Site Characterization and Remedial Alternative Selection

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Outline

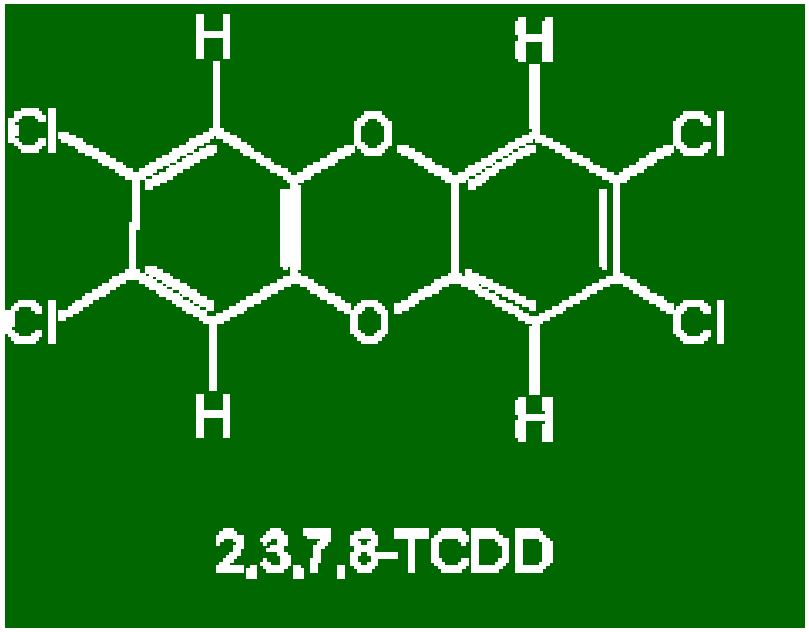
- Site Characterization- why we collect data
- Remedial Investigation/Remedial Design Components
- Exposure and Risk
- Remote sensing for sediment transport data

Site Characterization

- More than determining location and extent of contamination in impacted areas
- Data for:
  - Mechanisms and routes of exposure (RI)
  - Selection and design of remedial alternatives (RDI)

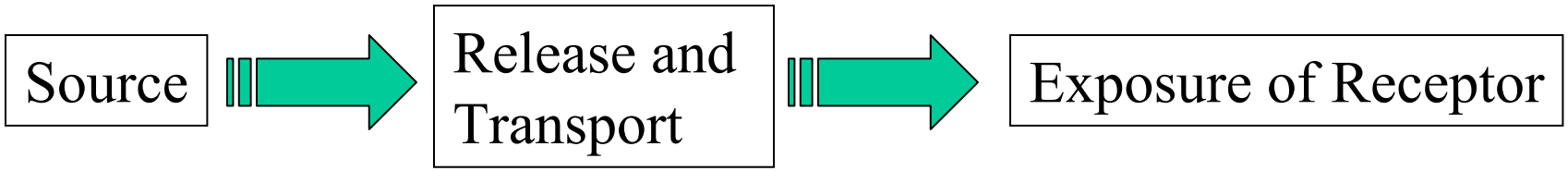
“Dioxin”

- 2,3,7,8 tetrachlorodibenzo-p-dioxin (multiple congeners of chlorinated dibenzo-p-dioxins and dibenzofurans)
- Persistent Organic Pollutants (Stockholm Convention)
- TCDD produced as by-product of chemical production



Remedial Investigation:

Define components of exposure

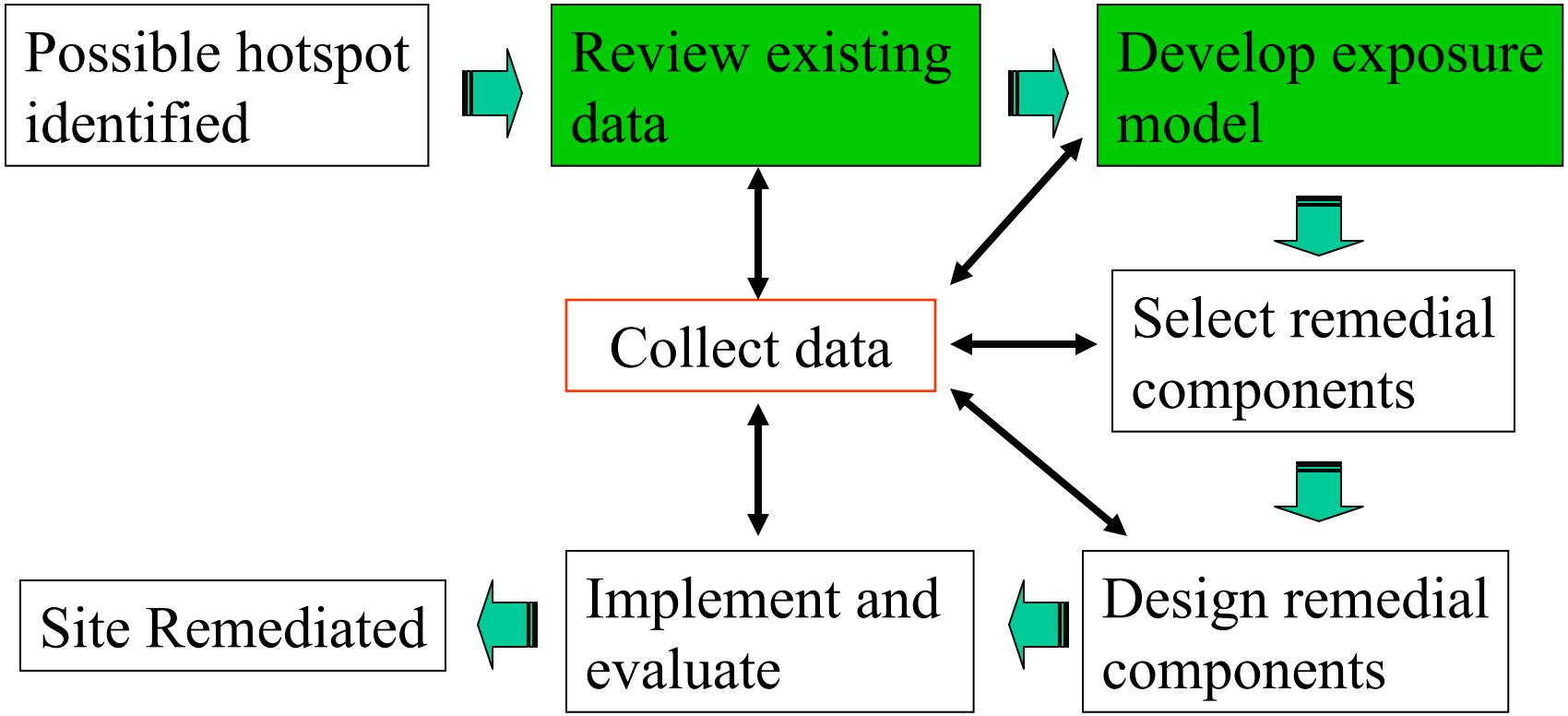


Remedial Design Investigation:

