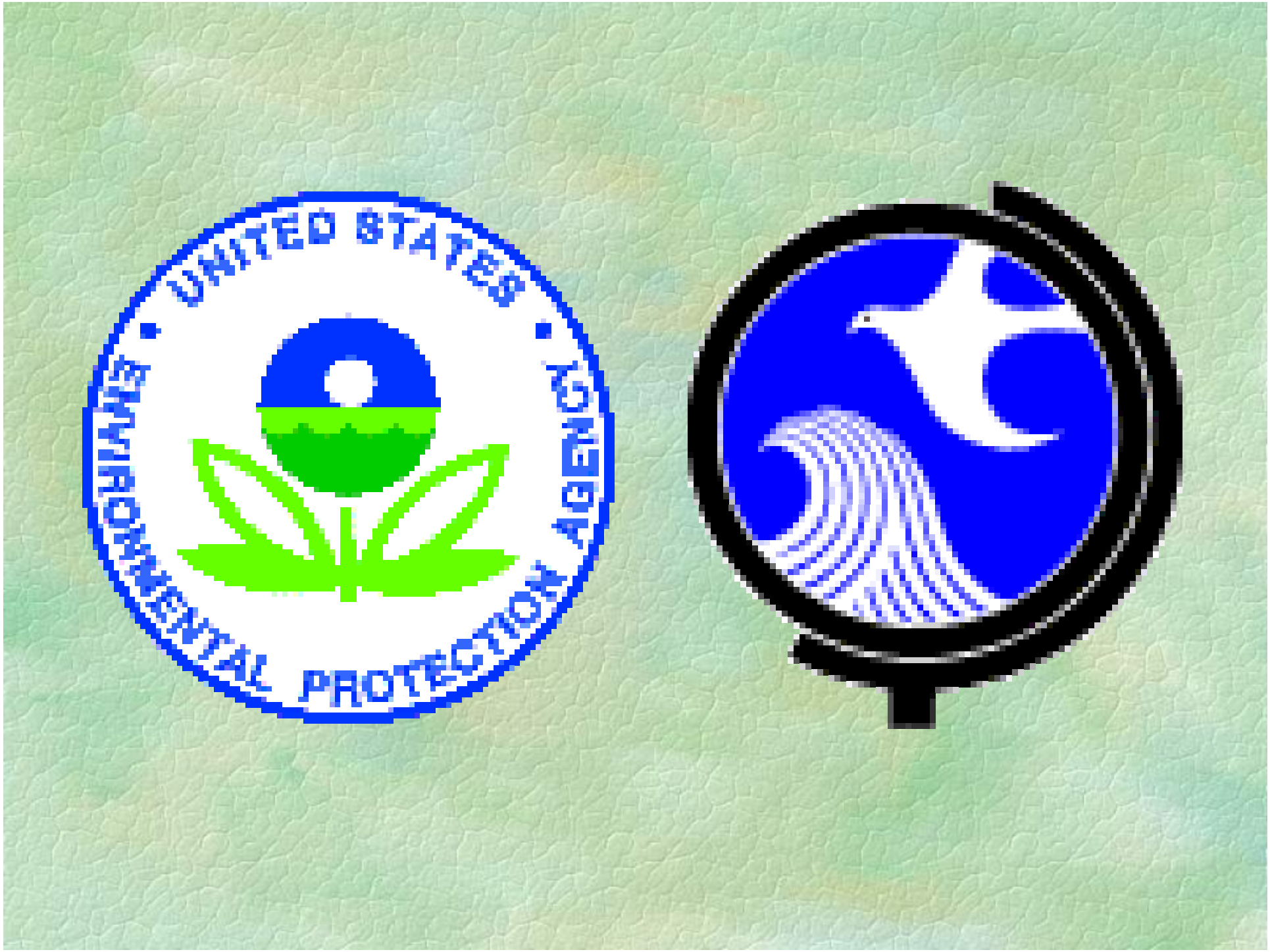
UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

Quantitative Environmental Indicators of Contamination (QEIC)

FY99 EMPACT Project Proposal

EPA OSW / Region 2 / NJDEP

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Quantitative Environmental Indicators of Contamination (QEIC)

A system for tracking environmental results.

