Performance Verification of Field Analytical Technologies that Can Assist in Site Characterization and Monitoring Activities

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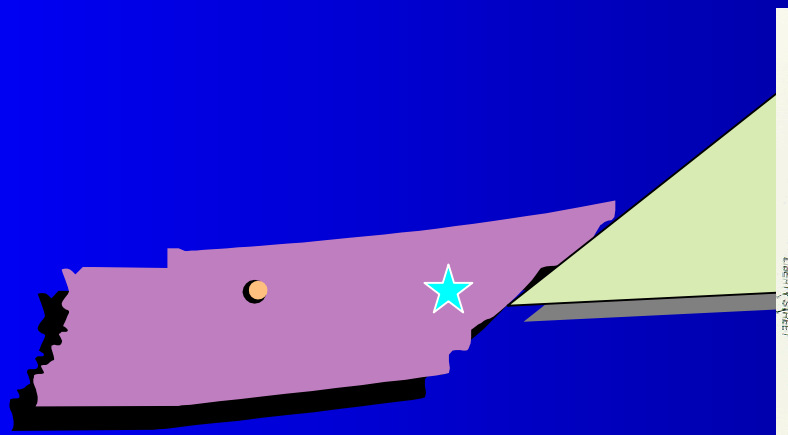
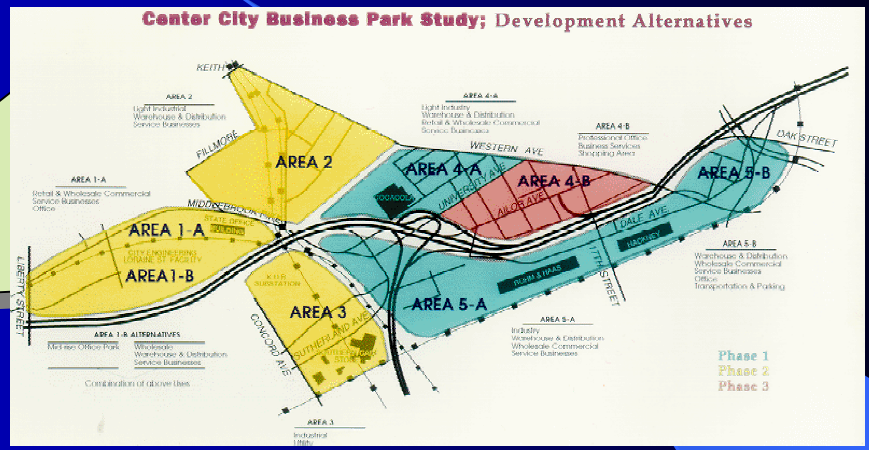
Brownfields investigations require ***innovative*** approaches…faster…cheaper…better

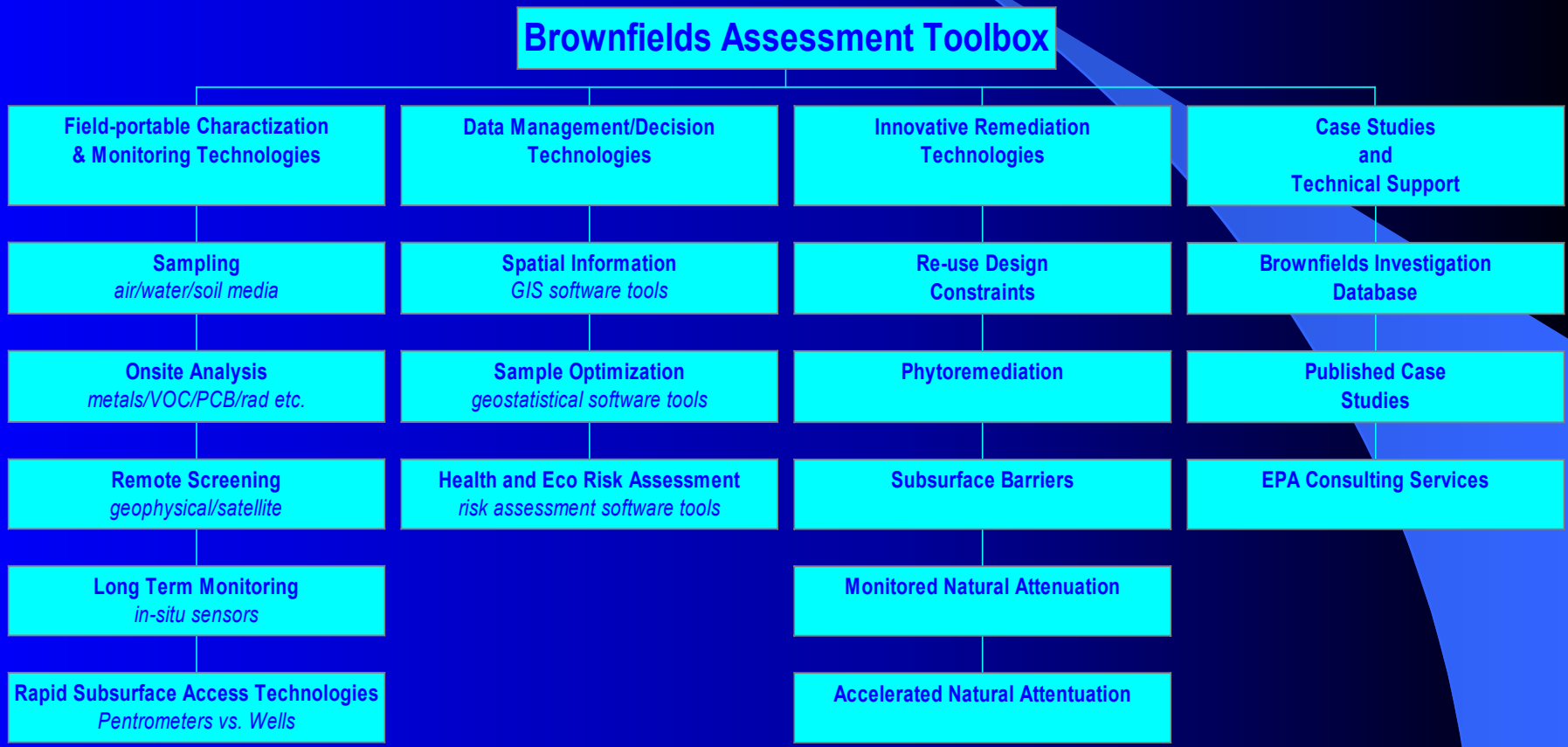
- **Faster...**
  - Reduced sample "turnaround" time
  - In-field decision-making
  - Minimized crew and equipment deployment time
- **Cheaper…**
  - Reduced analytical costs
  - Reduced field labor costs
  - Faster time-to-completion
- **Better…**
  - Data quality as good as or better than fixed off-site lab
  - Refined data analysis through onsite screening results
  - Computer assisted decision making

