

# Technical Approaches to Rapid Site Assessment & Cleanup of Drycleaner Sites: Florida Case Studies

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# Florida Drycleaning Solvent Cleanup Program

- Created by Florida Legislature in 1994
- First such program in U.S.
- Legislation sponsored by drycleaning industry
- Administered by Bureau of Waste Cleanup, Florida Department of Environmental Protection



# Why a Drycleaning Solvent Cleanup Program?



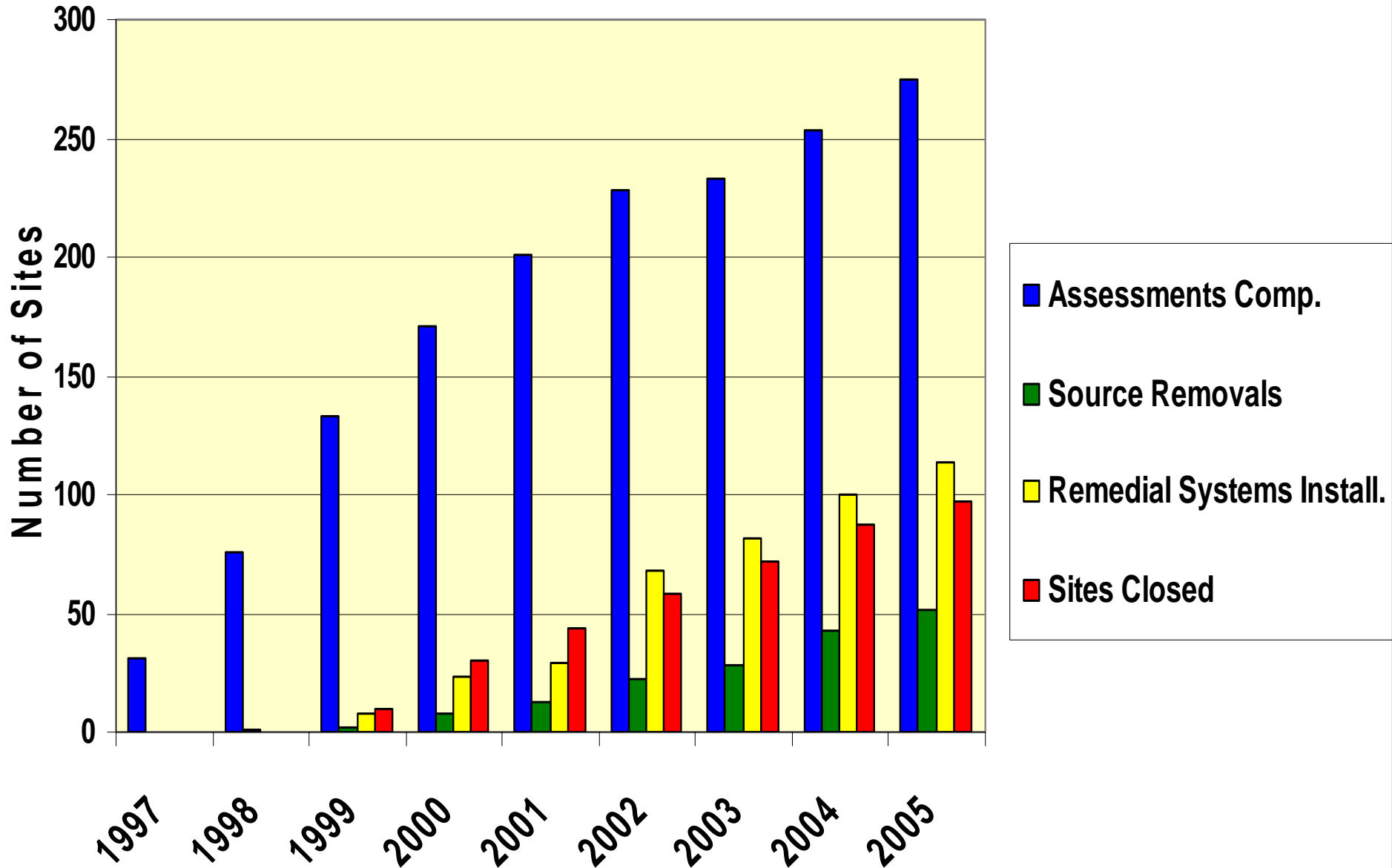


- 93% of Florida's drinking water derived from groundwater.
- Florida aquifers are vulnerable to contamination.
- Most drycleaning sites are contaminated.
- Drycleaners are small businesses with limited assets.
- Chlorinated solvent remediation is expensive.

# Funding & Implementation

- Four sources of funding: 2% gross receipt sales tax, \$5/gallon tax on perchloroethylene solvent, \$100 annual registration fee & deductible fee (\$100 – \$10,000)
- Annual revenue: \$10,000,000
- 1,576 Applications with 1423 Sites Eligible
- Assessment & remedial work conducted by 11 private-sector contractors.

# Florida Drycleaning Solvent Program Activity



# Conducting Site Assessments

- Samples collected with direct push technology
- Samples analyzed on site in mobile laboratory
- Scope of work changed in field
- Data necessary for remedial design collected during site assessment
- “Microwells” utilized as monitor wells
- Sonic drilling rigs used to collect deeper samples and install monitor wells
- Membrane Interface Probe used to delineate contaminant source areas
- Modified active soil gas surveys used to define unsaturated zone sources









