

# Using Real Time Monitoring for Real Time Management



**Delaware River Basin Commission**

DELAWARE • NEW JERSEY  
PENNSYLVANIA • NEW YORK  
UNITED STATES OF AMERICA

The Delaware Estuary Science Conference 2007

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Delaware River Basin Commission

# *Using* Real time information from the Web

- Real time information on the web;
- How is it used?
- **Examples of applications:**
  1. Real time flow and transport model;
  2. Flood Watch e-mail warning system;
  3. Water Quality watch e-mail warning system;
  4. Delaware Valley Early Warning system.
- What's next - Customizing data harvesting and processing for Delaware Estuary Resource managers?

# Available Real Time data for Delaware River and Bay (a small subset)...

## ■ USGS

- Flow and Stage
- Water Quality

## ■ NOAA (PORTS)

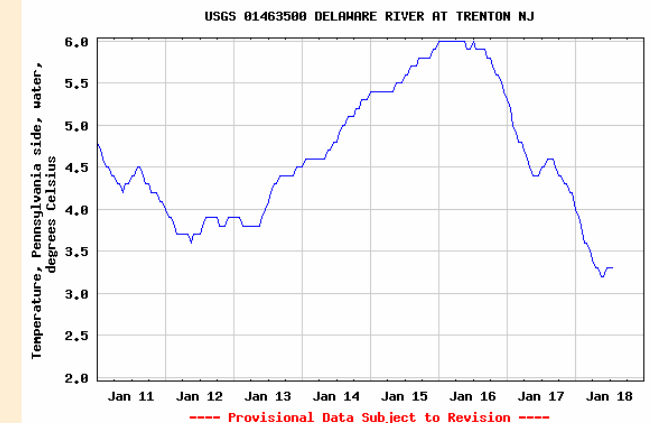
- Water surface elevations
- Salinity
- Water Temperature
- Current
- Meteorology

## ■ NOAA (NWS)

- Hydrologic predictions
- Quantitative precipitation forecasts

Temperature, Pennsylvania side, water, degrees Celsius

Most recent instantaneous value: 3.3 01-18-2007 13:00



[Create presentation-quality graph](#)