Brownfields Close to Home



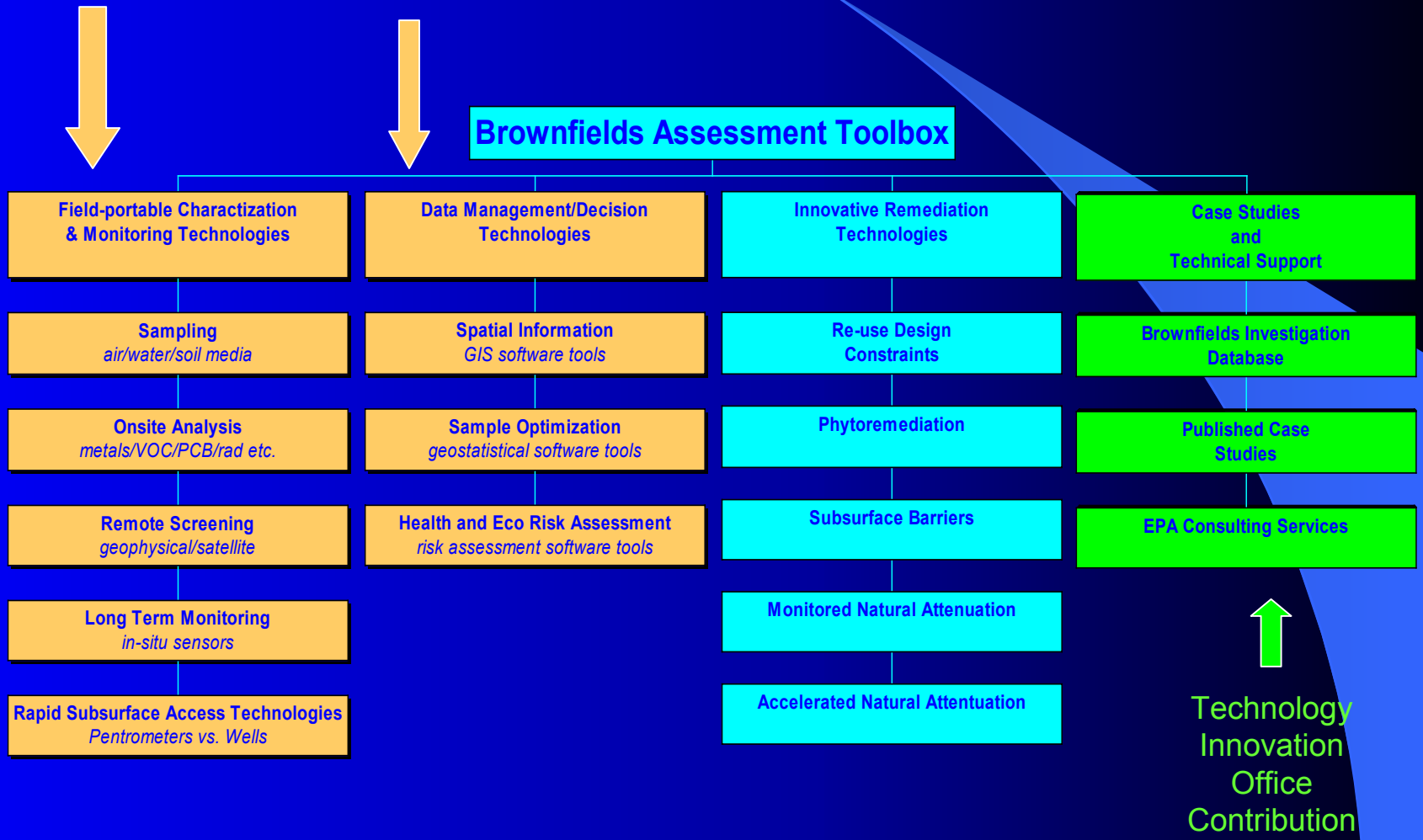


Brownfields Assessment Toolbox



Brownfields Assessment Toolbox

Areas where ETV/SCMT Pilot can contribute



U.S. EPA Environmental Technology Verification Program

- **Purpose:** Accelerate adoption of innovative environmental technologies through independent performance verification.
- **Methods:** Utilize stakeholder groups to prioritize testing needs; partner with third-party testing organizations; conduct scientifically rigorous verification tests.
- **Results:** Verified technology performance; enhanced user confidence; improved environmental protection at reduced cost and increased efficiency.

