Real Time Monitoring Program

Protecting the Drinking Water Source in the Huron to Erie Corridor
Reason for Monitoring

- Over 700 spills have been documented along the St. Clair River System since 1986.

- Two of the most notable spills:
  - 8-14-2003 spill of 134 kg of vinyl chloride.
  - 2-1-2004 (Super Bowl Spill) of 42,000 gallons of methyl ethyl ketone.

- A estimated 4.2 million people on the U.S. side receive their drinking water from the Huron to Erie waterway.
Existing Notification Process

Spill and Emergency Reporting Agencies

- State Police
- Spills Action Centre (Toronto)
- Pollution Emergency Alerting System (MDEQ PEAS system)
- MDEQ SE Michigan District Staff
- Drinking Water Treatment Plant Staff
Multiple Tasks

- Provide instant notification of contamination at a WTP intake
- Protect against CBRNE threat
- Provide ambient water quality information at each intake for treatment purposes
- Provide data to improve modeling of the HEC waterway
- Improve decision making during spill events
Primary Goals and Objectives

Establish a monitoring network along the St. Clair River, Lake St. Clair and Detroit River to protect the drinking water supply

- Install monitoring equipment at WTP intakes
- Analyze water quality every 15 - 30 minutes
- Share data (real-time) from the entire network with each WTP
- Institute a water quality alarm notification system
Existing Monitoring Systems

- **ORSANCO – Ohio River Valley Water Sanitation Commission**
  - The oldest and most well established system

- **AMWEDS - Allegheny and Monongahela River early warning system**
  - Temporarily out of service due to lack of funding

- **Lower Mississippi River early warning system**

- **Delaware Valley early warning system**

- **Upper Mississippi River early warning system**

- **Susquehanna River early warning system**
Huron to Erie Corridor
WTP Intakes
Funding Sources

- EPA grant with match
  - St. Clair River and Upper Lake St. Clair communities
  - Macomb (and St. Clair) County Health Dept. grant fiduciary
  - Some State funding

- Department of Homeland Security grant
  - Urban Area Security Initiative (UASI)
  - Wayne County communities
  - Administered by Michigan State Police through the MDEQ

- State MDEQ Grant(s?)
  - Water Bureau Settlement Funds
  - Annual grants
Develop Early Warning Water Quality Monitoring Network

- Conduct suitability and susceptibility analysis to determine threats and resources
- Identify on-line monitoring equipment
  - GC/MS
  - Fluorometer
  - Total Organic Carbon Analyzer
  - Multiparameter probe
- Rapid Toxicity System - Distribution
  - Microtox
YSI Multiparameter Sonde

- pH
- Temperature
- Conductivity
- Dissolved Oxygen
- Oxidation/Reduction Potential
- Turbidity
- Chlorophyll
Fluorometer
Fluorometer Flow Cell

NON-CONTACT, NON-FOULING FLOW CELL

The TD-4100 does not have a glass flow cell. Aromatic hydrocarbons are detected in a stream of water which flows through an annular chamber; the stream does not contact, dirty or foul the optical windows used for monitoring aromatic hydrocarbons. A proprietary Air Carbon system keeps optical windows free from chemical contaminants or hot water applications.

LOW MAINTENANCE

There are no tubes, pumps or valves to replace. The system's one moving part has a life expectancy of greater than 3 years. Routine maintenance involves changing a pump twice a year and an air filter periodically.

DIRECT, CONTINUOUS MONITORING

The TD-4100 monitors flowing water stream continuously. No chemicals, no pretreatment and no manual manipulation of the sample are required to monitor aromatic hydrocarbons.

ACCURATE

The TD-4100 directly measures aromatic hydrocarbons in water with accuracies that consistently exceed commercial laboratory methods.