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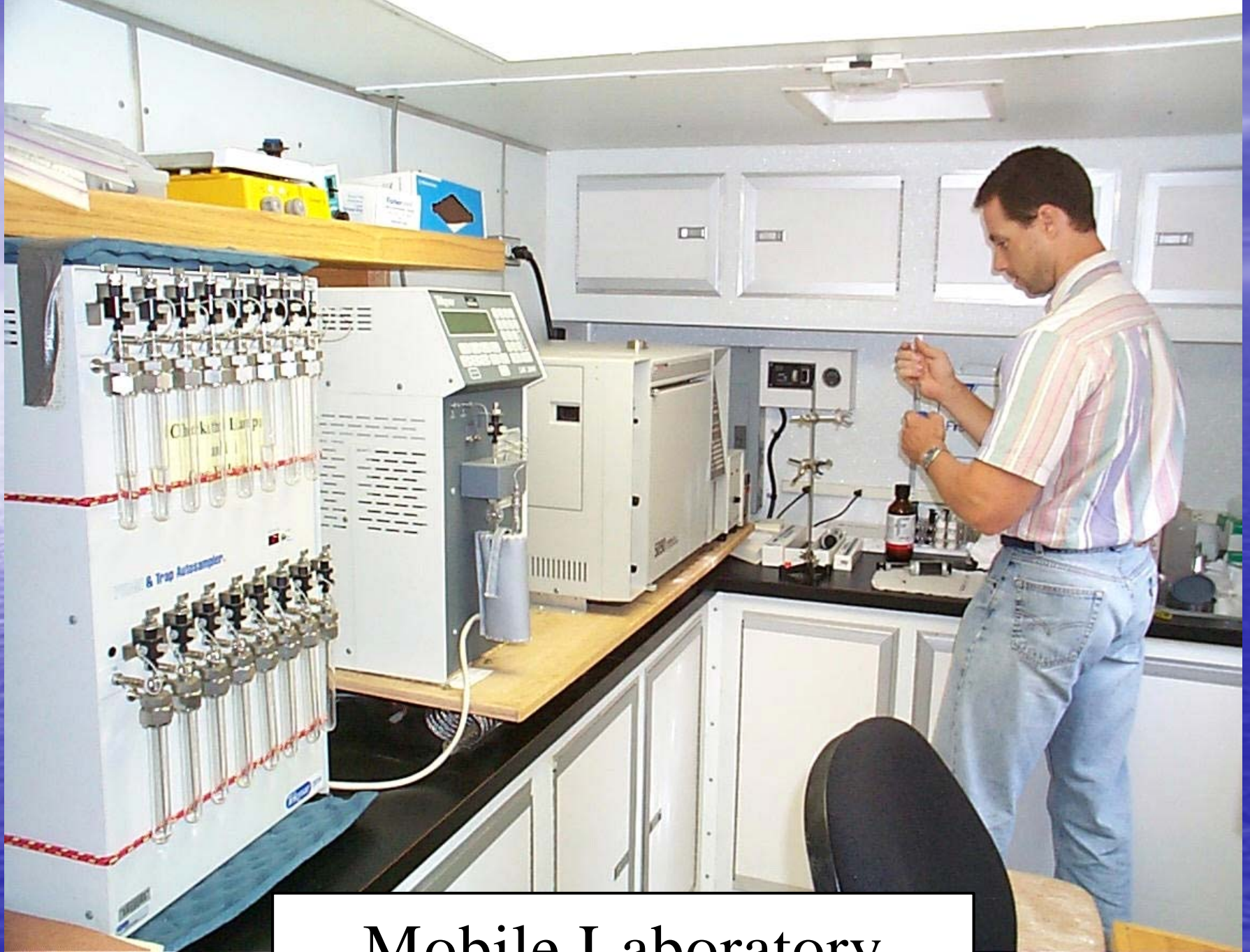
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MOBILE  
ENVIRONMENTAL  
LABORATORY

1758  
LCT-486



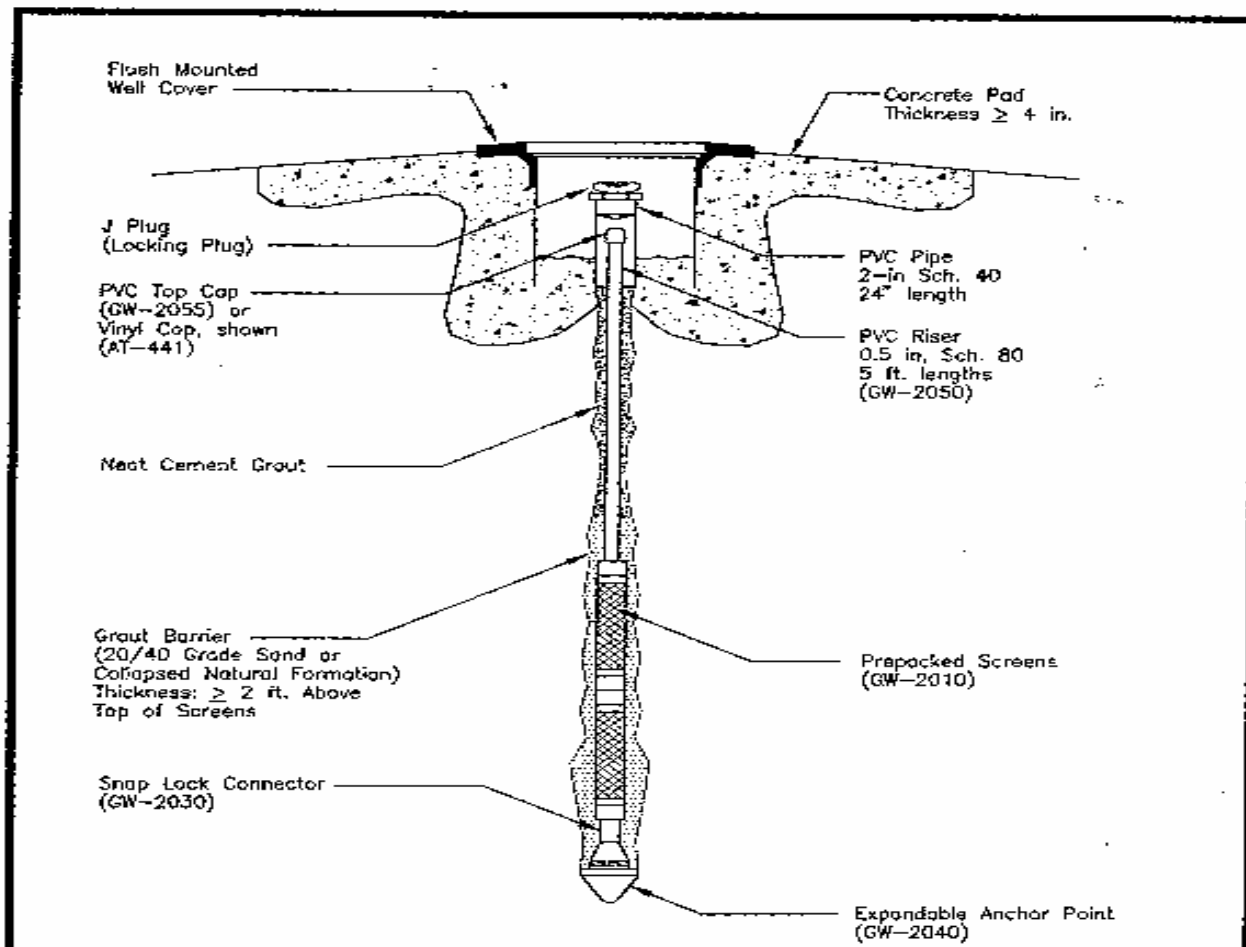




Mobile Laboratory



# Direct-push installed "Microwell"



Geoprobe Prepacked Screen Micro Monitoring Well Schematic

**M&E** Metcalf & Eddy  
 340 E. Lincoln Ave.  
 Denver, North Platte  
 Phone (303) 233-7770

DATE 6/16/97  
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DRY CLEAN INN