ETV Customers

- Technology Users and Purchasers - State and Federal Agencies; Consulting Engineers
- Technology Enablers - Permitters; Regulators; Financial and Export Communities
- Technology Developers and Vendors

ETV Program Features

- **Voluntary participation**
  - Commercial-ready technologies only
  - Vendor cost-sharing
  - Not an R&D effort
- **Not an "approval" process**
  - Document technology performance
  - No technology inter-comparison
- **Five-year pilot program**
  - Test alternative methods
  - Public-private partnerships
  - Huge !!! Outreach effort
- **Report to Congress in 2001**

Environmental Technology Verification Program Structure

- 12 Pilot Areas

Drinking Water Systems

Pollution Prevention - Waste Treatment

Pollution Prevention - Metal Finishing

Pollution Prevention - Innovative Coatings

Indoor Air Products

Advanced Monitoring Systems

Air Pollution Control

EvTEC (independent private-sector entity)

Wet Weather Flows

Site Characterization and Monitoring

Source Water Pollution

Climate Change

✓ Third-party Testing Organizations

Battelle-Columbus, Sandia National Laboratories, Oak Ridge National Laboratory

Concurrent Technologies, Research Triangle Institute, National Sanitation Foundation,

California EPA, Civil Engineering Research Foundation, Southern Research Institute

Overview of Environmental Technology Verification Process

Statisticians

Project Officers

Developers

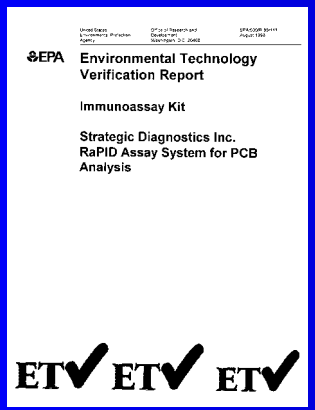
Chemists

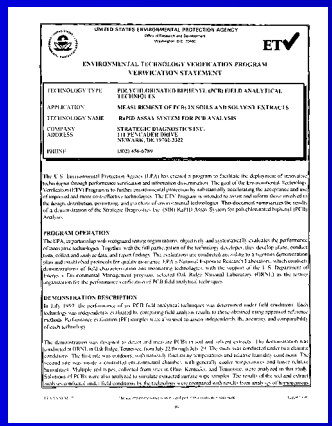
Stakeholders

Experimental Plan

Samples are collected, homogenized, labeled, and assembled for distribution.

Technology developers analyze randomized samples under field conditions.



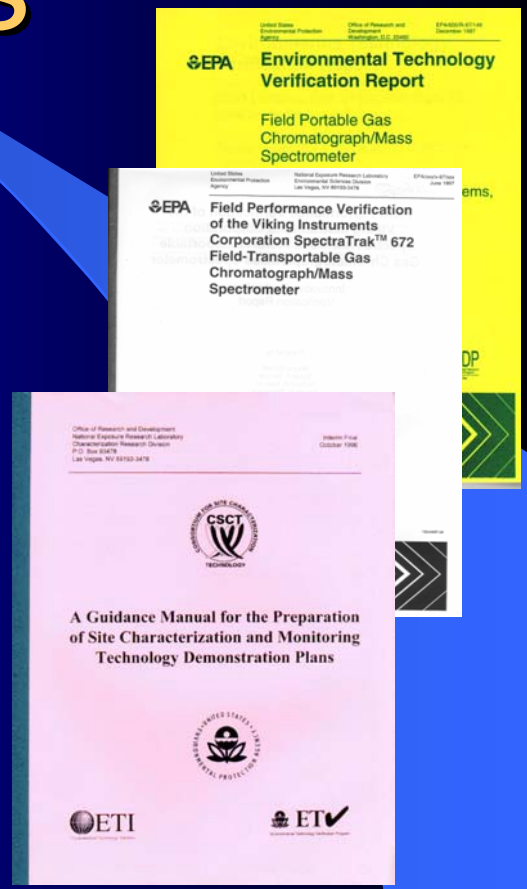


Product is report and verification statement.

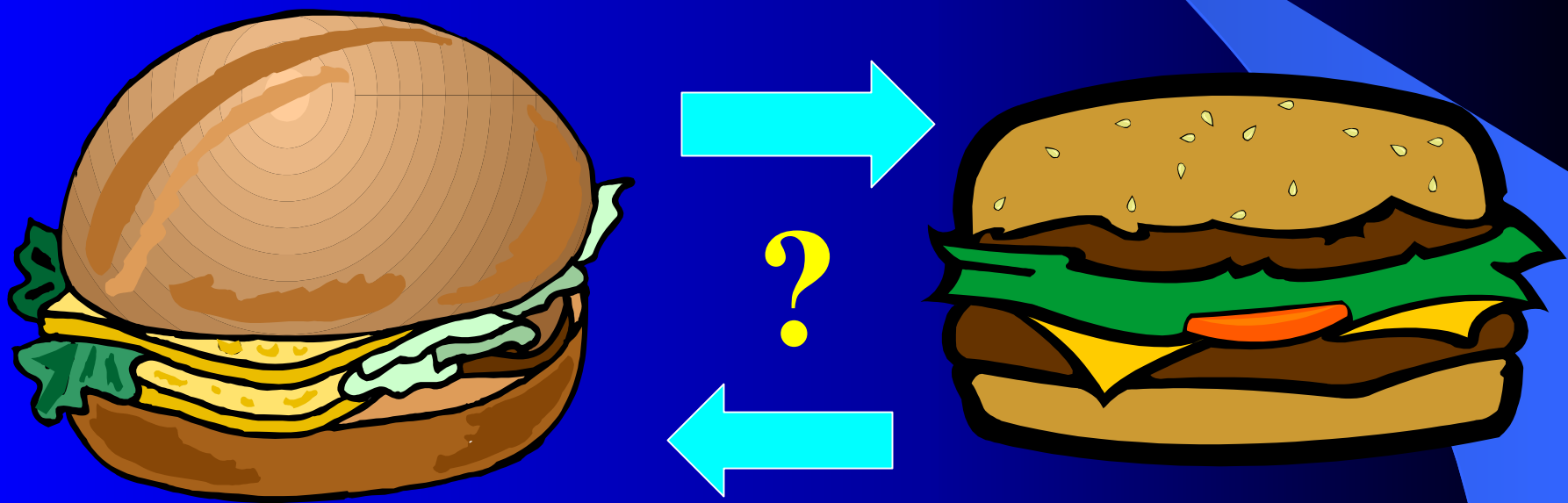
QA Audits Conducted During Verification Testing Documents the High Quality of Data Being Generated

Technology Verification Report Contents

- Verification Statement
- Technology Description
- Site and Design Description
- Reference Laboratory Data Validation
- Technology Demonstration Results
- Field Observations and Cost Summary
- Technology Update



Ok, So Where's the Beef?