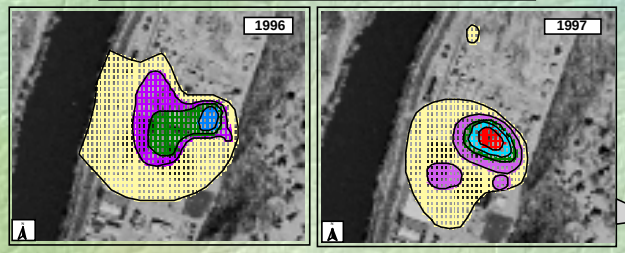
- **DEFINITION:**
- **QEIC are scientific measurements of change in the quality of the environment expressed as the aerial extent and mass load of chemical contamination.**

Need for the QEIC approach.

- 1
- 2
- 3
- 4
- Allows for a more objective, less confrontational assessment of environmental quality progress than dollars spent and bean-counting.

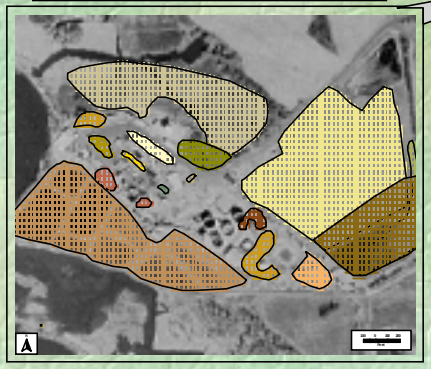
FY98-99 New Jersey EMPACT Project

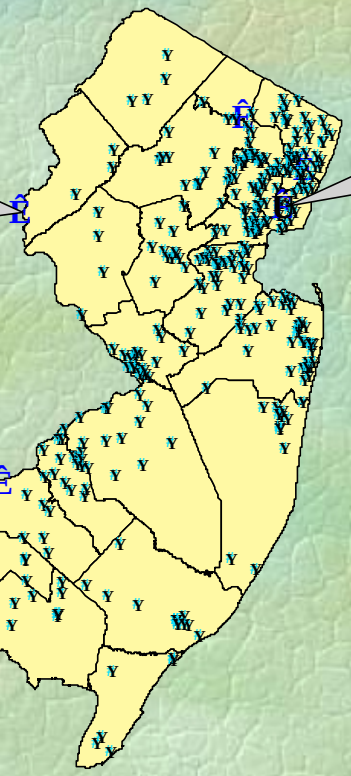
JT Baker Groundwater Contamination: Total Volitile Organics