GEOPROBE PREPACKED SCREEN MONITORING WELL SCHEMATIC

FIGURE 13







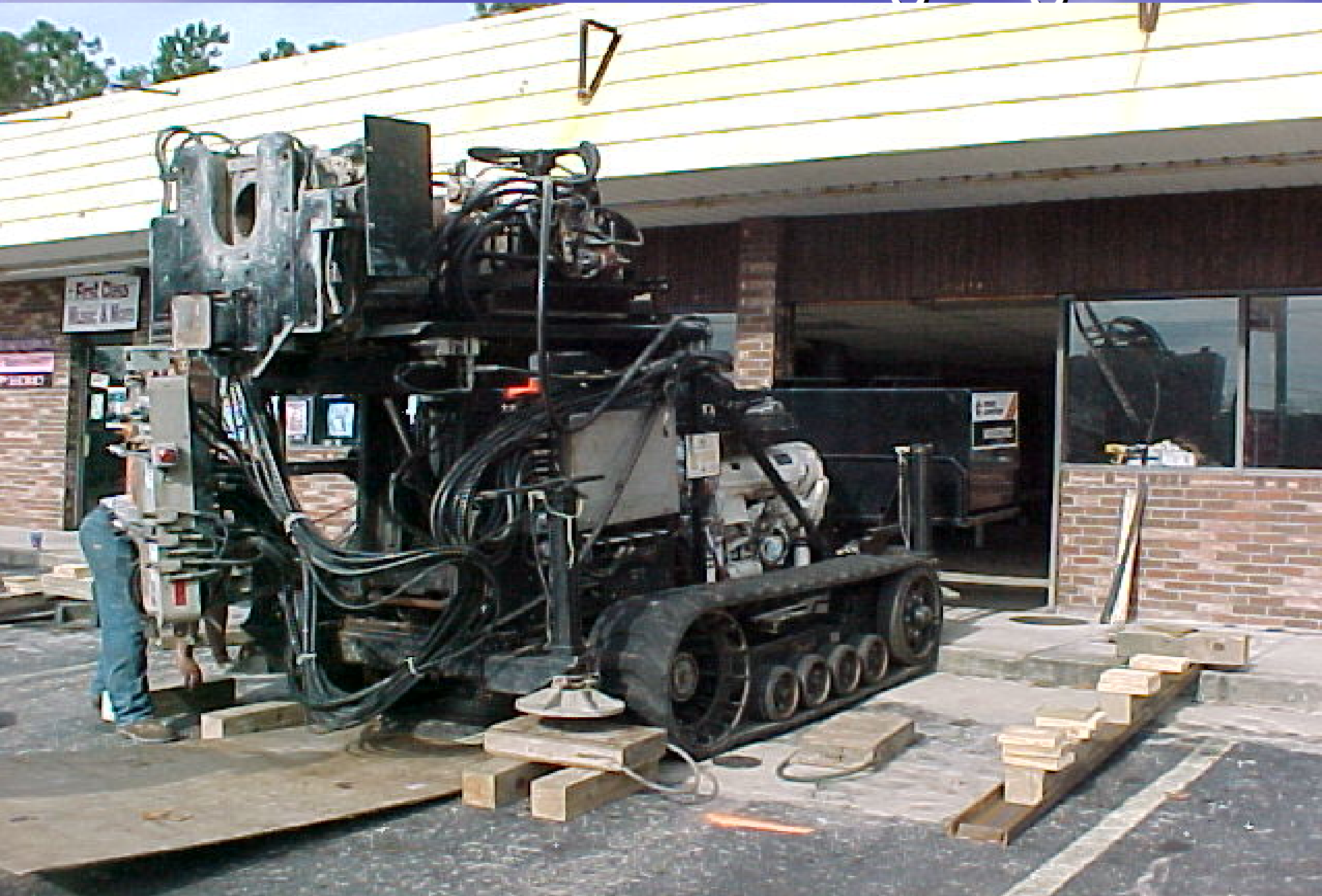
Installation of Micro-well



Rotosonic Drill Rig



# "Mini" Rotosonic Drilling Rig

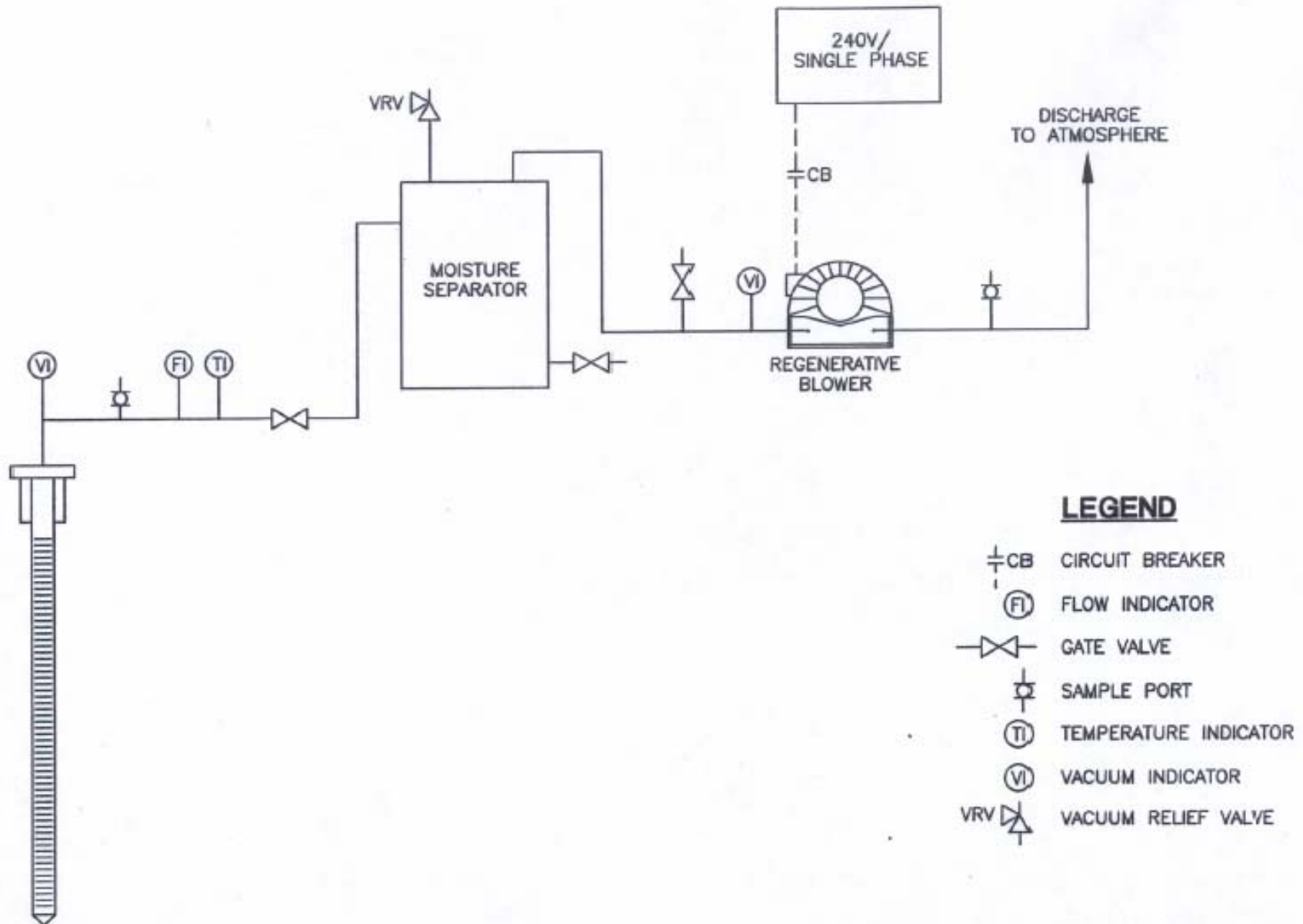