MISSING/REMOVED ELEMENT

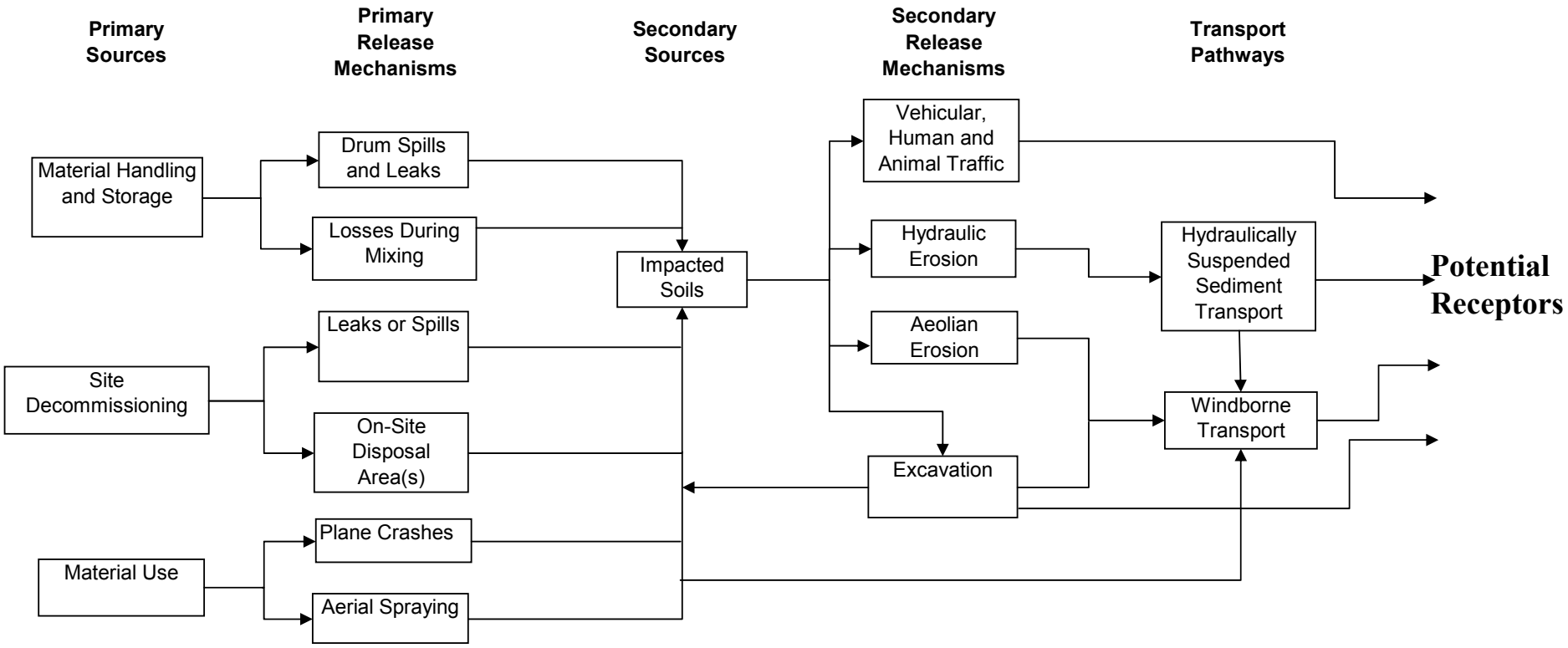
= *NO EXPOSURE*

Conceptual Remediation Approach:
Remedial Investigation



Exposure Routes

Role of Sediments



Sediment Transport and Deposition

- Sediment transport modeling-predict deposition
- Sediment erosion and deposition
- ***Data ?*** (Historic/Temporal data)

- Satellite photo analysis
- Aerial photo analysis
  - Use data to guide sampling
  - Correlate locations with contaminant and microbial potential (dechlorination)
  - Model validation

Sources of Imagery

- Federal
- State
- County
- Local
- University archives
- Aerial survey and mapping companies

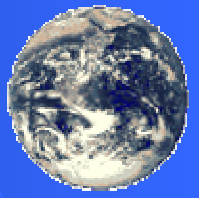
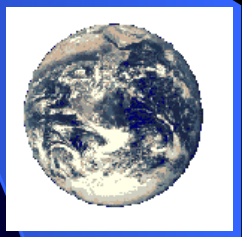


Photo Interpretation

- Careful interpretation of basic elements
- Deductive and inductive evaluation
- Common sense, field experience
- Broad background of knowledge and expertise

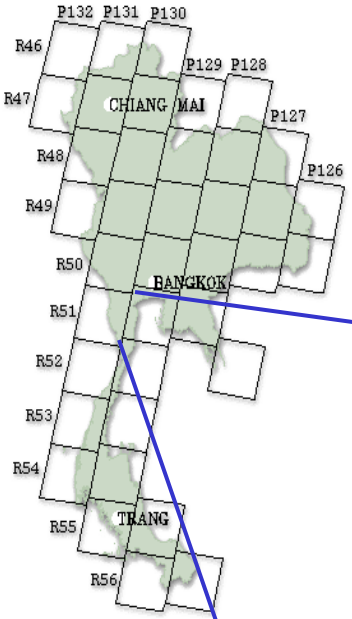


- **Sediment transport-Thailand**
- **Background Information:**
  - Geographic coordinates: 15ºN100ºE, WRS Zone 47.
  - Size : 514,000 sq km , ~2 times larger than the State of Michigan. About 2,230 sq km of the total area of Thailand is water.

- Population: 64 million, ~7 times larger than the State of Michigan.
- Major land use: Agriculture (47%).
- Coastline: 3,219 km and many rivers.