Essex Chemical Site Contamination Exception Areas

Rollins Environmental Services Soil Contamination Areas



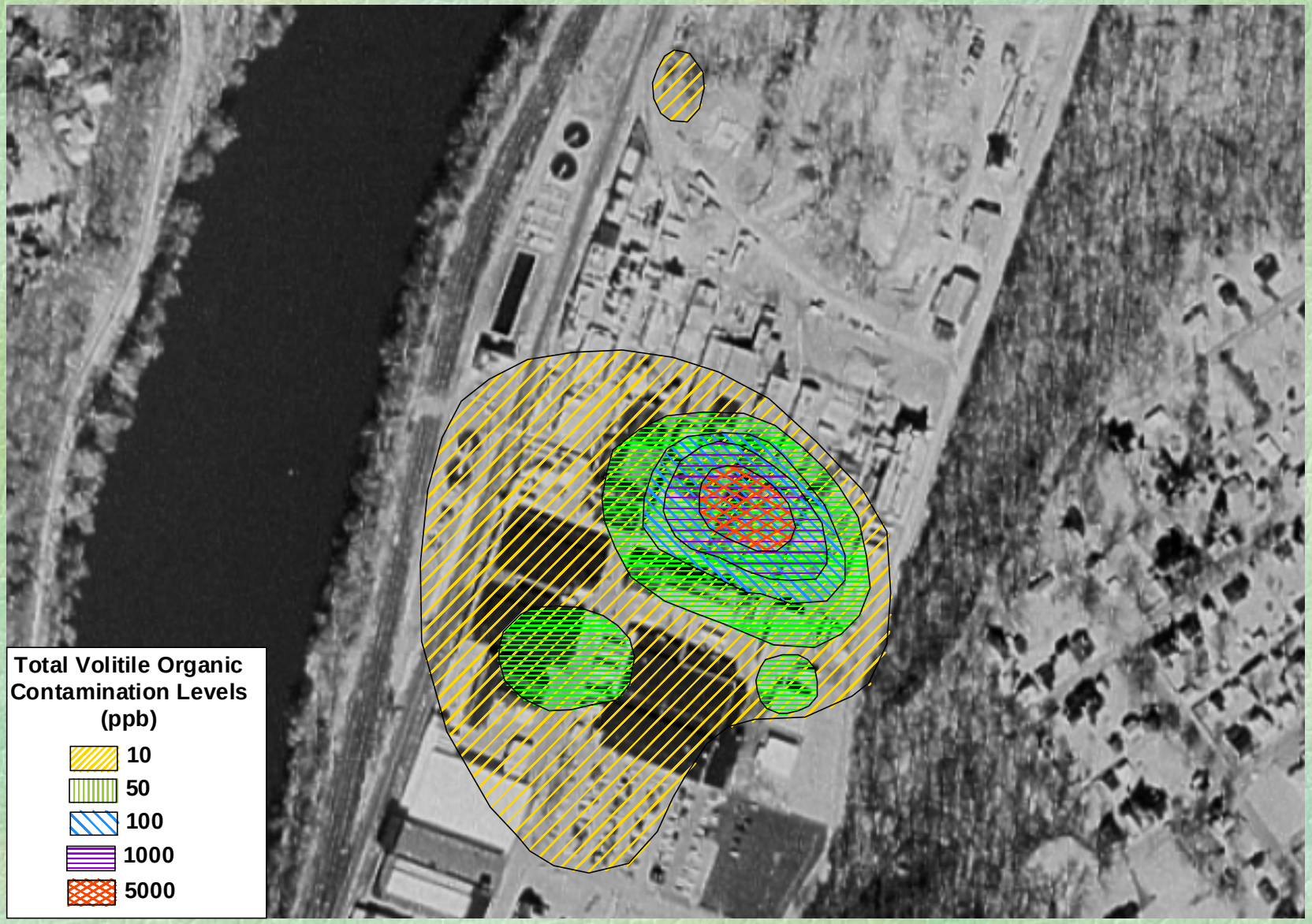


Objectives for FY98/99

- Finish QEIC calculations for all 20 pilot sites in NJ.
- Complete computation of QEIC for a total of 100 contaminated sites in NJ.
- Complete QEIC computation Standard Operating Procedure (SOP) for both hard copy and electronic data.
- Present QEIC results to the public attending contaminated site cleanup meeting in March 1999 (including a QEIC map in a newspaper notice).
- Establish an interactive web site for presenting QEIC information to the public.
- Present QEIC methodology and results at the *International Environmental Technology Expo '99* . (April 20-21, 1999 in Atlantic City, NJ)
- Train EPA staff in Regions 2 (New York and Puerto Rico) and 3 (Pennsylvania) and complete QEIC at 10 sites in each state, 2 in Puerto Rico.

Mercury Contamination Emanating from Industrial Site

Ground Water Contamination at a New Jersey Industrial Site



QEIC CALCULATIONS

Area of Groundwater Contamination

The area of the contaminated groundwater plume that contains contaminants above applicable groundwater standards.

Benzene - Water Table Plume

- 1 ppb
- 1 - 10 ppb
- 10 - 100 ppb
- 100 - 1000 ppb

0.1 0 0.1
Miles

Amount of Groundwater Contamination

The mass of contaminants within the groundwater plume above applicable standards.

The contaminant plume is assumed to extend in a uniform manner through the entire depth of each particular water zone.

Lead - Water Table Plume

- 450 g
- 1,161 g
- 9,560 g
- 11,611 g
- 12,234 g
- 40,155 g

0.1 0 0.1
Miles

QEIC CALCULATIONS

Amount of Contamination Transferred from Groundwater to Surface Water

The mass of contaminants, in excess of a facilities site specific groundwater cleanup standards, that is transferred (loaded) to surface waters per year.

Plume/Surface Water Interface

Arsenic - Water Table Plume

- 1 ppb
- 1 - 10 ppb
- 10 - 100 ppb

0.1 0 0.1

Miles

Amount of Extracted Groundwater Contamination

The mass of contaminants physically extracted from plume by active remediation per year.