Parameter 00010; DD 09

```

# ----- WARNING -----
# The data you have obtained from this automated U.S. Geological Survey database
# have not received Director's approval and as such are provisional and subject to
# revision. The data are released on the condition that neither the USGS nor the
# United States Government may be held liable for any damages resulting from its use.
# Additional info: http://waterdata.usgs.gov/nj/nwis/help/?provisional
#
# File-format description: http://waterdata.usgs.gov/nwis/?tab_delimited_format_info
# Automated-retrieval info: http://waterdata.usgs.gov/nwis/?automated_retrieval_info
#
# Contact: gs-v_support_nwisweb@usgs.gov
# retrieved: 2007-01-18 10:46:23 EST
#
# Data for the following site(s) are contained in this file
# USGS 01460200 Delaware R below Tohickon Cr at Point Pleasant, PA
# -----
# Data provided for site 01460200
# DD parameter Description
# 01 00095 Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius
# 02 00010 Temperature, water, degrees Celsius
# 03 00400 pH, water, unfiltered, field, standard units
# 04 00300 Dissolved oxygen, water, unfiltered, milligrams per liter
#
# agency_cd site_no datetime 04_00300 04_00300_cd 01_00095 01_00095_cd 02_00010
# 5s 15s 16s 14s 14s 14s 14s 14s 14s
# USGS 01460200 2007-01-11 00:00 12.5 103 7.3 7.3
# USGS 01460200 2007-01-11 00:30 12.5 103 7.3 7.3
# USGS 01460200 2007-01-11 01:00 12.5 103 7.3 7.2
# USGS 01460200 2007-01-11 01:30 12.5 104 7.3 7.2
# USGS 01460200 2007-01-11 02:00 12.5 104 7.3 7.3
# USGS 01460200 2007-01-11 02:30 12.5 104 7.3 7.3
# USGS 01460200 2007-01-11 03:00 12.5 104 7.3 7.3
# USGS 01460200 2007-01-11 03:30 12.5 104 7.3 7.3

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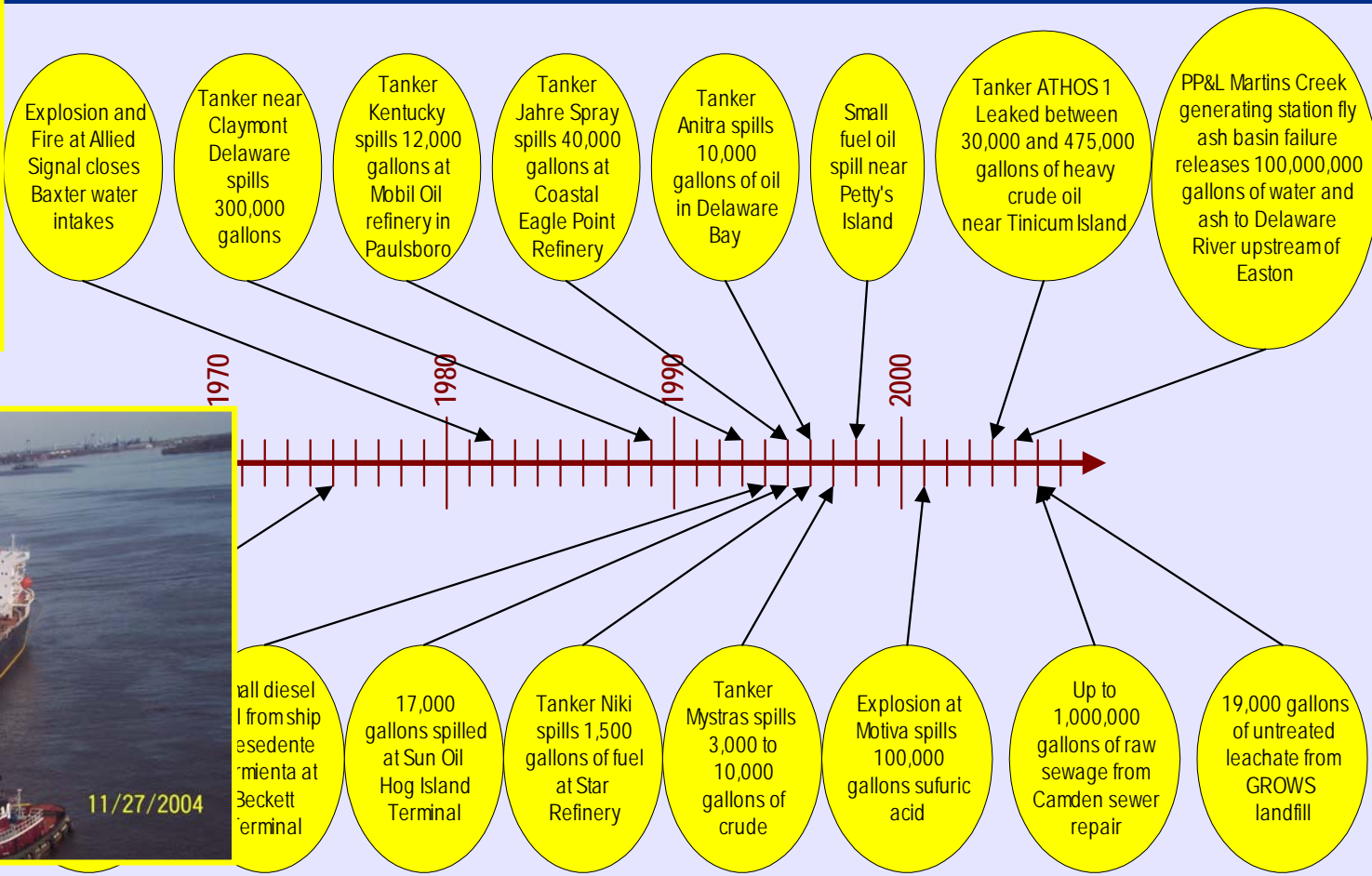