Landsat-7 09/02/01

Color 4,3,2



Chao Praya River

Bang Pakong River

Aquaculture

Industrial estates

Tourism area

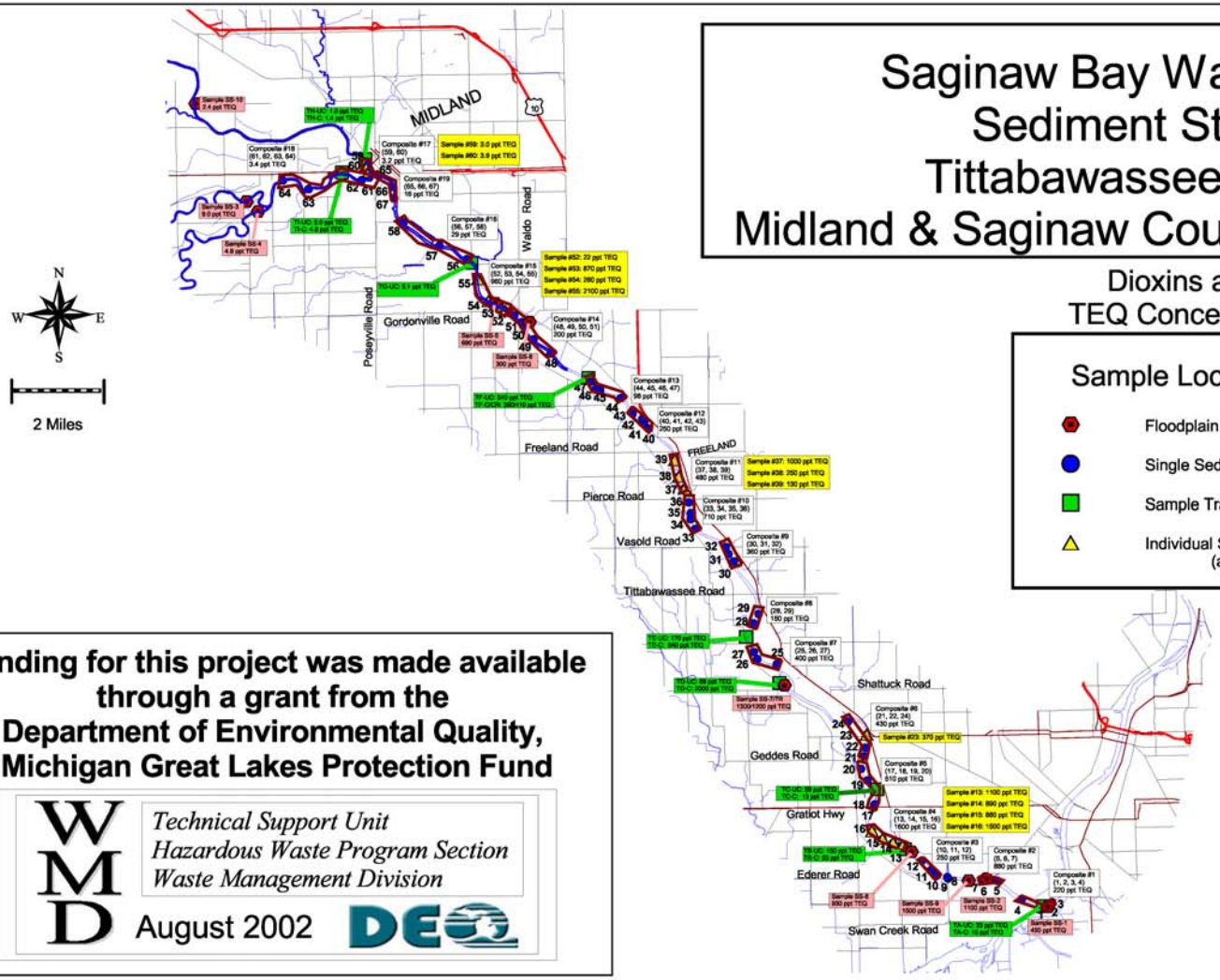

07/24/01


08/25/01


09/02/01
Deltaic Deposition


01/08/02

Saginaw Bay Watershed
Sediment Study
Tittabawassee River
Midland & Saginaw Counties, Michigan



Dioxins and Furans
TEQ Concentration in ppt

Sample Locations

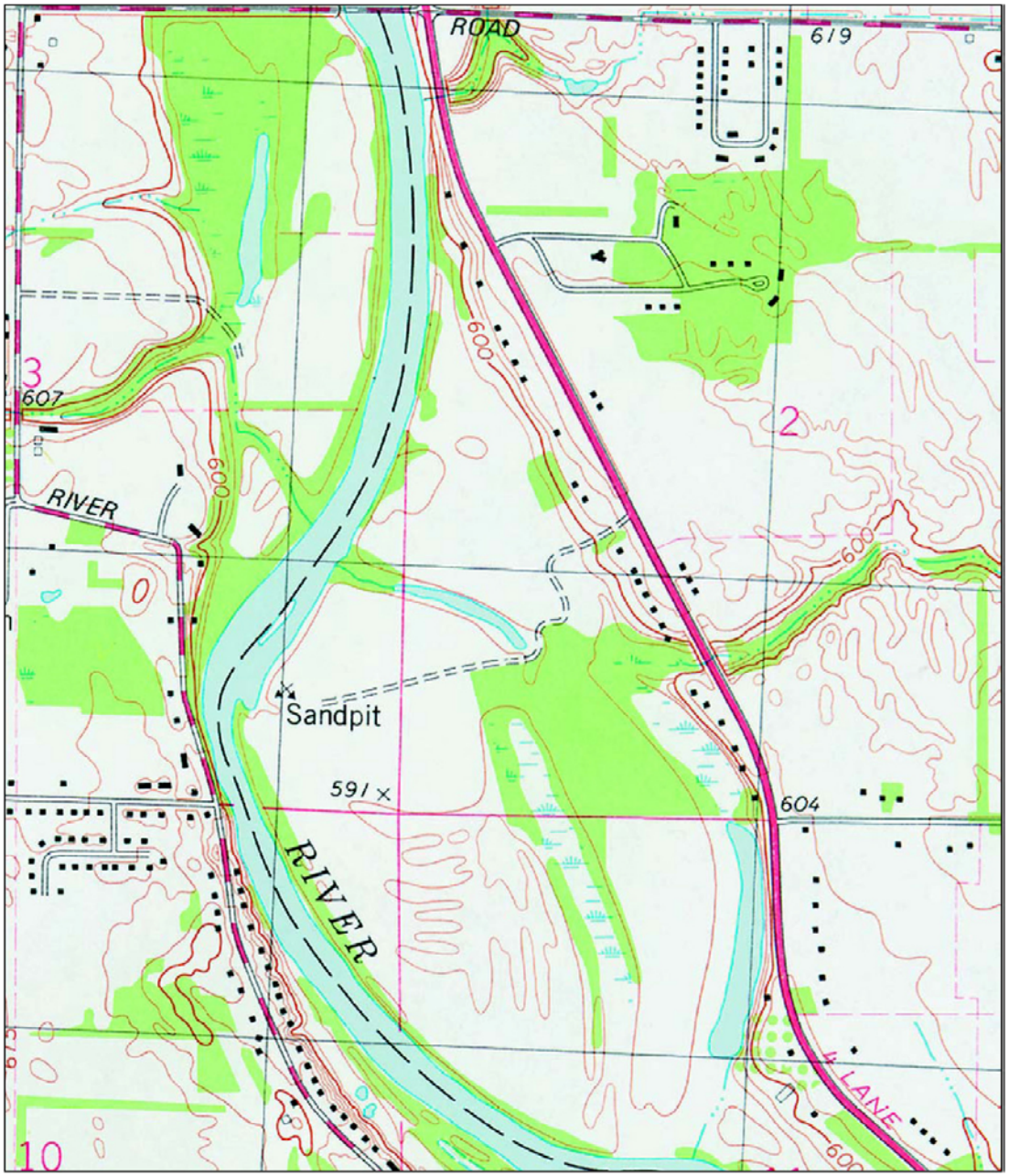
- Floodplain Soil
- Single Sediment Samples
- Sample Transects of River
- Individual Sediment Samples (analyzed separately)