# Inside Work with Rotosonic Rig





# Modified Active Soil Gas Survey



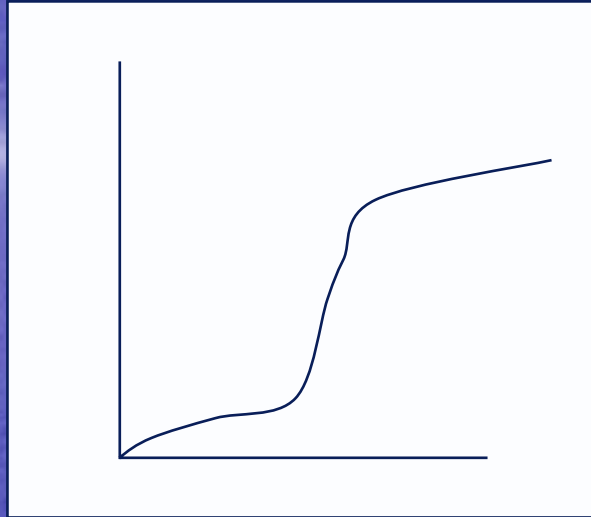
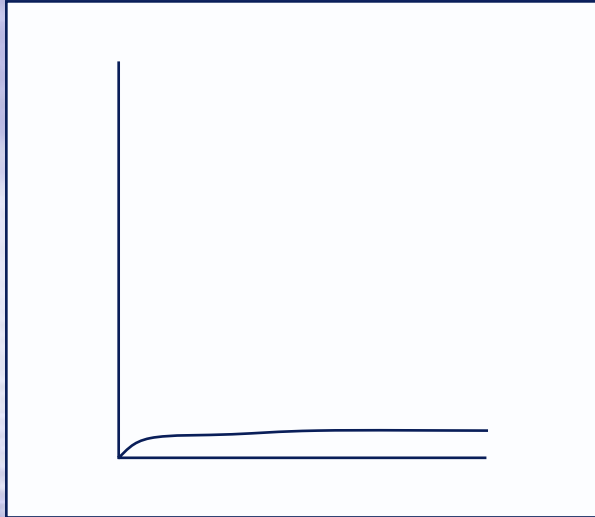
NOT TO SCALE

# MAGS Schematic

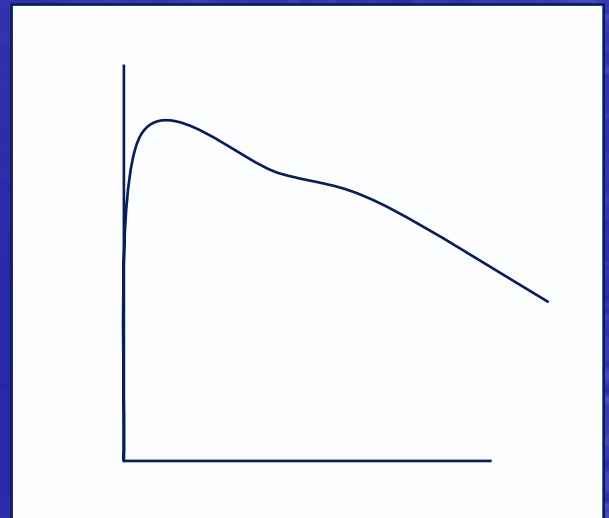
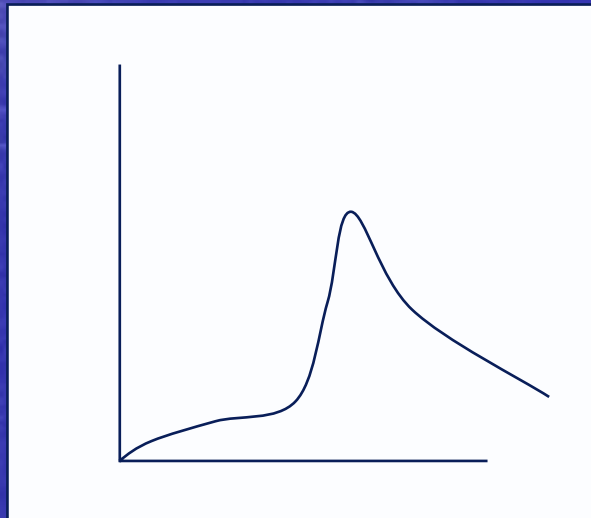
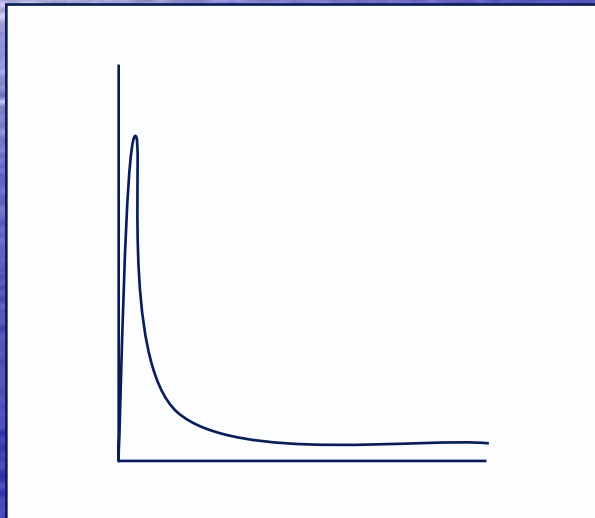