Trichloroethylene - Water Table Contaminant Mass Removed (1990 - 1998)

0 Abatement Well

Mass removed in grams

0.1 0 0.1

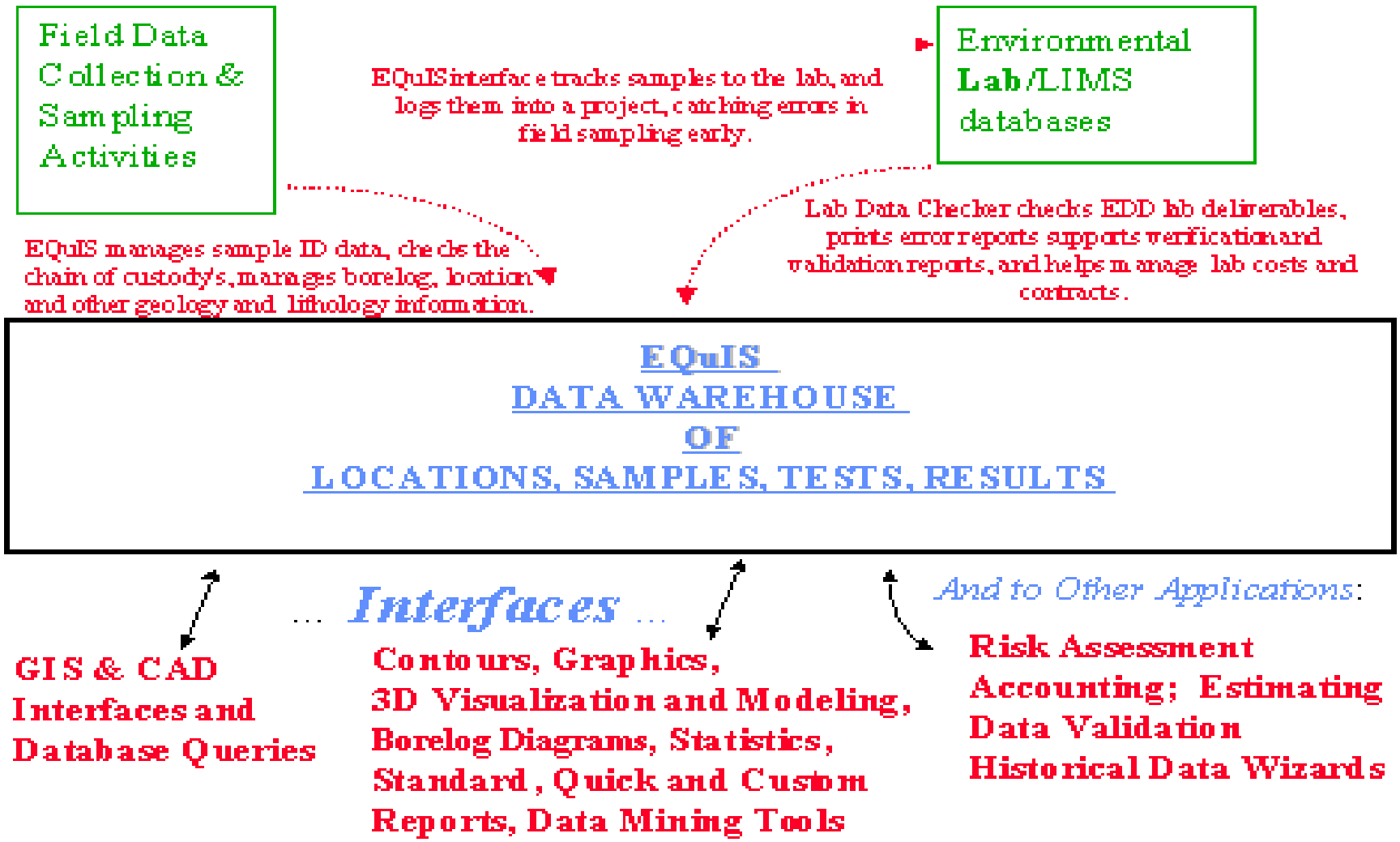
Miles

Limitations: Volume, Time, Data Management.

Refining QEIC estimates and enhancing public communication

- Q: How can we overcome 2-D limitations?
- A: 3-D analytic & visualization systems.
- Q: How do we mark change over time?
- A_1: Past and Present--data management.
  A_2: Future--modeling.
- Q: How do we handle the additional data to accomplish all this?
- A: Employ state-of-the-art environmental data management system.