Wellhead VOC Monitoring Technologies
Inficon HAPSITE

Detection Limits: 5-10 ug/L

Precision: 12% RSD (median)

Accuracy: 8% absolute difference

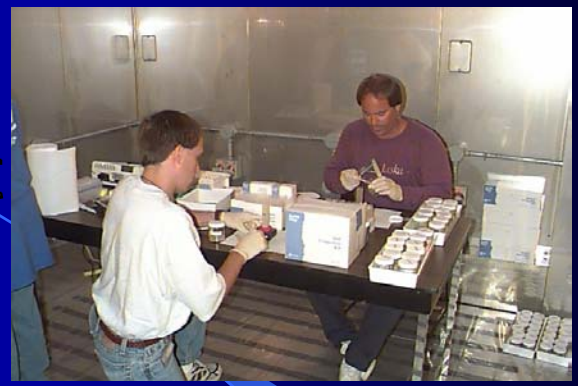
Throughput: 2-3 sample/hr

Weight: 50 lbs

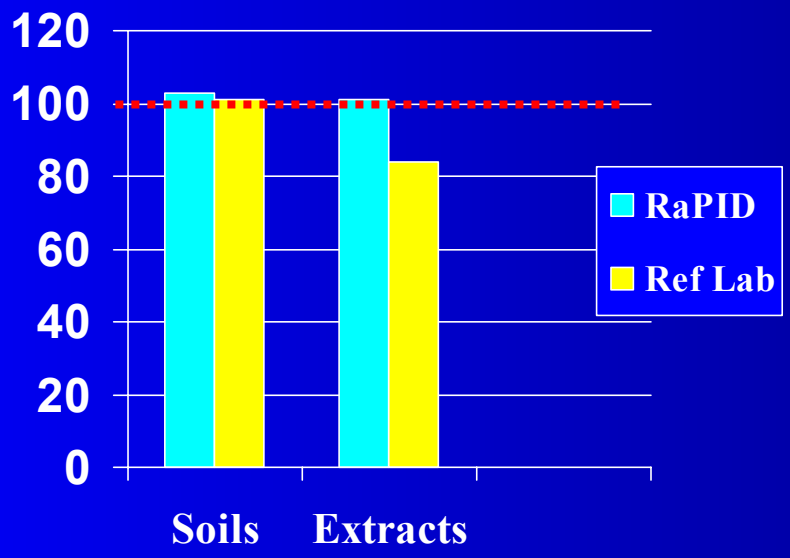
Cost: $ 75-95K

Setup Time: 30 min

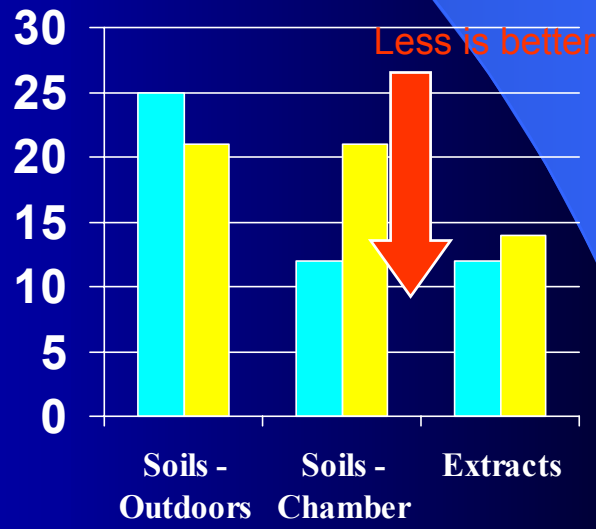
SDI RaPID Assay System for PCB's in Soil and Solvent Extracts