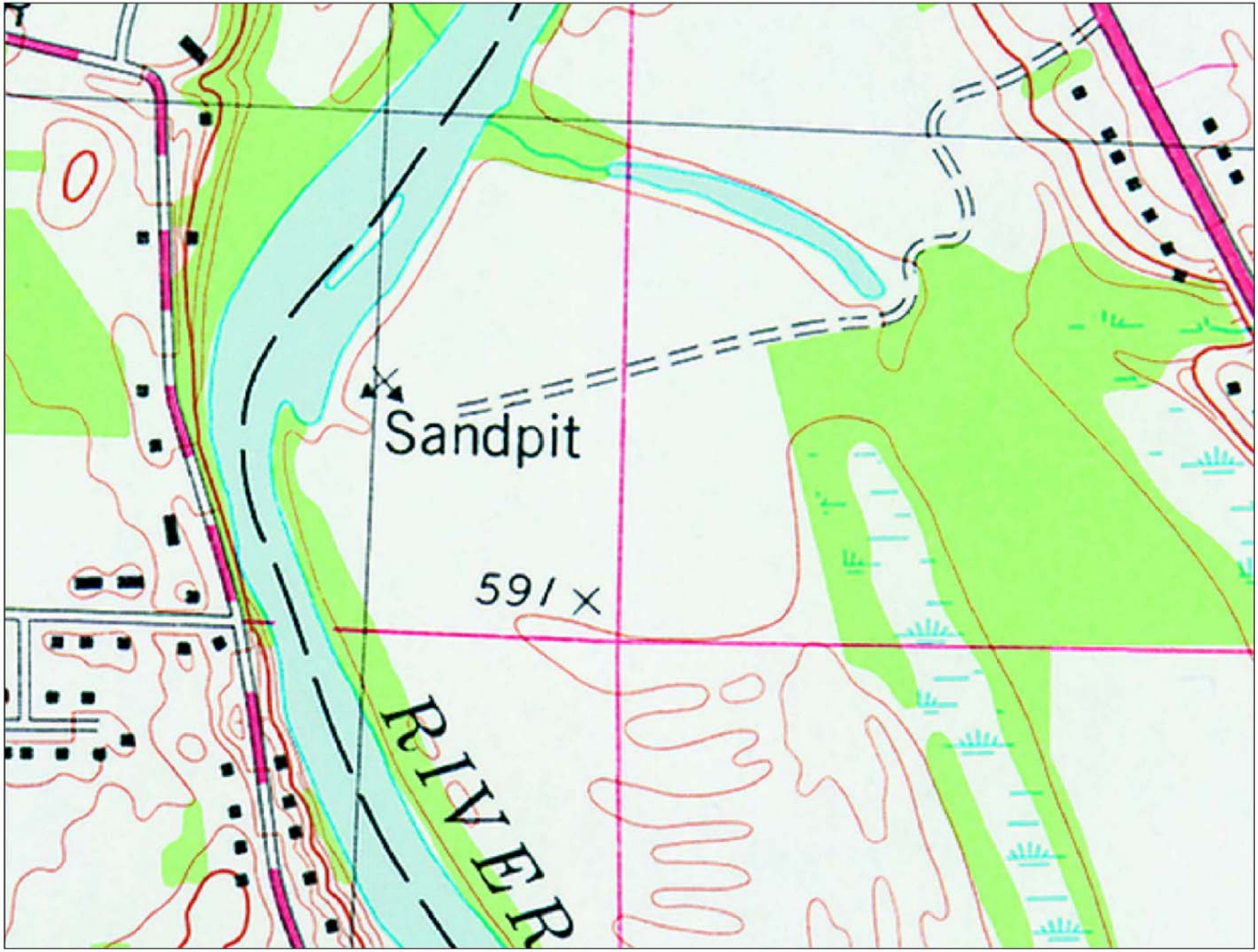
Funding for this project was made available through a grant from the Department of Environmental Quality, Michigan Great Lakes Protection Fund

WMD
Technical Support Unit
Hazardous Waste Program Section
Waste Management Division
August 2002
DEQ