# Application 1

## Real Time Flow and Transport Model

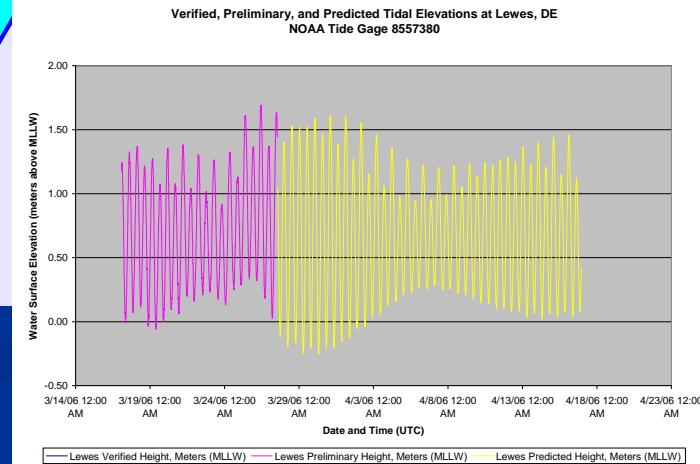
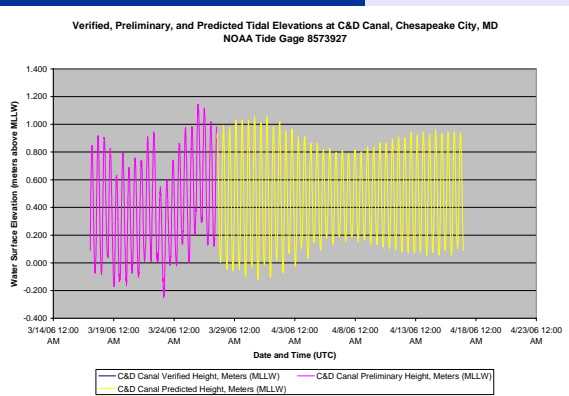
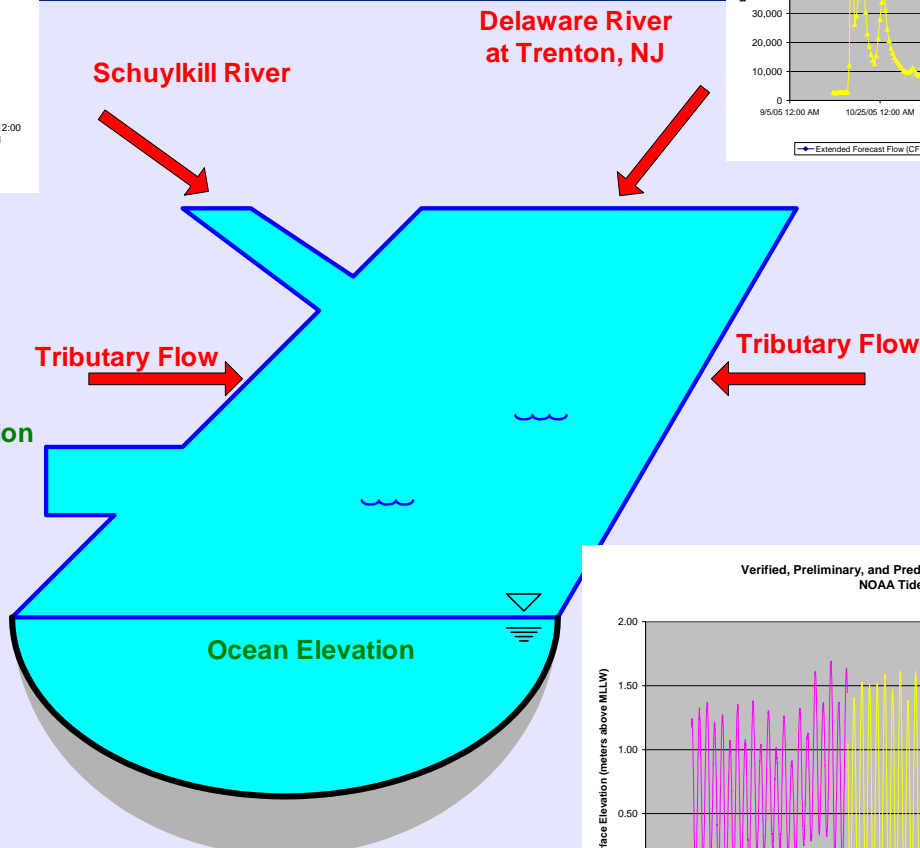
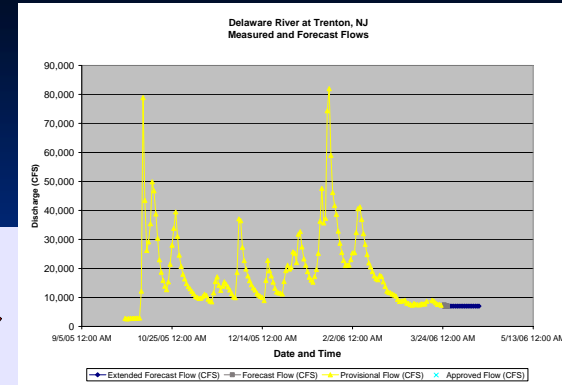
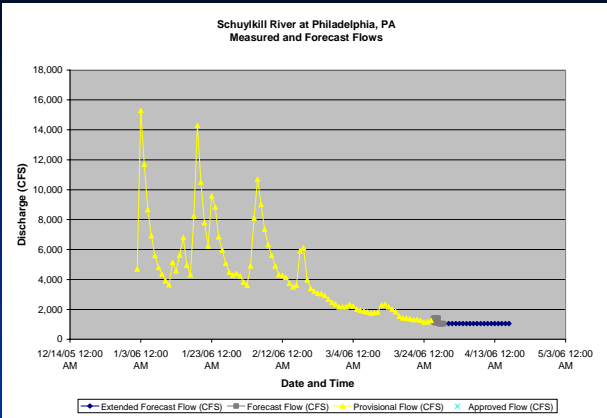
# The tidal Delaware is a Hard Working River...

- Drinking Water for over one million people;
- 3rd largest petrochemical port - 42 million gallons of crude each day;
- Largest North American port for steel, paper, and meat;
- Largest importer of cocoa beans and fruit on the east coast;
- World's largest freshwater port;
- 6 nuclear reactors;
- \$19 billion annually;
- Strategic military port;
- Delaware River refinery complex provides 70% of gasoline and heating oil for entire East Coast.