Accuracy, %



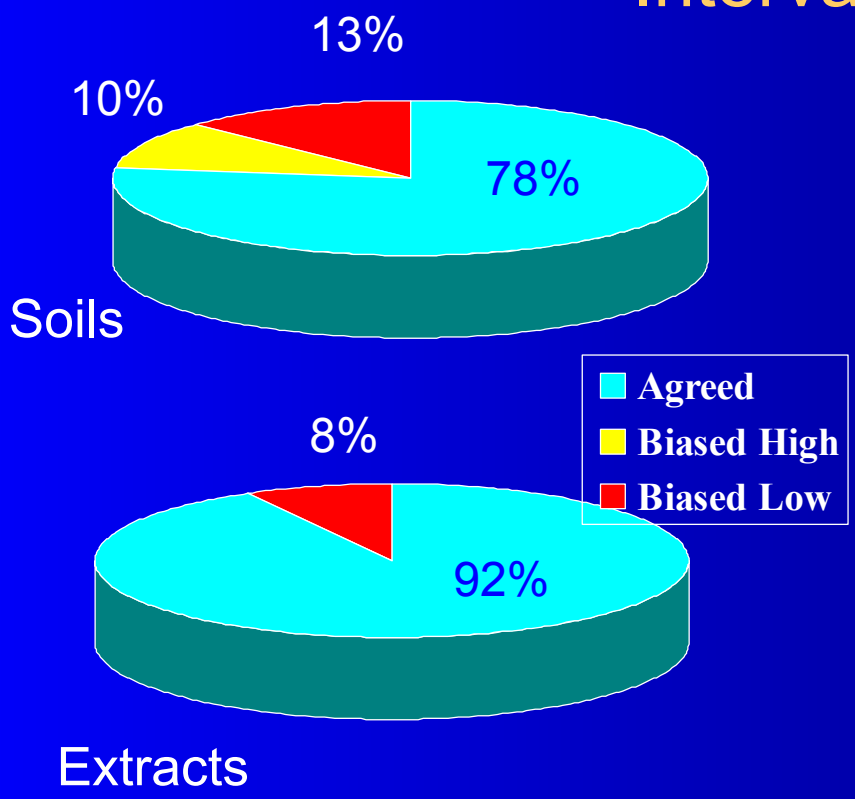
Precision, RSD,%



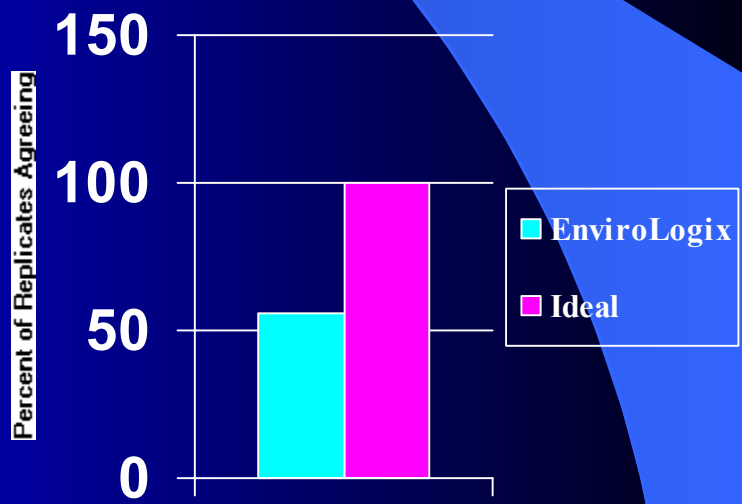
EnviroLogix
PCB in Soil Tube Assay

Accuracy, %

Interval Data



Precision of Replicates



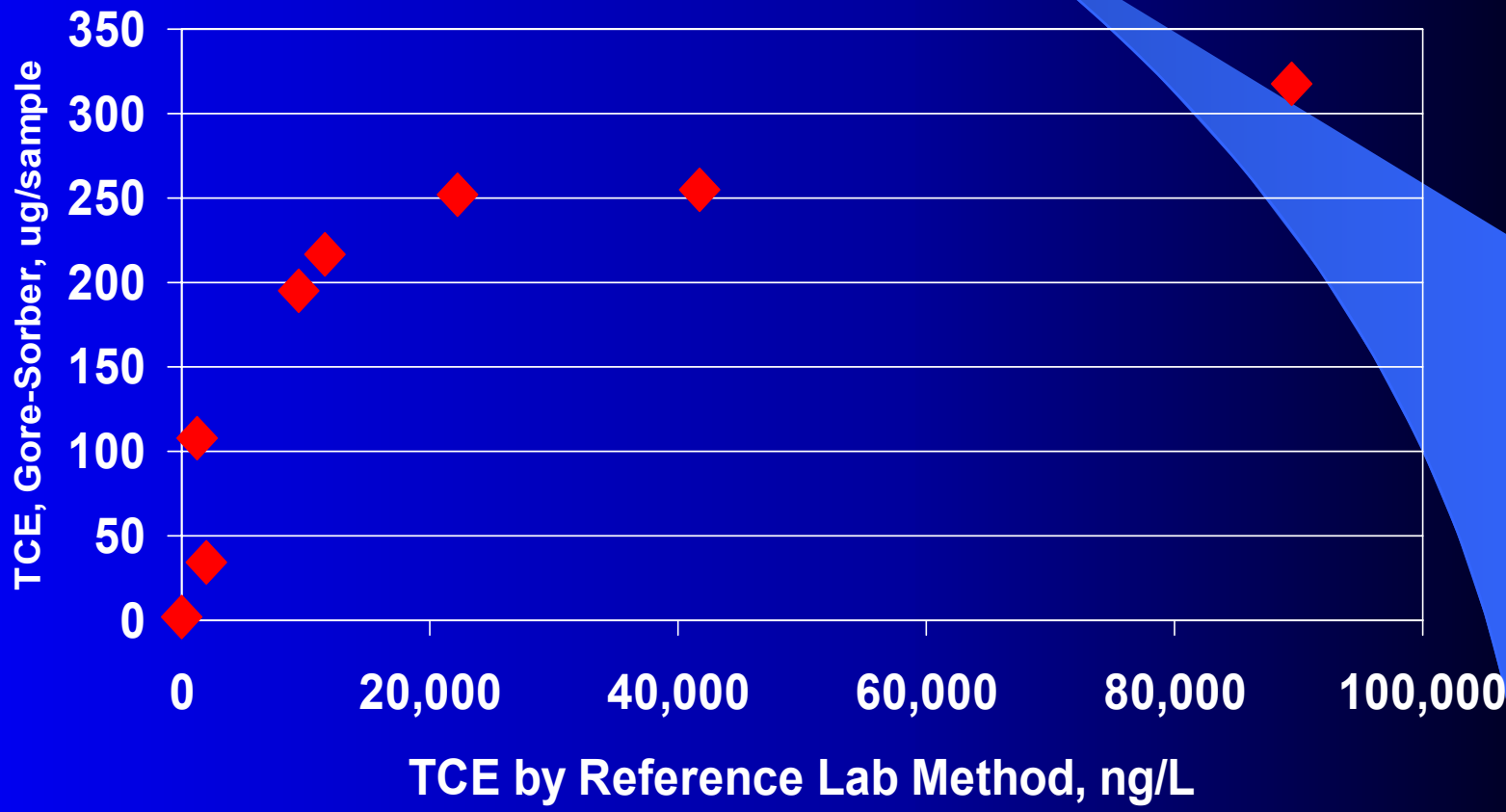
Soil Sampling Technology
W. L. Gore and Associates Gore-Sorber