# MAGS: VOC Concentration vs. Time



$$R_{lt} = \sqrt{\frac{Q}{\theta_a b \pi}} \times t$$



# Membrane Interface Probe

- Developed by GeoProbe
- Polymer membrane mounted on probe
- Membrane heated to 100-200 degrees C
- Heated membrane volatilizes contaminant
- Vaporized conducted to surface through tubing via inert gas.
- Typically 3 detectors at surface: FID, PID, ECD



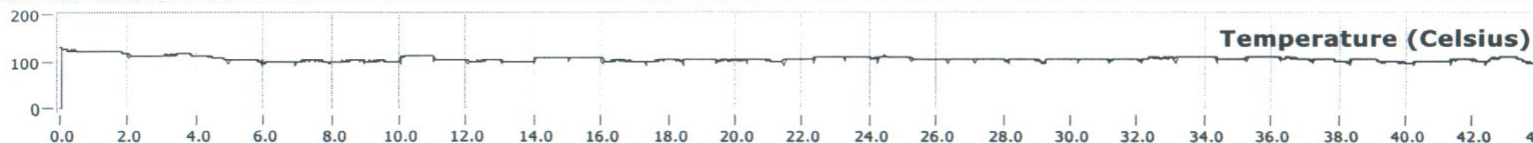
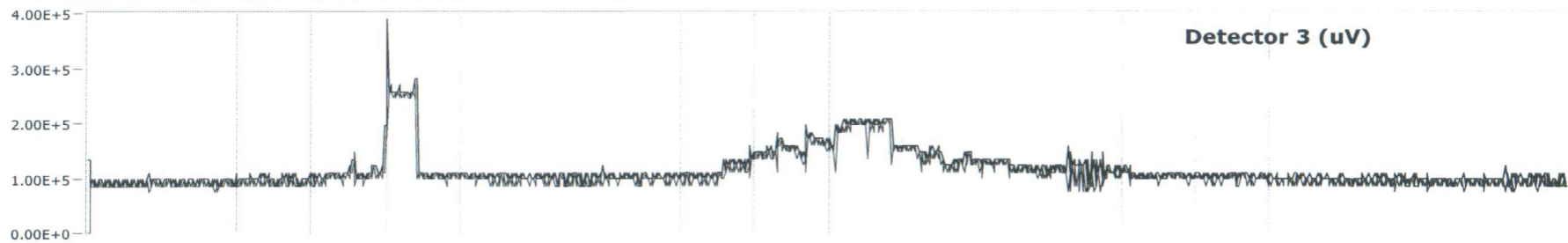
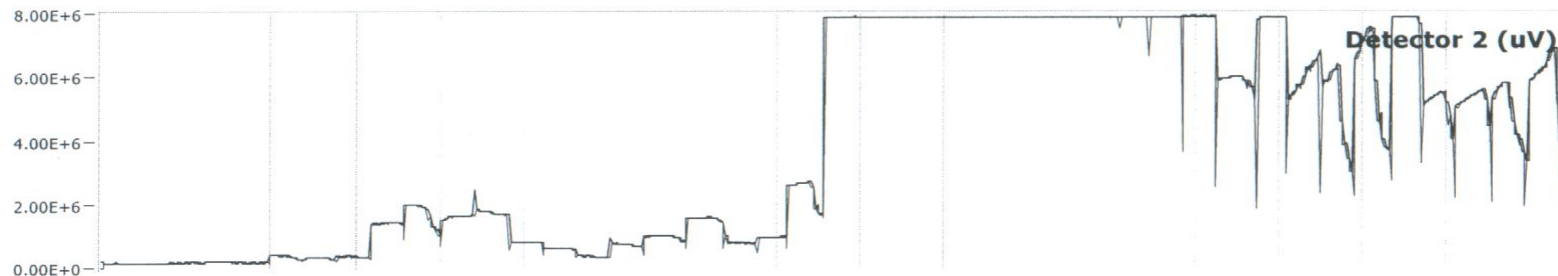
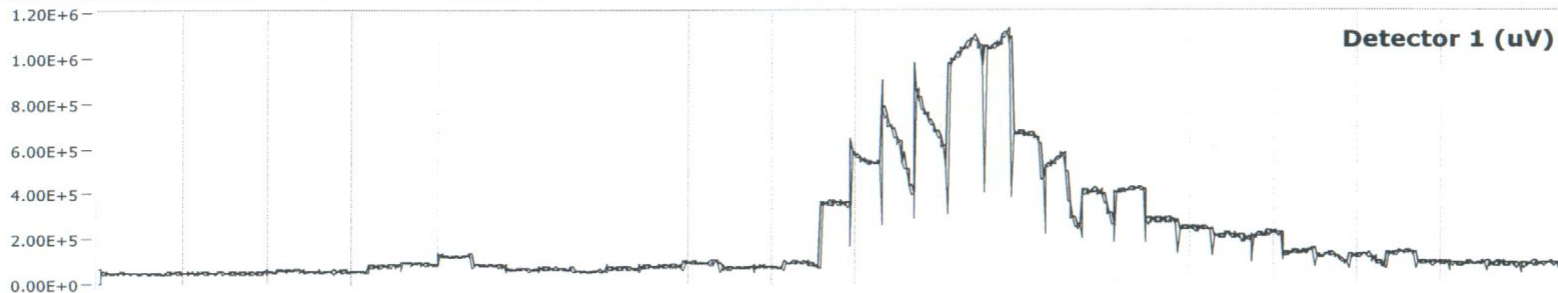
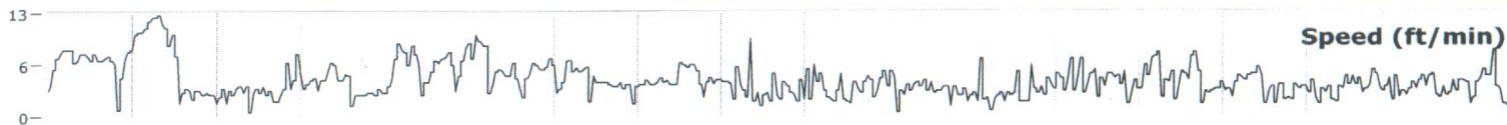
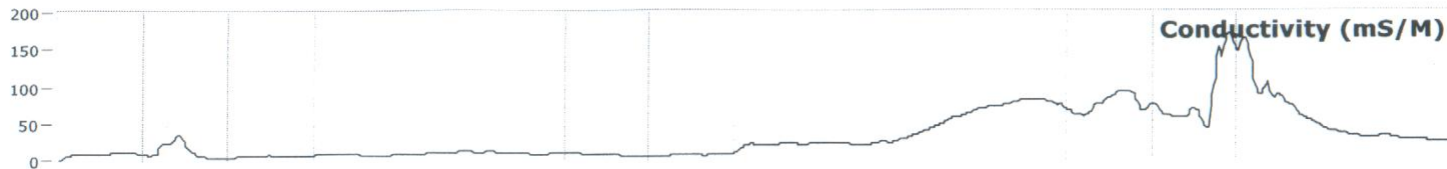