Figure 8

POTENTIAL EROSION AND DEPOSITION SITES

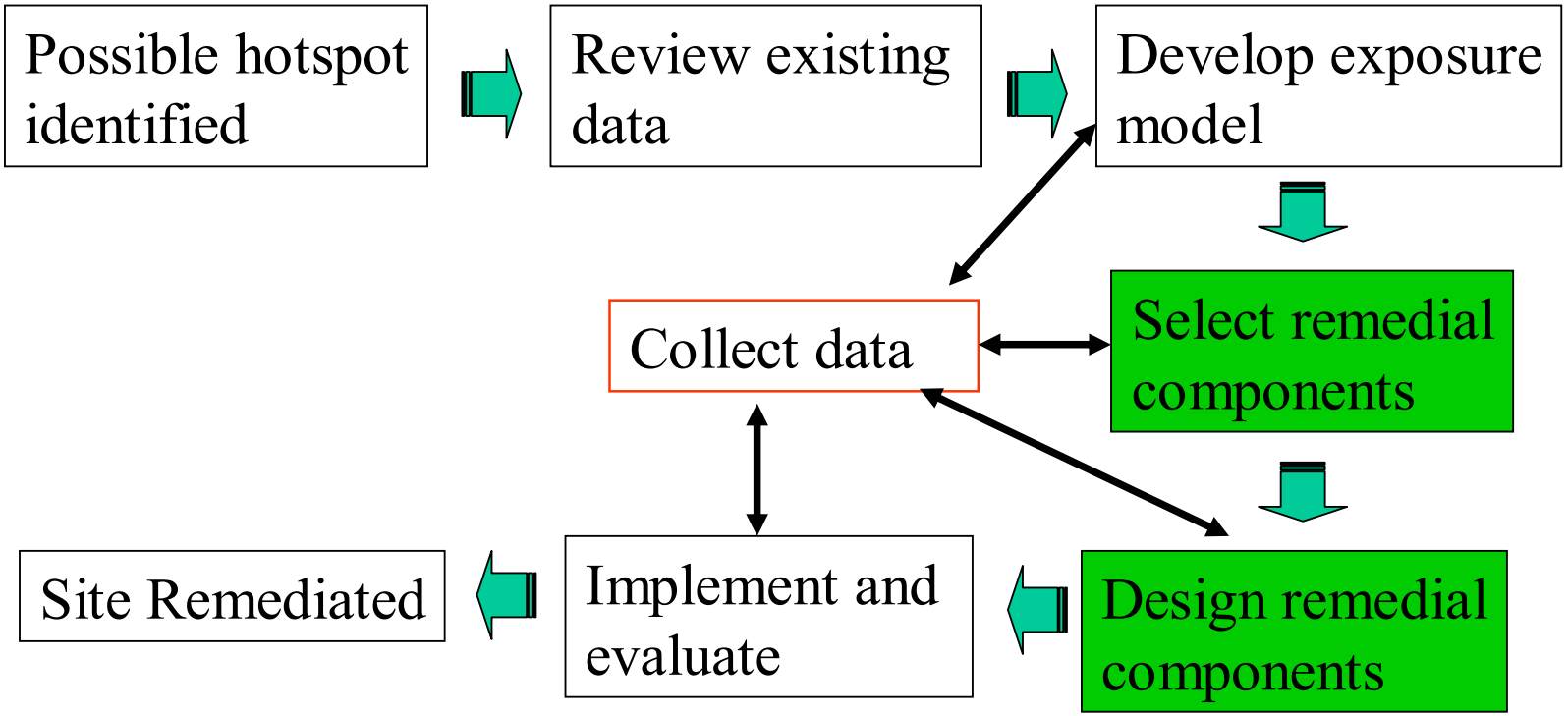



Sandpit
591
RIVER

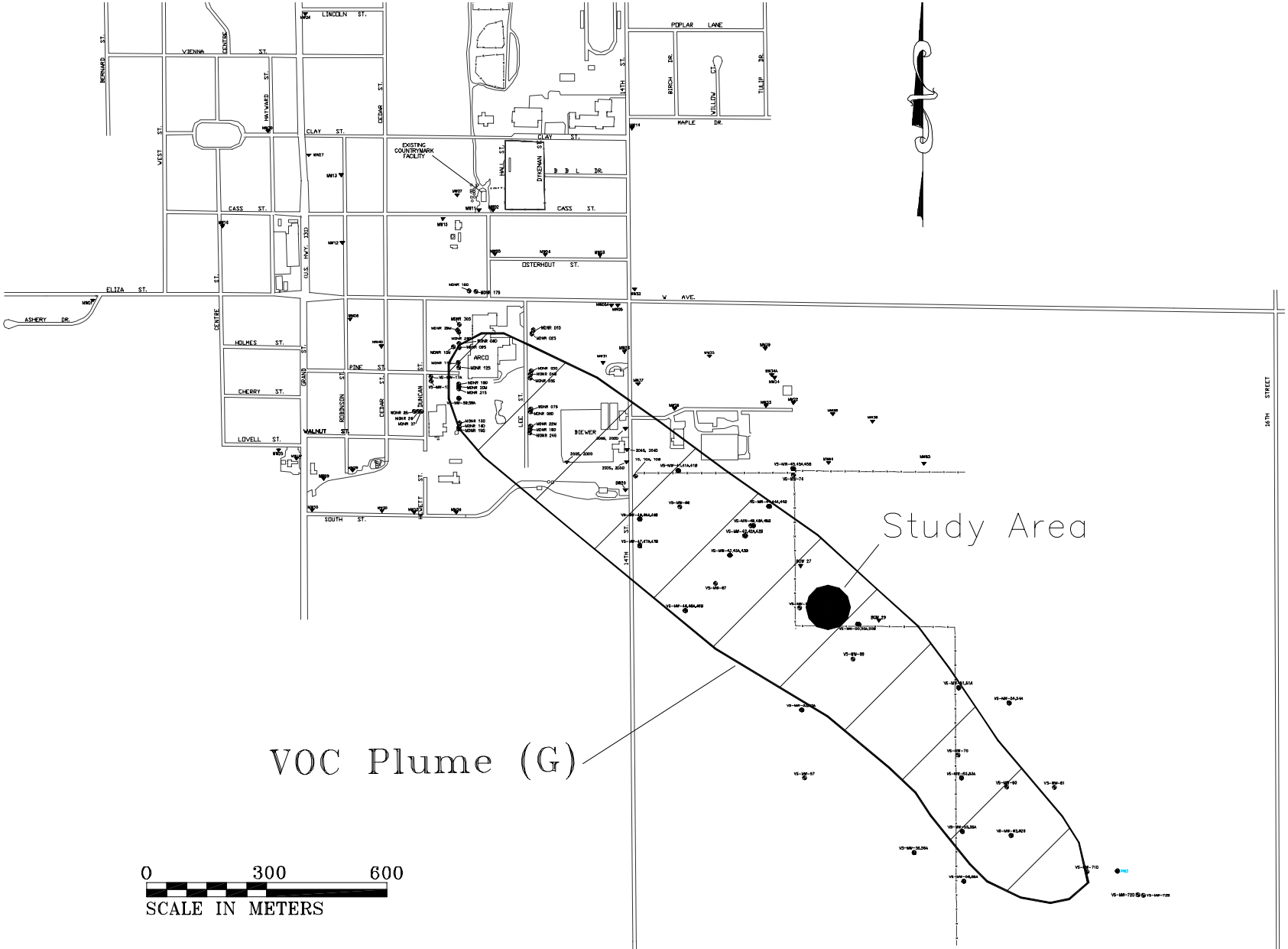

1941


1974

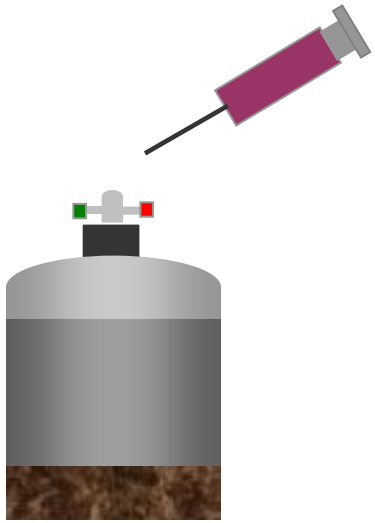
Conceptual Remediation Approach:
Remedial Design



Site Specific Field Evaluation



Remedial Design Investigation
Process Specific Data
Bioremediation



SITE CONDITIONS

Lab Studies

Groundwater/sediment slurry from contaminated site

Bioaugmentation or Biostimulation?