- ✓ Compounds detected: VOC, SVOC
- ✓Sample Deployment Time: 8 per hour
- ✓Sample Retrieval Time: 30 per hour
- ✓Exposure Time: ~ 3 days
- ✓Analysis Time: ~14 days
- ✓Costs: $125-225 per sample
- ✓Logistical/training requirements: minimal

Soil Sampling Technology

W. L. Gore and Associates Gore-Sorber

Comparability with Reference Laboratory



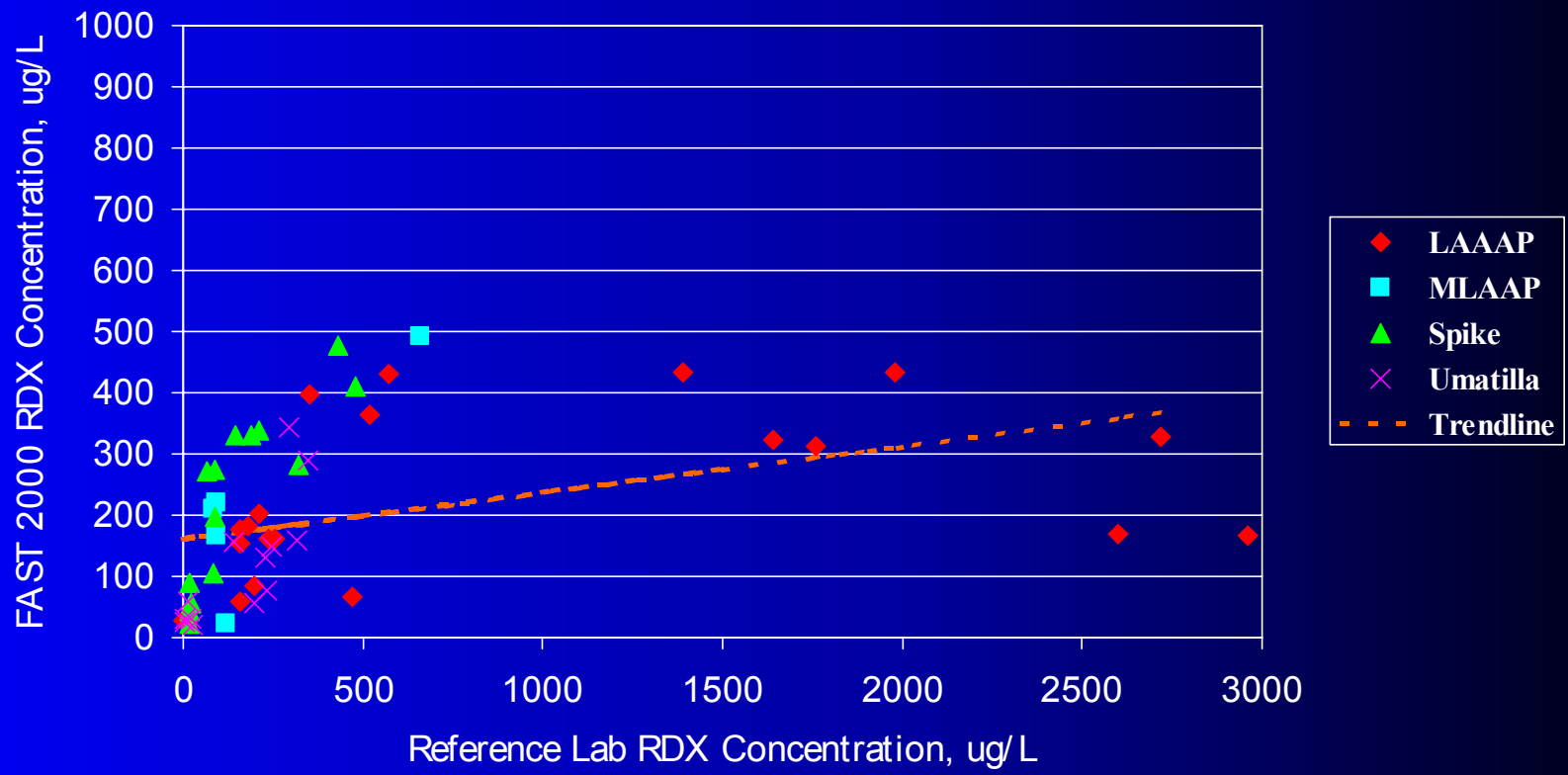
Cone Penetrometer/Laser-Induced Fluorescence