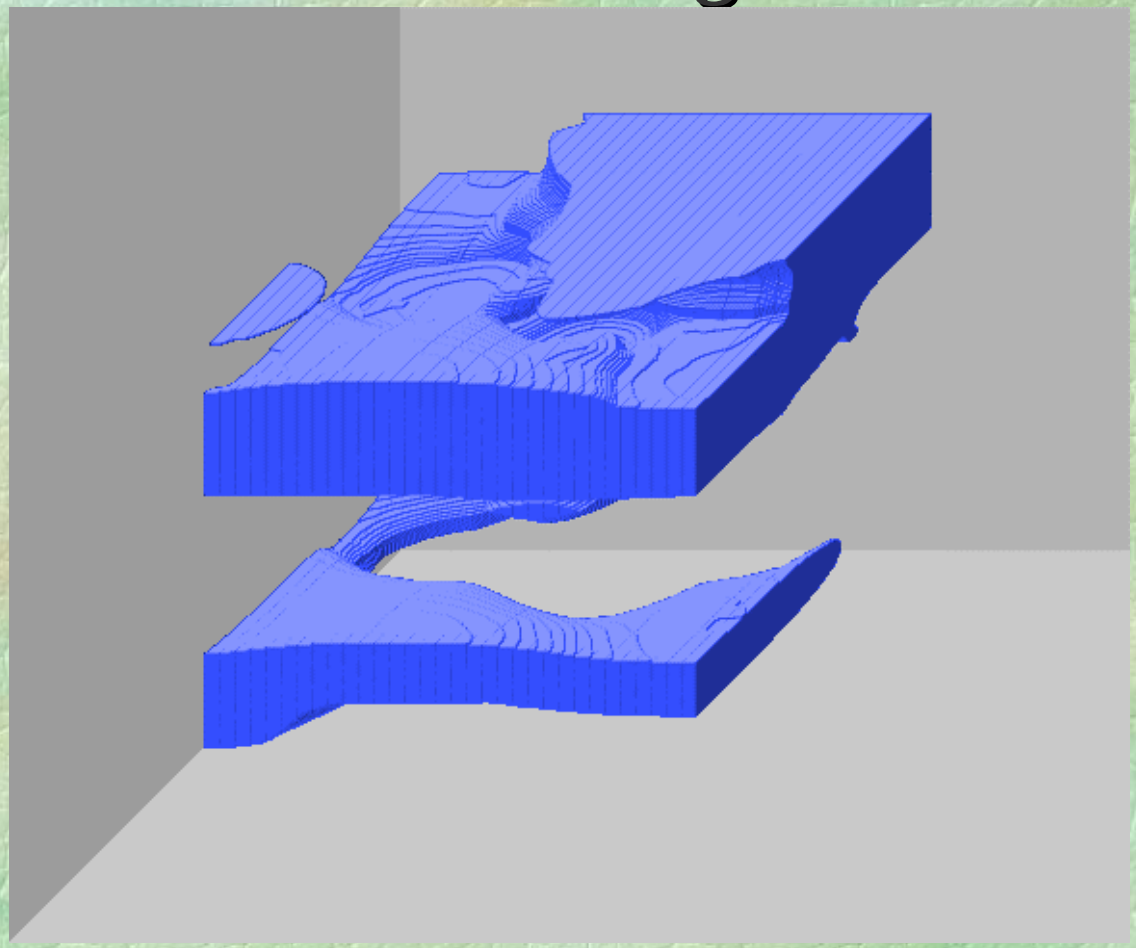
Environmental Quality Information System



EQuIS by EarthSoft Inc.