# Membrane Interface Probe Operation







# Remediation





# Remedial Technologies Utilized at Florida Drycleaning Sites

- Excavation/Removal
- Soil Vapor Extraction
- Pump & Treat
- Dual/Multiphase Extraction
- Air Sparging
- Recirculating Wells
- Diffusive Oxygen Emitters
- Co-solvent Flushing
- Zero-valent Iron
- Chemical Oxidation using: Potassium Permanganate, Fenton's Reagent, Ozone
- Co-oxidation
- Biostimulation using: Ethyl Lactate, Potassium Lactate, Dextrose, Hydrogen Release Compound, Molasses, Vegetable Oil,
- Bioaugmentation

## Vacuum Excavation of Residual Soils (vapor control)



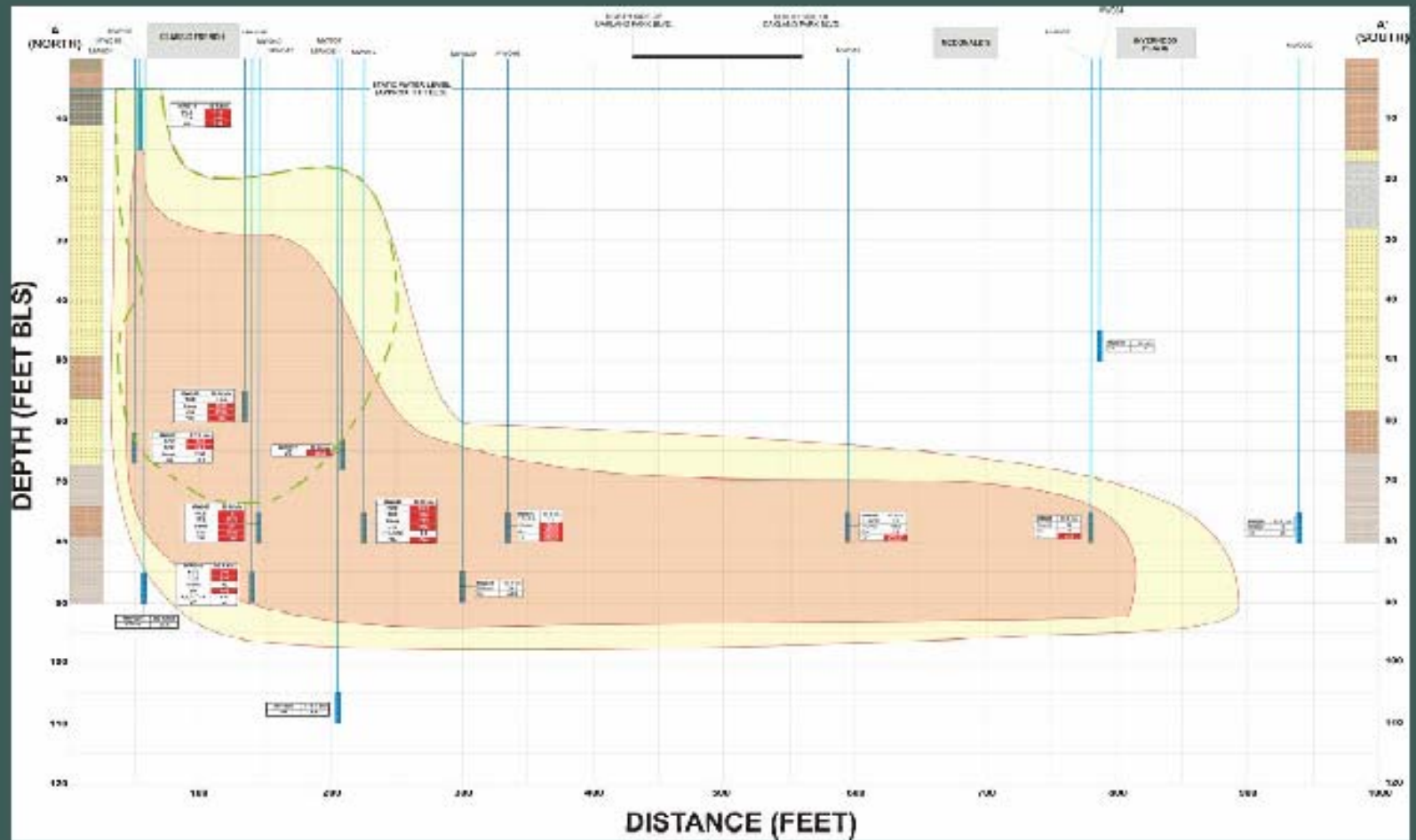


# Horizontal Extent of GW Contamination

- Plume length ~ 350 meters
- Deepest contamination ~ 25 meters
- PCE – 29 mg/l
- Total VOHs – 42 mg/l