Fugro Geosciences Inc.'s Rapid Optical Screening Tool

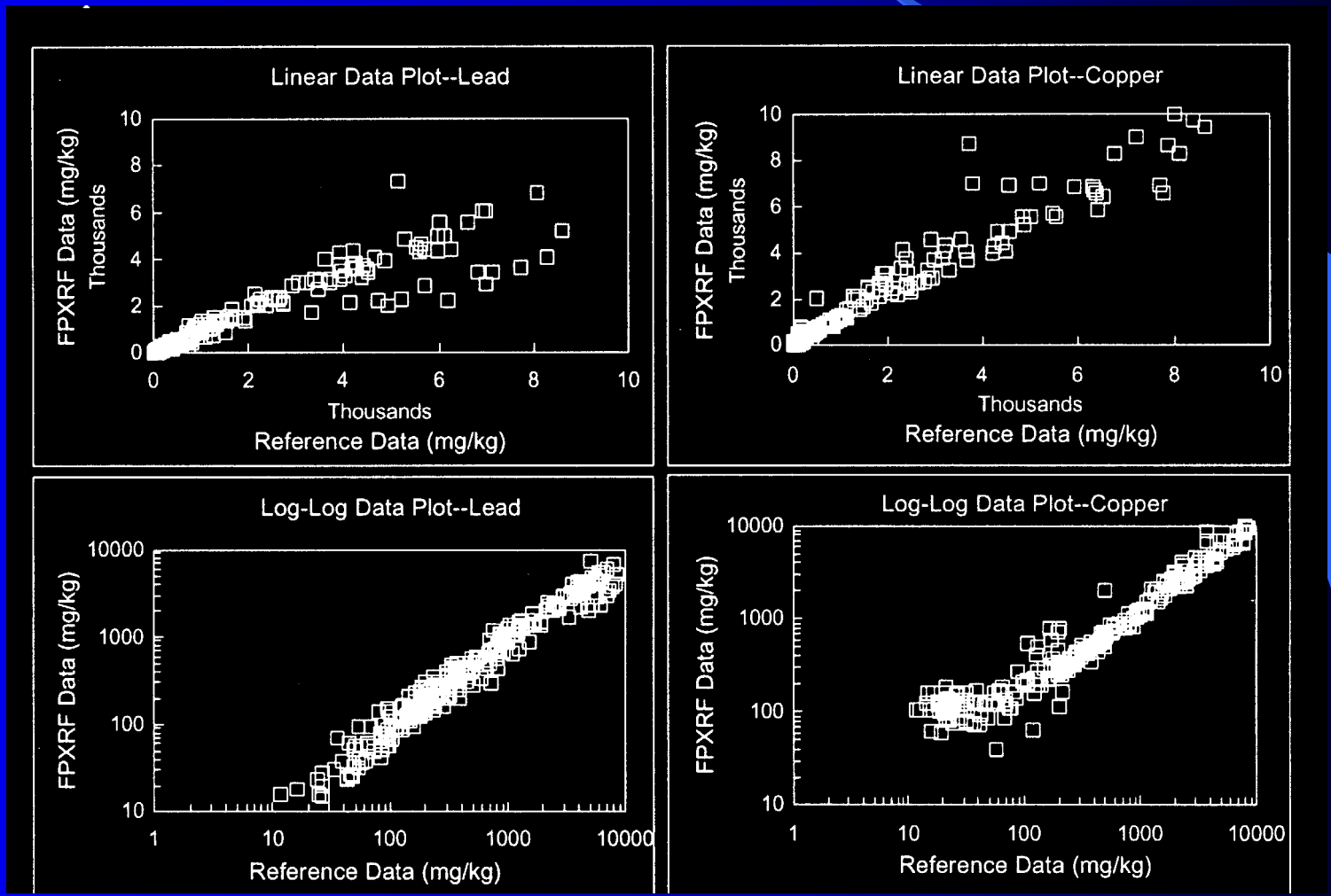
ROST agreement with reference laboratory for the detection of TPH below the surface

Detect/No Detect Match:	90%
False positive results:	7%
False negative results:	3%

Research International FAST 2000 Explosive Contamination in Water Comparability for RDX

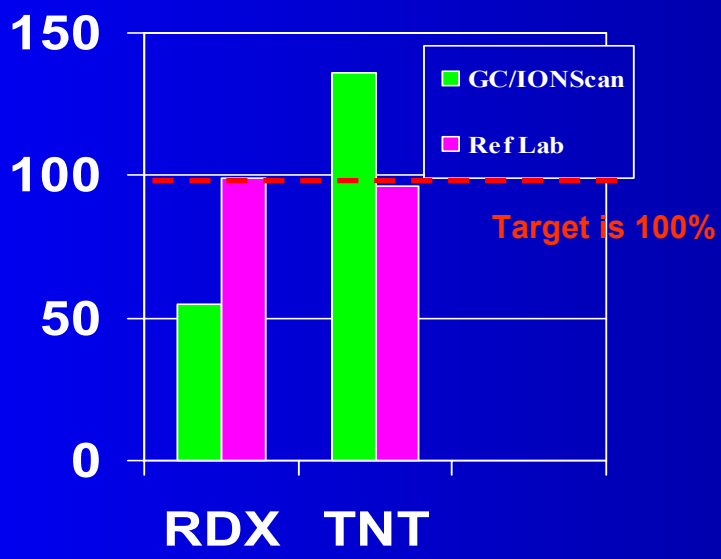


Performance of X-Met 940 Portable XRF: Metal Contaminants in Soil Comparability with Reference Lab Analyses



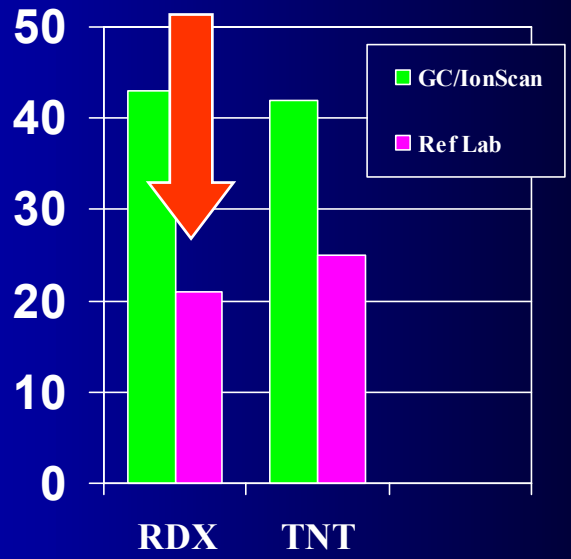
Technologies Proven in Other Areas Want to Make Leap into Environmental Market: *Barringer GC/IonScan*