Amendments, electron donors

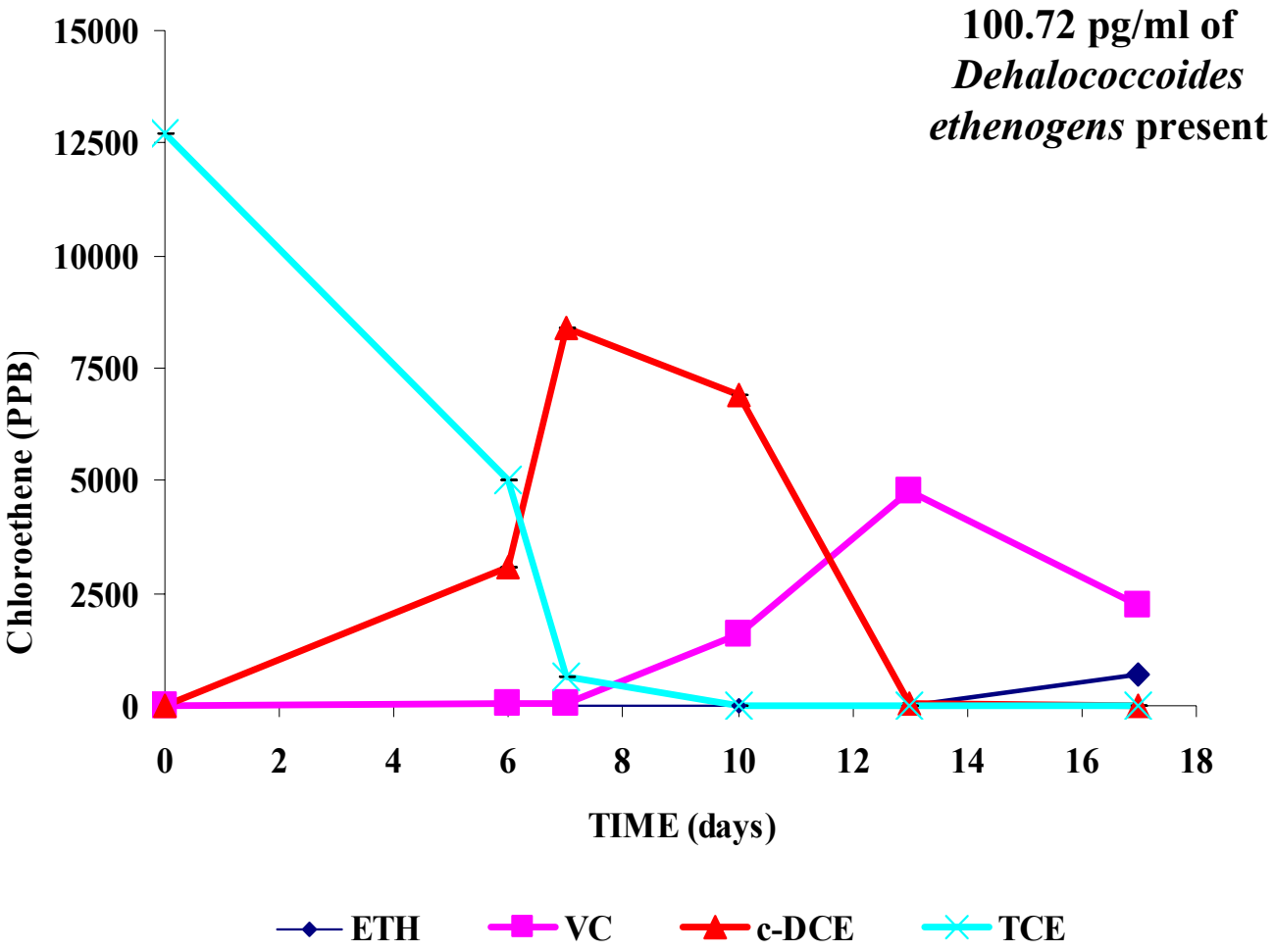
Pilot Scale Field Studies

Small Scale

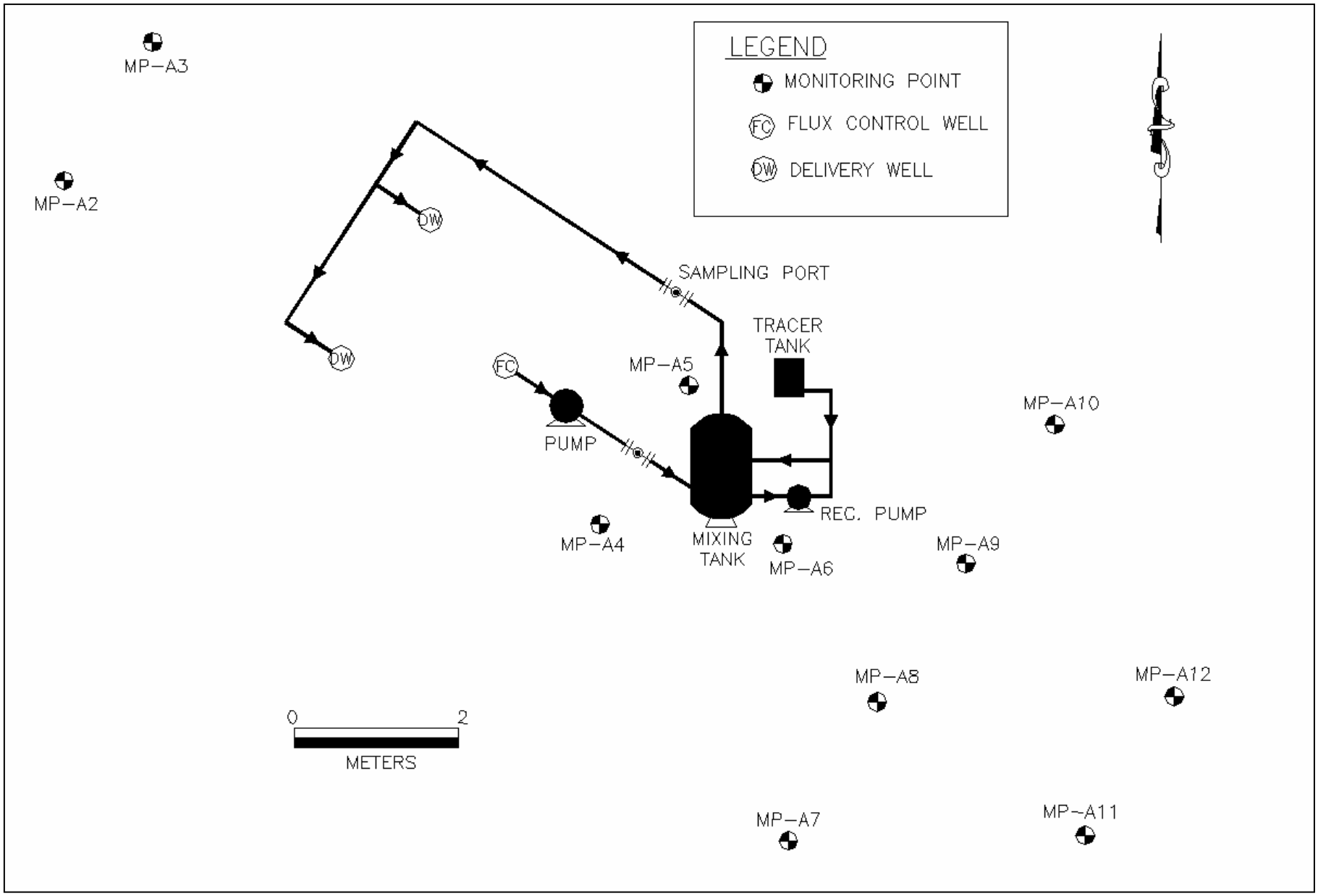