# And Spills Do Happen...

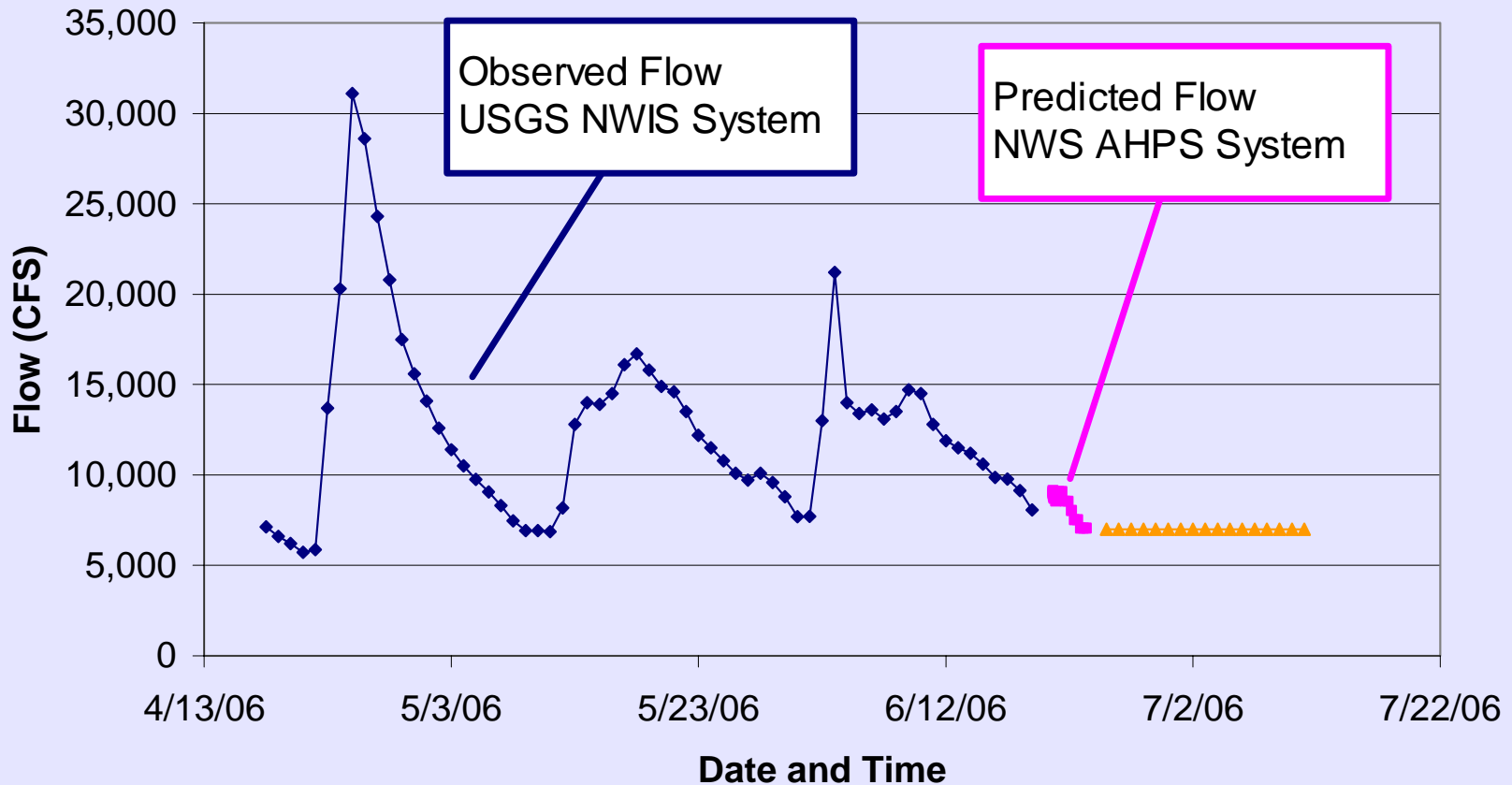


*Photos of Athos 1 courtesy U.S. Coast Guard*



# Conceptual Schematic of Automated Hydro Model

Measured, Forecasted, and Extrapolated Forecasted Flows at the Delaware River at Trenton (USGS Station 01463500)



◆ Flow (CFS)   
 ■ Forecasted Flow (CFS)   
 ▲ Extrapolated Forecasted Flow (CFS)

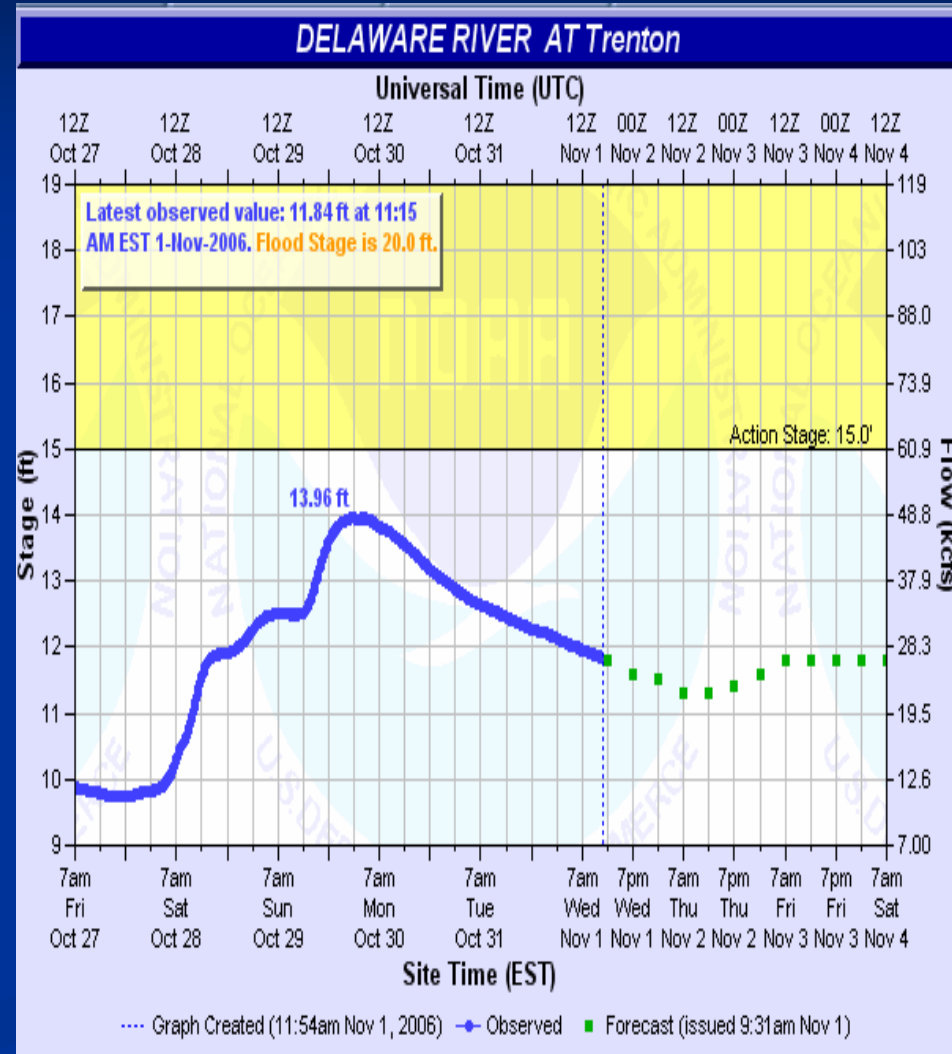
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# Application 2

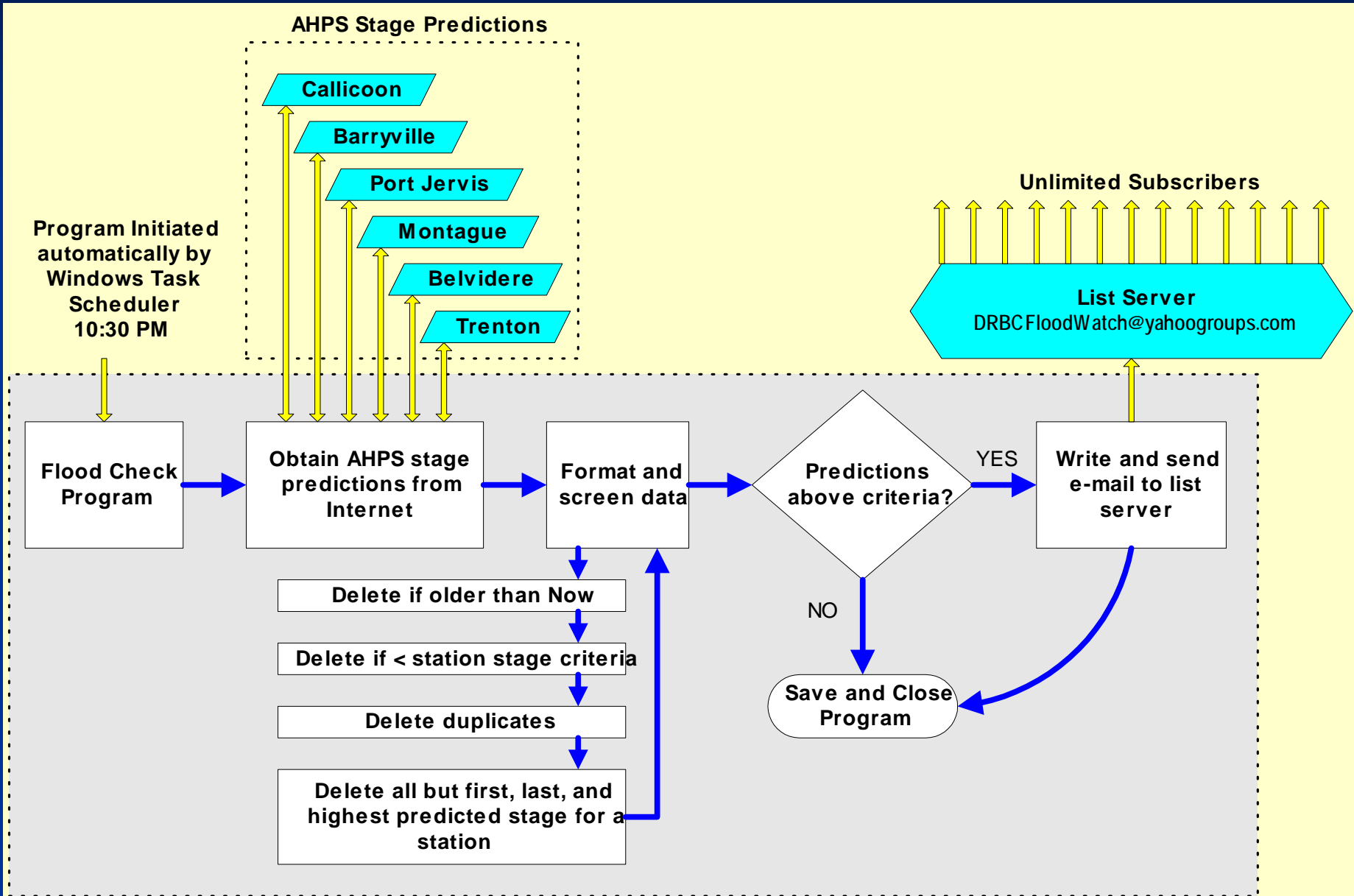
## Flood Watch E-mail Warning System

# Automated Flood Watch Notification

- DRBC developed an automated application that performs the following *daily* tasks:
  - Retrieves river forecast from 8 stations from National Weather Service's Advanced Hydrologic Prediction Service (AHPS);