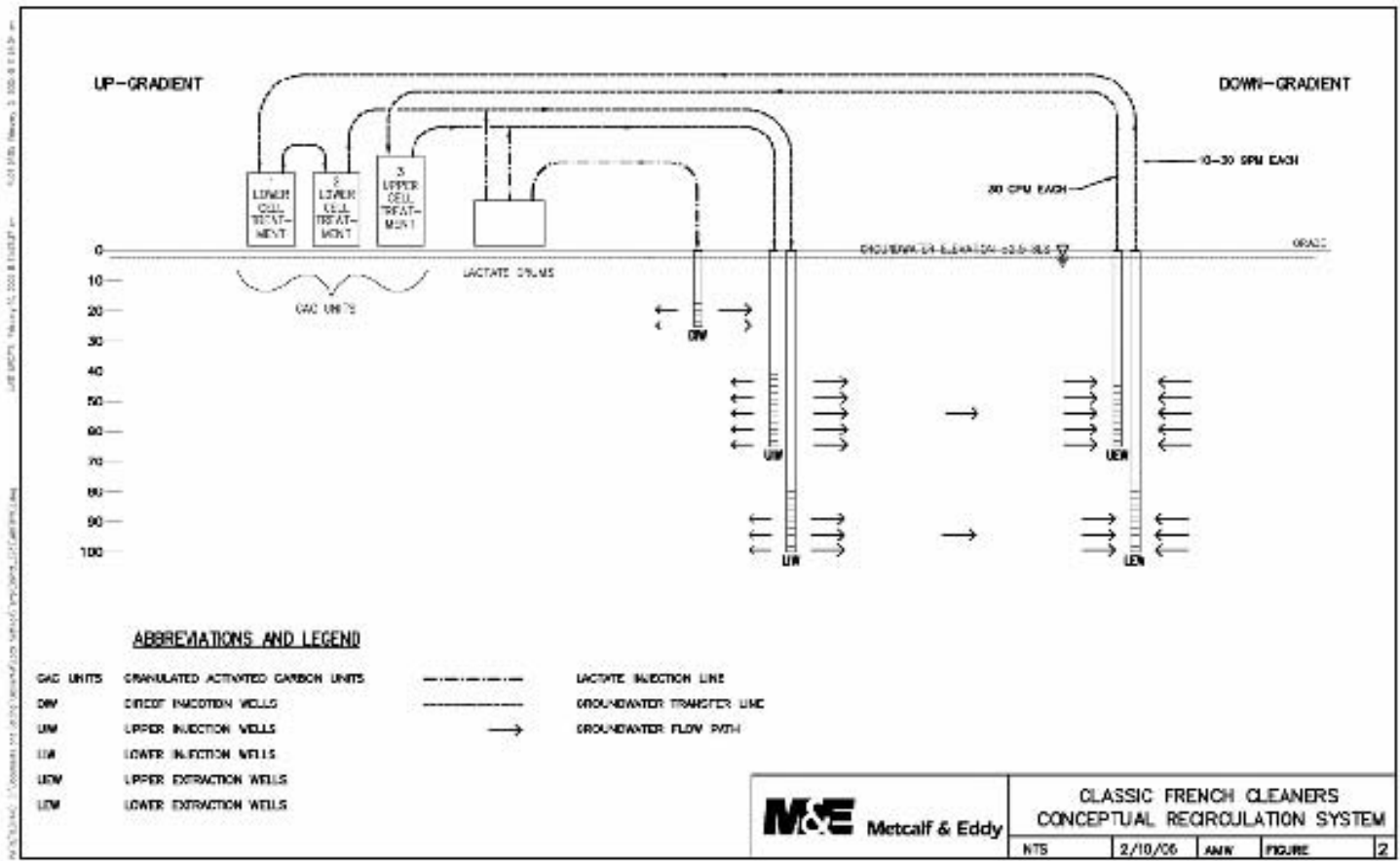


# Plume Cross-Section





# Process Flow



# In-Situ Chemical Oxidation (Potassium Permanganate) One Stop Cleaners



Injection Well Vaults



Analyzing  
Permanganate  
solution

Injection  
Well Manifold

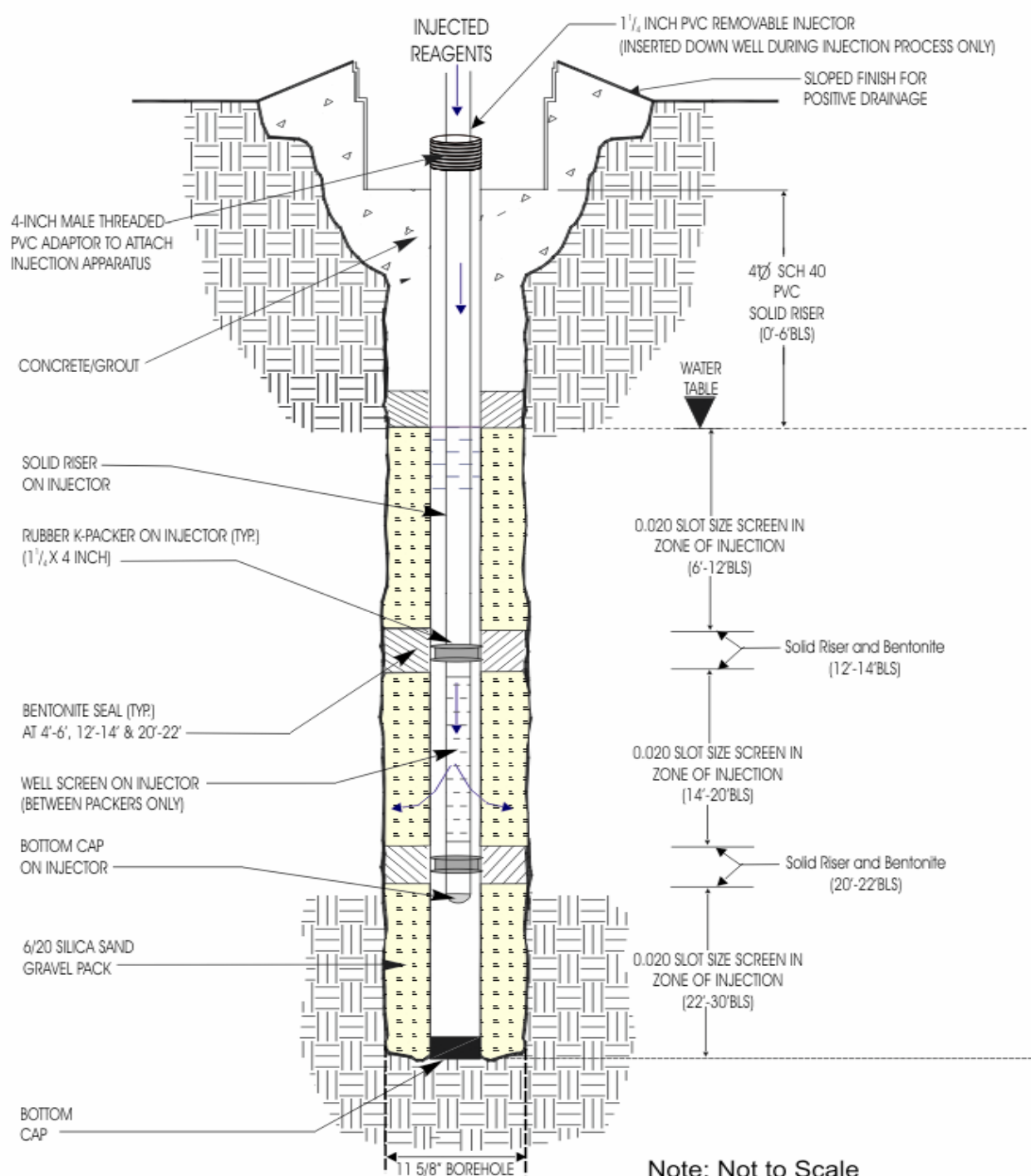