Highly monitored

LAB INVESTIGATIONS

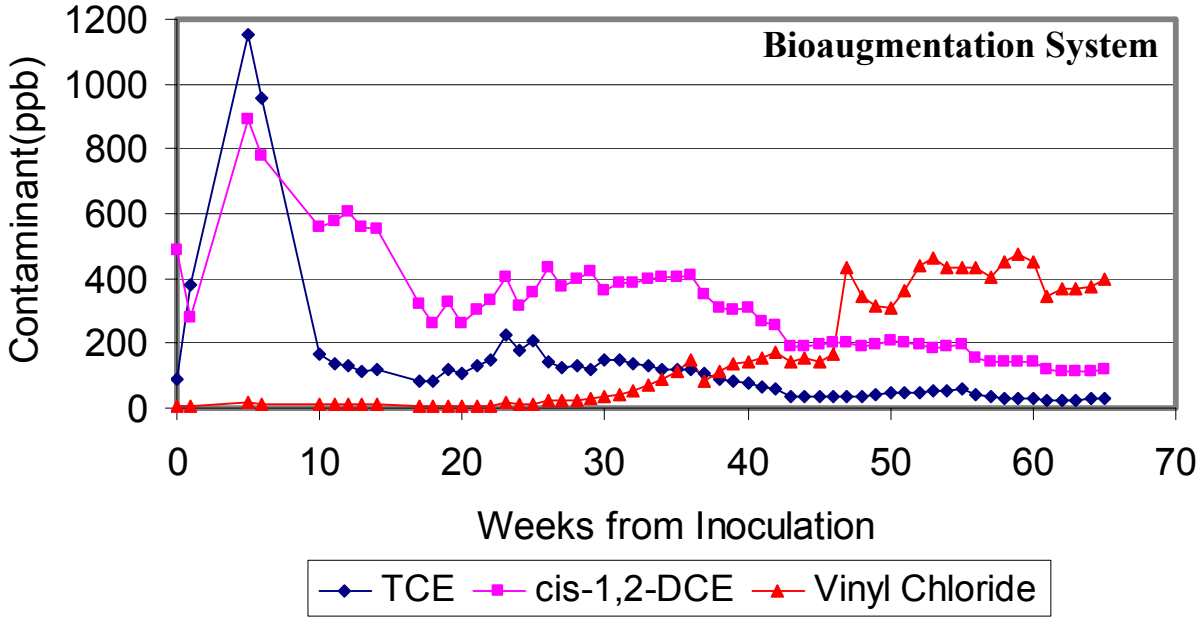
Trichloroethene transformation in multiple fed microcosm