OPERATOR FRIENDLY

The TD-4100 is designed for easy operation. Simple on-board software controls the system, 4.29 inch output, diagnostics and calibrators.
Total Organic Carbon Analyzer
Total Organic Carbon Analyzer
Inficon Gas Chromatograph/
Mass Spectrometer
<table>
<thead>
<tr>
<th>Compound</th>
<th>Target Concentration (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Benzene</em></td>
<td>0.005</td>
</tr>
<tr>
<td><em>m, o, p -Xylene</em></td>
<td>3.33</td>
</tr>
<tr>
<td>Chloroform</td>
<td>0.08</td>
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<tr>
<td>Carbon tetrachloride</td>
<td>0.005</td>
</tr>
<tr>
<td>Tetrachloroethene</td>
<td>0.005</td>
</tr>
<tr>
<td>1,1,1-Trichloroethane</td>
<td>0.2</td>
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<tr>
<td>1,1,2-Trichloroethane</td>
<td>0.005</td>
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<tr>
<td>Styrene</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2-Dichloropropane</td>
<td>0.005</td>
</tr>
<tr>
<td>Methylene chloride</td>
<td>0.005</td>
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<tr>
<td>Chlorobenzene</td>
<td>0.1</td>
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<tr>
<td>Ethylene dibromide</td>
<td>0.00005</td>
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<tr>
<td><em>Toluene</em></td>
<td>1</td>
</tr>
<tr>
<td>Compound</td>
<td>Target Concentration (mg/L)</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>1,2-Dibromo-3-chloropropane</td>
<td>0.0002</td>
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<tr>
<td>MTBE</td>
<td>0.04</td>
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<tr>
<td>Hexane</td>
<td>3</td>
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<tr>
<td>Cyclohexane</td>
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<tr>
<td>Trichloroethene</td>
<td>0.005</td>
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<tr>
<td>Acrylonitrile</td>
<td>0.0026</td>
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<tr>
<td>1,1-Dichloroethene</td>
<td>0.007</td>
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<tr>
<td>*1,2-Dichloroethane</td>
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<tr>
<td>*Vinyl chloride</td>
<td>0.002</td>
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<tr>
<td>Ethyl benzene</td>
<td>0.7</td>
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<tr>
<td>1,2 &amp; 1,4–Dichlorobenzene</td>
<td>0.6 &amp; 0.075</td>
</tr>
<tr>
<td>cis &amp; trans -1,2-Dichloroethene</td>
<td>0.07 &amp; 0.1</td>
</tr>
</tbody>
</table>

* denotes compounds identified by GC/MS.
Data Logger with YSI probe
Data Management and Dissemination

- Data storage on an off-site project server
- Data shared between the WTPs through a password protected website
- Data visualization using NexSens iChart software
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Samples</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>St Dev</th>
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<tbody>
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<td><strong>East China</strong></td>
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<tr>
<td>Temp (°C)</td>
<td>1142</td>
<td>3.70</td>
<td>4.70</td>
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<td>Sp Cond (uS/cm)</td>
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<td>Turb+ (NTU+)</td>
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<tr>
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<td>12.92</td>
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<td>0.22</td>
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<td><strong>Ira Township</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Temp (°C)</td>
<td>4689</td>
<td>1.92</td>
<td>12.89</td>
<td>1.16</td>
<td>1.21</td>
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<tr>
<td>Sp Cond (uS/cm)</td>
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<td>241</td>
<td>270</td>
<td>221</td>
<td>9</td>
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<tr>
<td>pH (pH)</td>
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<td>8.29</td>
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<tr>
<td>ORP (mV)</td>
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<td>650</td>
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<td>63</td>
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<tr>
<td>Turb+ (NTU+)</td>
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<td>20.46</td>
<td>930.50</td>
<td>5.00</td>
<td>52.54</td>
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<td>Chlorophyll (ug/L)</td>
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<td>4.2</td>
<td>29.1</td>
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<td>ODO (mg/L)</td>
<td>4689</td>
<td>14.16</td>
<td>14.79</td>
<td>1.44</td>
<td>0.35</td>
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</tbody>
</table>
Notification System

- Develop the Spill Notification Protocol
  - Email?
  - Internet based server alarm?
  - Text message?

- Determine alarm settings/conditions for each parameter
  - MCL or Health Advisory?
  - Method Detection limit?
  - Established normal QA/QC chart values?

- Determine WTP response and corrective actions

- Conduct spill drills to test the system
Not Real Time but Real Good
Microtox
Biosensor based toxicity assessment
Other Applications

- USGS dimensional models for the St. Clair River and Lake St. Clair

- Controlled Chemical Applications
  - USFWS Lampracide Program
  - MDEQ Aquatic Nuisance Program
Particles expected to pass an area near the Village of St. Clair WTP intake about 4 hours after release.
Summary

- Over 4 million people use the Huron to Erie Corridor for their drinking water
- RTM project has varied uses and tasks
- A major cost benefit may be confirmation that no threat exists at all!
Questions?

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