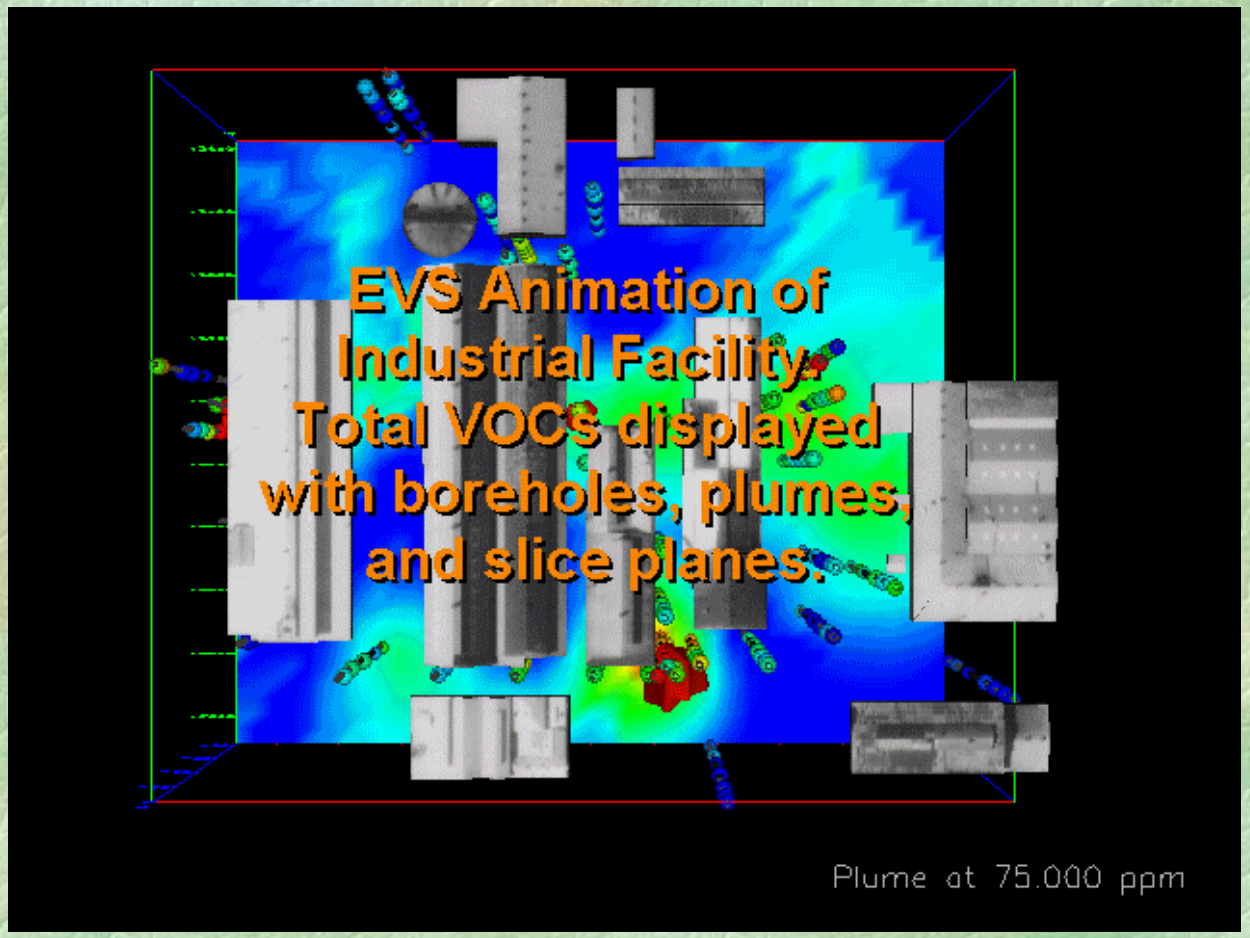
Geology Corrections

Technologies



Rockworks by Rockware, Inc.

Technologies



Environmental Visualization System by C-Tech

Communication through Visualization

- Data management system (EQuIS) allows integration of the geology and chemistry data sets for use in GIS and visualizations.
- GIS locates contaminants in two-dimensional space showing the extent of contamination and allowing first level QEIC mass load estimation.
- Visualization adds third and fourth dimensions enhancing QEIC mass load estimates.
- The visualization more closely approximates reality communicating local contamination conditions to the general public more clearly and with greater accuracy.

FY99 QEIC EMPACT
Goals and Objectives

- Complete application of QEIC to contaminated sites in NJ from FY98 and increase the number of sites with QEIC completed in NJ to 100
- Develop methodologies to automate the computation of QEIC from electronic data submissions and integrate existing NJDEP databases.