Median Accuracy, %



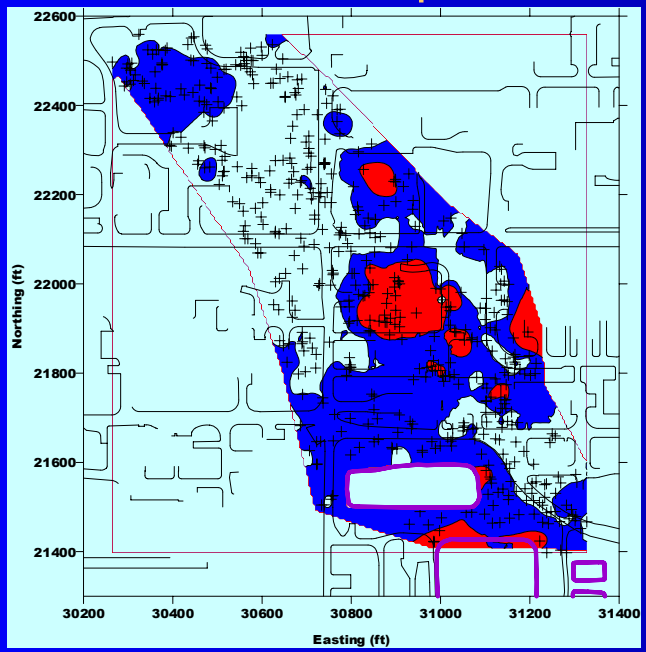
Median Precision, RSD %

Less is better

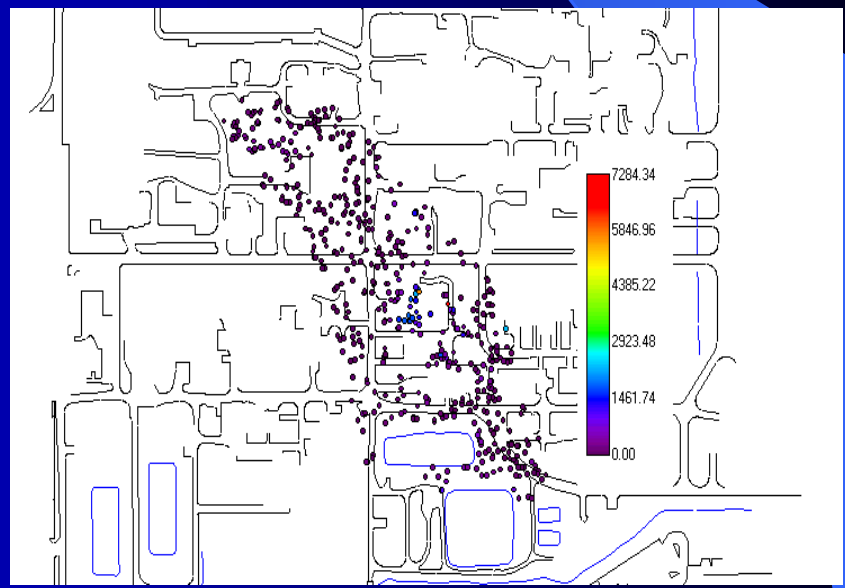


Decision Support Software Evaluation

Sample locations and arsenic concentrations (mg/kg) generated by Surfer (baseline) and SADA for the Site N cost-benefit problem.



Baseline Analysis Using SURFER



Test Analysis Using SADA

ETV Program does ***NOT*** make Head to Head comparisons of technologies, because there are needs for a *variety* of tools in the environmental technology toolbox

But …….

Data Quality Objective Examples Can Provide Perspective

?

Data Quality Objective Example

How many samples from an individual homogeneous barrel of PCB-contaminated soil does one need to analyze to confidently send the soil to a hazardous waste disposal facility (incinerator) or to merely landfill it?

TSCA Regulatory Threshold: 50 ppm

Range of answers (number of samples) of technologies providing quantitative (vs interval) results:

1 sample per drum – 220 samples per drum

ETV-Verified Technologies

Applicable to Brownfields investigations...

- **Field-portable X-ray Fluorescence Analyzers**
- **Soil/Soil Gas Samplers**
- **Subsurface TPH via Cone-penetrometer/LIF**
- **Field-portable Kits/Instrumentation for PCBs in Soil**
- **Field portable GC & GC/MS**
- **Decision Support Software**
- **Sediment Samplers**
- **Groundwater Samplers**
- **Field-portable instrumentation for Explosives in Soil/Water**

ETV-Verified Technologies Future

Applicable to Brownfields investigations...

- **Geophysical Characterization Technologies** -- Buried Objects
- **Geophysical Characterization Technologies** -- Subsurface DNAPL
- **Field Gamma Spectroscopy**
- **Cone-Penetrometer Sensors** -- VOC, rad, etc.
- **Bioavailability Assessment and Monitoring Natural Attenuation**
- **Field-portable Test Kits** – PCBs, Pb, As, asbestos, pesticides in soil
- **Vadose and saturated zone sampling and analysis** -- direct-push "micro-wells"
- **Others?**

The ETV Contribution to Brownfields Investigations

- **Applicable Technology Categories**
  - ETV category selections made with Brownfields in mind
  - aggressive market surveys to identify "sleepers"
- **Demonstrated Technology Performance**
  - rigorous test designs
  - credible third-party data
  - relevant field applications
- **Facilitated Technology Selection**
  - cost information
  - inter-comparison of candidate technologies by users
  - enhanced regulator acceptance

For More Information ……

- EPA ETV Website
  - www.epa.gov/etv
- ORNL ETV Website
  - www.ornl.gov/etv