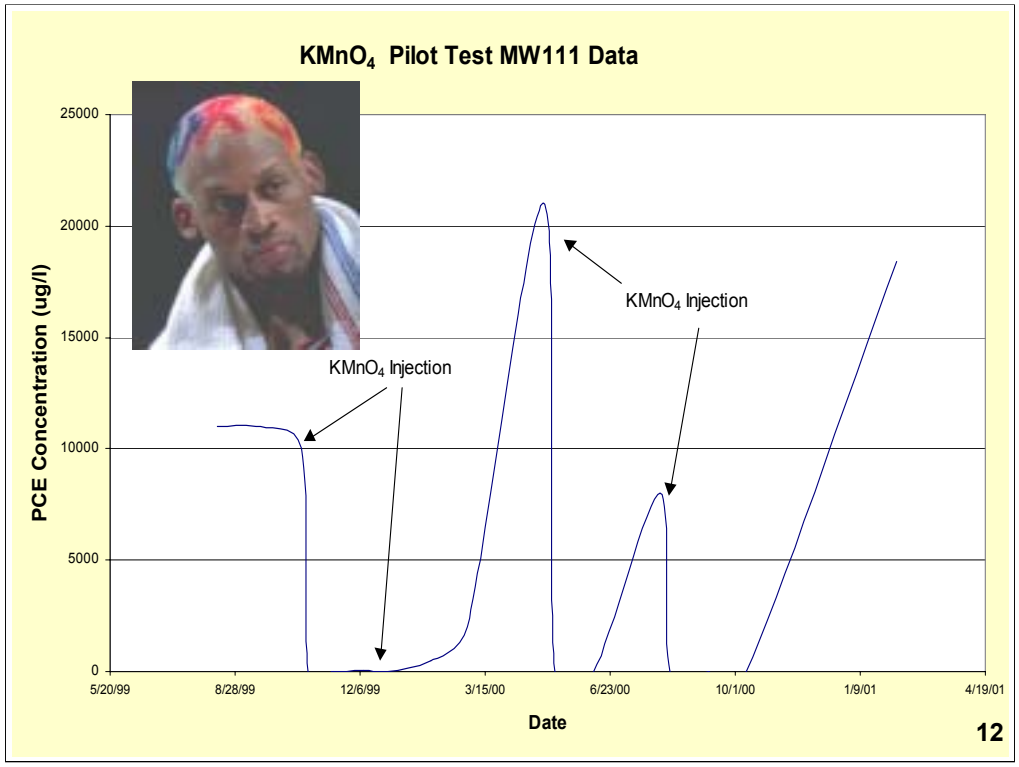
KMnO4 Pilot Test MW111 Data
PCE Concentration (ug/l)
25000
20000
15000
10000
5000
0
5/20/99
8/28/99
12/6/99
3/15/00
6/23/00
10/1/00
1/9/01
4/19/01
Date
KMnO4 Injection
KMnO4 Injection
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Pilot Testing

- Co-Oxidation
  - Promising Technology, but Untested
  - May Still Suffer Rebound
  - Improves Contact Between Oxidant and PCE

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Co- Oxidation

- Hybrid of ISCO and Cosolvent Flushing
- Mixture of Permanganate and Cosolvent (tert-Butyl Alcohol)
- Improves Mass Transfer and Solubility of PCE
- Gets PCE into Aqueous Phase for Oxidation
- Patented Technology Still Under Development

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Co- Oxidation

- Faster than Permanganate Alone
- Less Infrastructure Required Than Cosolvent Flushing
- Less Space Required Than Cosolvent Flushing
- Contaminant Destroyed In-Situ-No Aboveground Treatment
- Extraction of Co-Oxidant Typically Required
- Safety Issues- Combination of a Strong Oxidizer and an Organic Molecule

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Many Sites are Not Suitable for Source Removal at This Time

- Heavy Soils/ Fractured Limestone
- Limited Space/Access
- Areas Beneath Operating Facilities

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Source Containment

- Hydraulic Containment- It's Hard to Like
  - Cost
  - Space Requirements
  - Infrastructure and Logistics
  - OM&M
  - Disposal of Treated Water

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Biological Containment

- Lower Cost
- Small Footprint
- No O&M, Reduced Monitoring
- No Extracted Water to Treat/ Dispose

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Biological Containment

- Intent is to Isolate the Source from Surrounding Groundwater
- Goal is to Establish a Biological Barrier That Can be maintained for a Long Time
  - Low Capital and O&M Costs
  - Monitoring for Effectiveness, not Source Reduction

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Areas of Potential Savings

- Design and Installation- Cut Off the Plume
- Substrate Injection based on Site-Specific Criteria
- O&M- Milk Run Approach to Substrate Injection
- Monitoring- LIMITED number of Wells, Less Frequently
- Emphasis on Indicators of Biological Activity, Not Contaminant Reduction

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Areas of Potential Savings

- Semi-Annual or Annual Monitoring
- Indicators of Biological Activity (ORP, pH. Chloride)
- Wells in Barrier and Downgradient, not in Source Area
- 8021 Analysis to Track Barrier Effectiveness, not “Remediation”

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Adopting Biological Containment is not Conceding Defeat

You are Just Waiting for a Bigger and Stronger Opponent to Die of Old Age

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Major Source Removals in 2002-2003

- Butler Cleaners- Co-Oxidation
- Sages Cleaners- Cosolvent Flushing
- Johnson's Cleaners- KMnO4 Reinjection
- One-Stop Cleaners- KMnO4 Reinjection

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