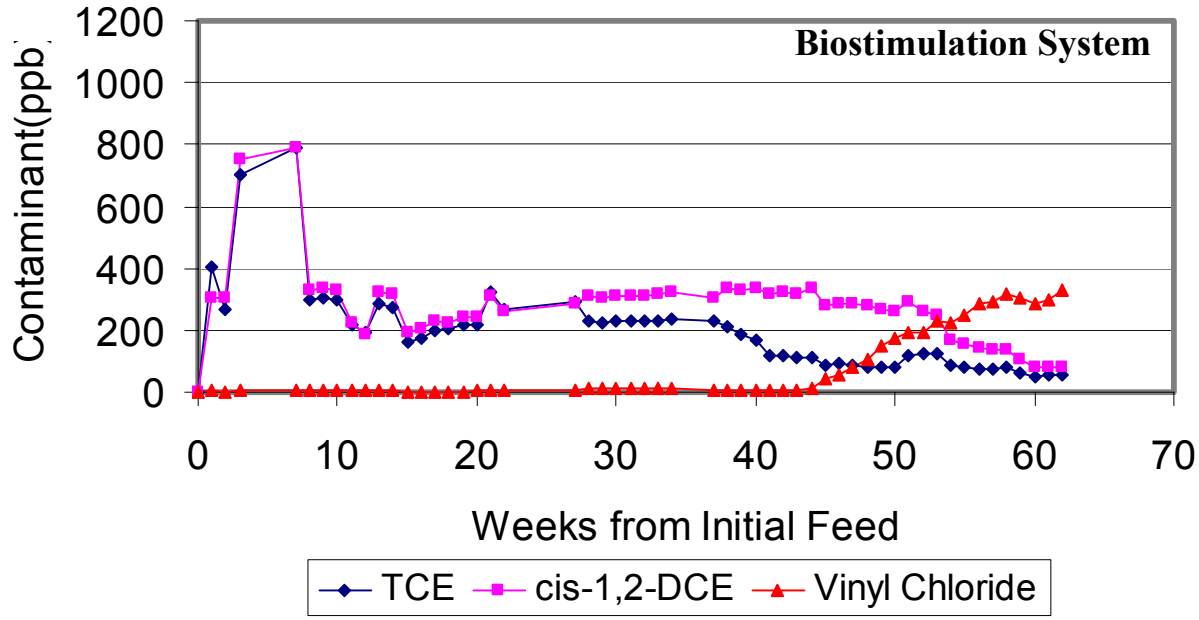


Pilot Scale Nutrient Delivery System

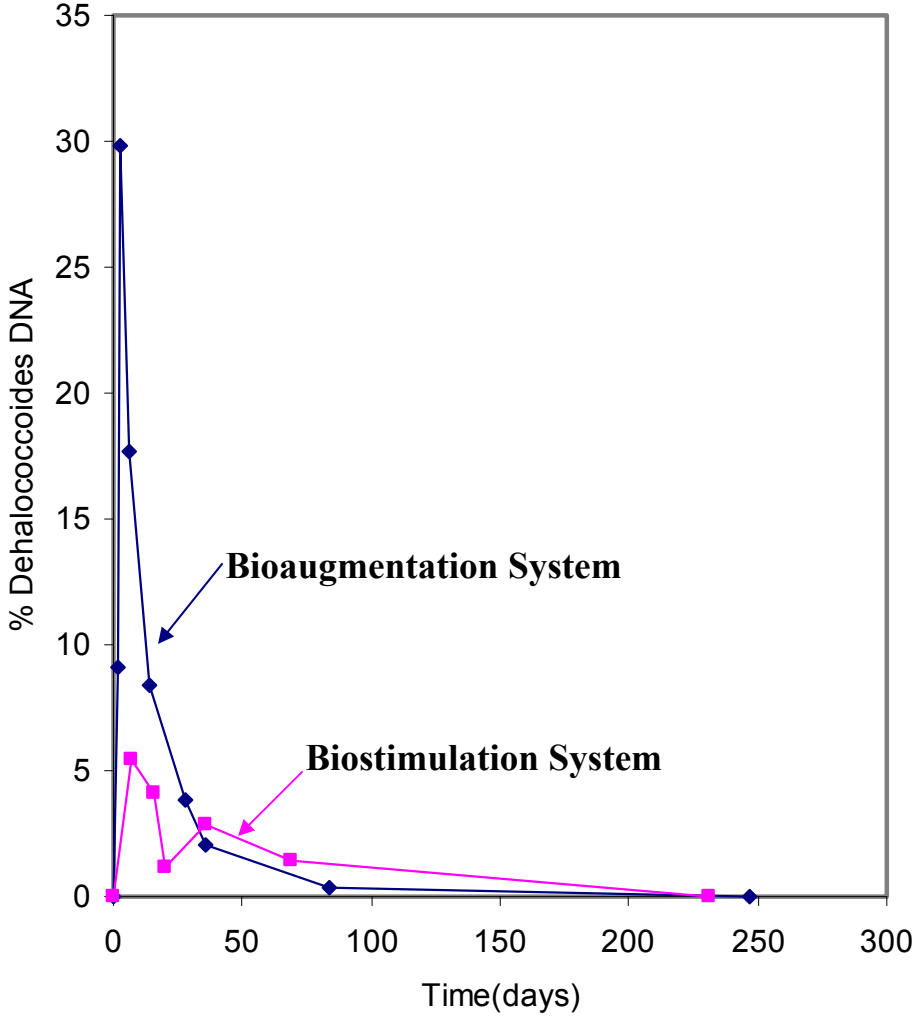


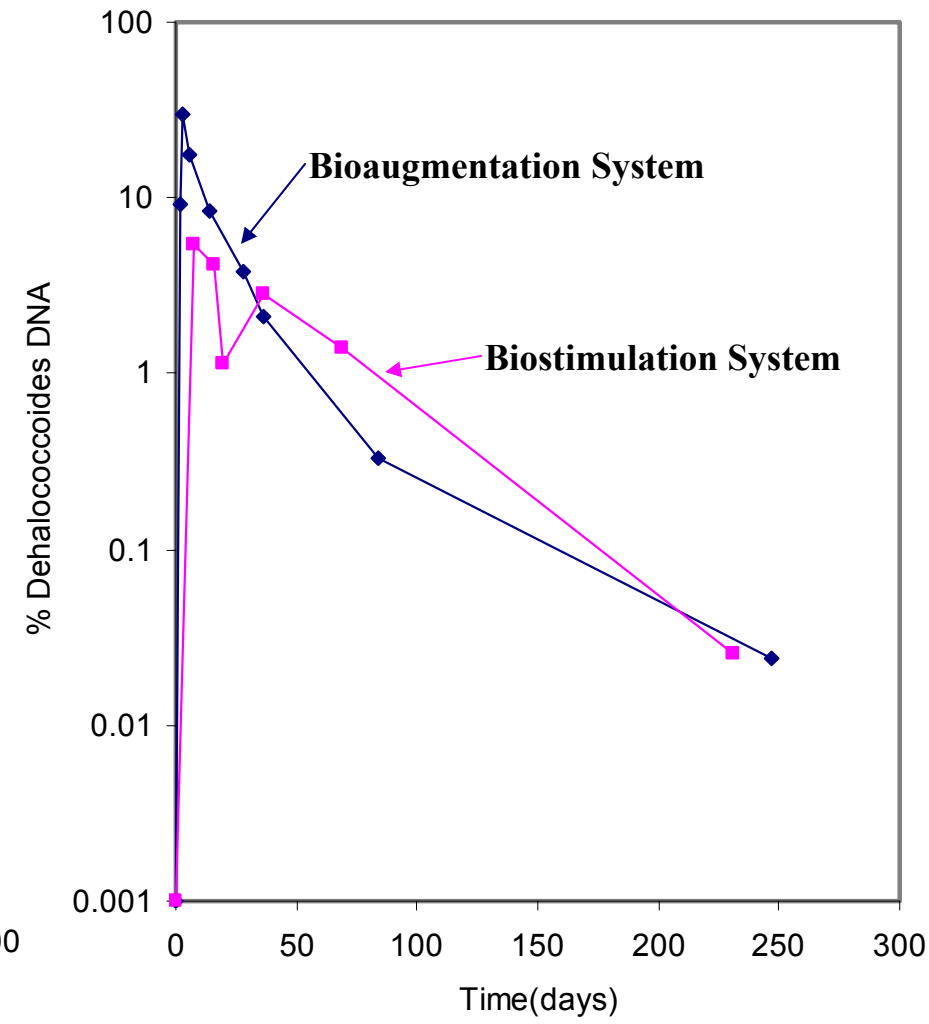
Technology Specific Design Data





Dehalococcoides DNA as a Percentage of total Population DNA





Tracking Microbial Activity (by satellite)

- Remote sensing can provide data on historic sediment transport/deposition
- This data can guide selection of sampling locations to find hot spots

- Combine with microbial evaluation to identify locations with likely degradation conditions
- targeted sampling will evaluate dechlorination
- Microbial activity (dehalogenation) may be enhanced