Loading Permanganate  
Storage Hopper





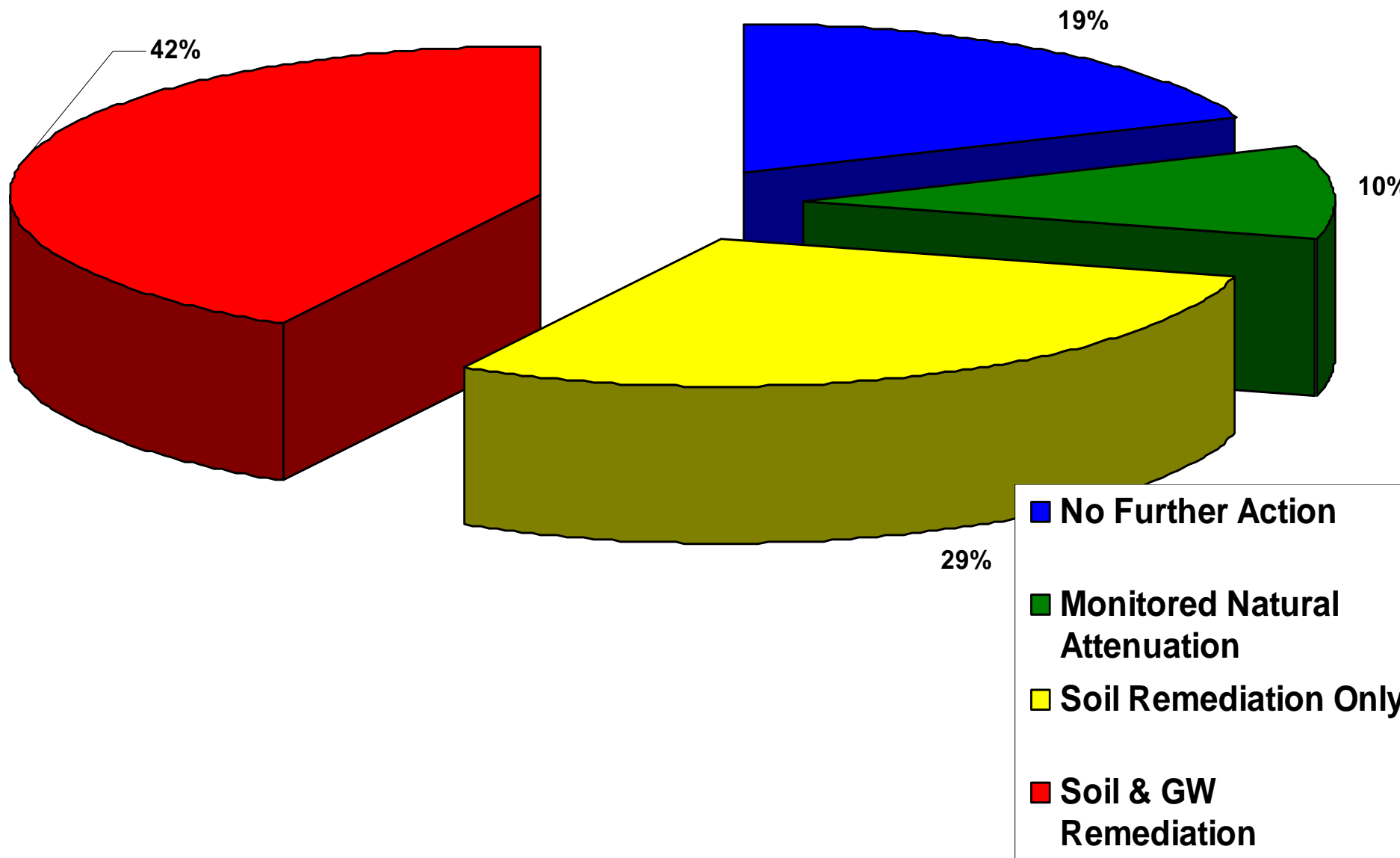
WARNING  
NO TRESPASSING  
ALL ACTIVITIES  
ARE PROHIBITED  
ON THIS SITE  
UNLESS AUTHORIZED  
BY THE OWNER



Note: Not to Scale



# Closing Florida's Contaminated Drycleaning Sites (275 Sites)



Questions???