FY99 QEIC EMPACT
Goals and Objectives

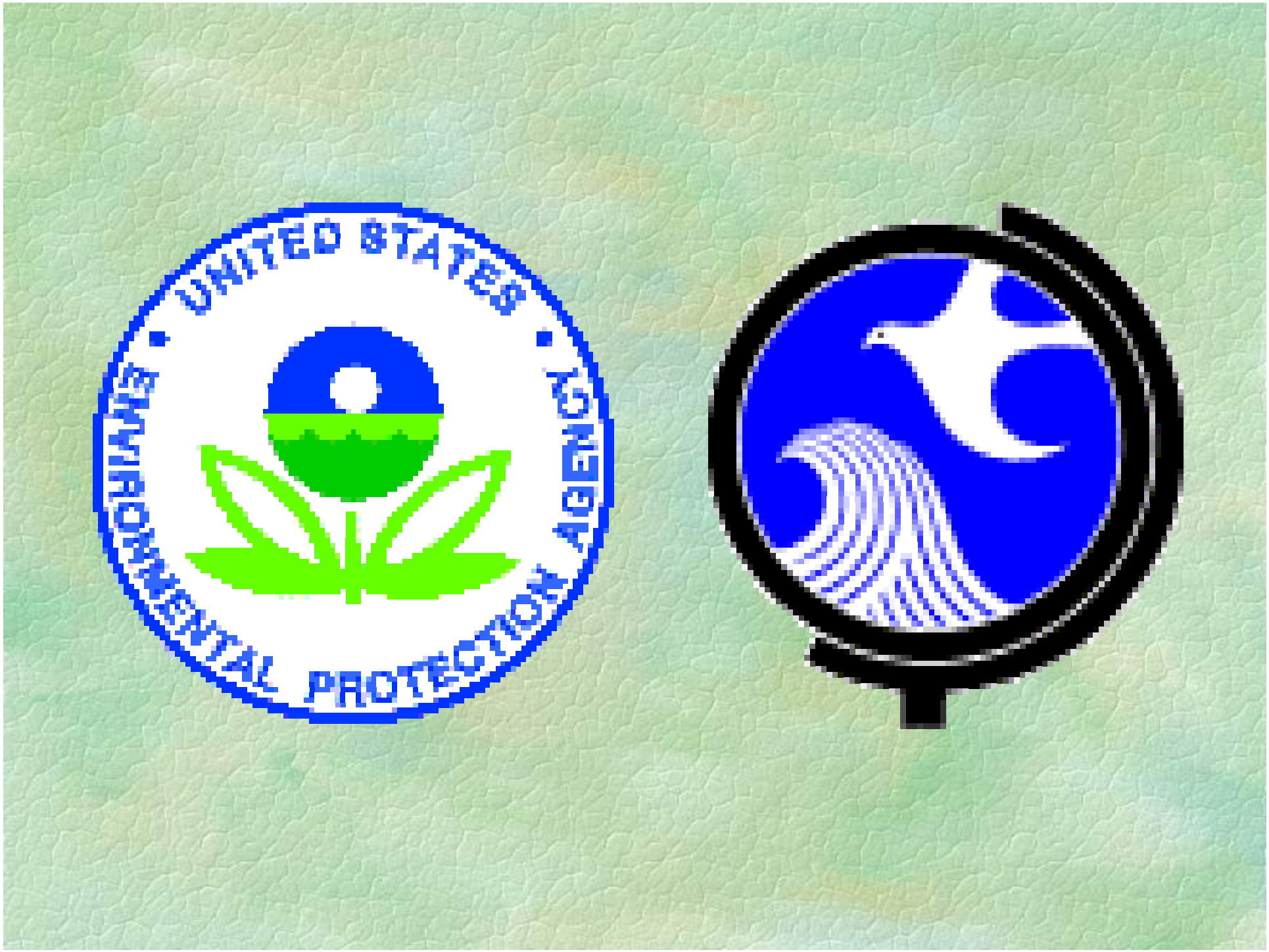
- Expand application of QEIC to contaminated sites in Pennsylvania and New York state (to complete the Philadelphia & New York EMPACT cities).

- Expand application of QEIC to contaminated sites in a new EMPACT city (San Juan, Puerto Rico).

FY99 QEIC EMPACT
Goals and Objectives

- Make site-specific QEIC results available to the general public in a comprehensible graphic format (via Internet, newspapers, and meetings).

- Share QEIC methodologies (developed via EMPACT) with international audience.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