  - Generates and sends e-mail to a list server if stage exceeds Flood Action criteria.
- NOAA is modifying the code to develop a nationwide product to be released December 2006.



# Flood Watch Program Flow Chart



# NOAA Incorporated the same algorithms to develop a product for the Northeast

NOAA's National Weather Service  
Advanced Hydrologic Prediction Service

Home News Organization Search for:  NWS All NOAA Go

Home > AHPS > RSS Feeds > "Alert" River Conditions Based on Local Action Settings

[RSS Feeds](#) [Observed](#) [Forecasts](#) [Alerts](#)

### "Alert" River Conditions Based on Local Action Settings

This page provides access to observed and forecast river conditions in [RSS/XML](#) feeds/format. This is an experimental product of the National Weather Service Eastern Region Headquarters. [Comments and feedback](#) are welcome. A [Product Description Document](#) is also available.

Note: The alerts utilize both observations and forecast information (where available). Forecasts are available at select river locations where data histories and forecast procedures make them possible. This RSS feed is based on the original development efforts of John Yagecic of the [Delaware River Basin Commission](#).

To subscribe to one of our RSS feeds below, copy the URL (web address) of the content you are interested in and insert this to your newsreader (RSS reader) or aggregator (usually as an "add feed" option).

By State	By Gauge	By County
<a href="#">Connecticut</a>	<a href="#">XML</a>	<a href="#">XML</a>
<a href="#">Delaware</a>	<a href="#">XML</a>	<a href="#">XML</a>
<a href="#">District of Columbia</a>	<a href="#">XML</a>	<a href="#">XML</a>
<a href="#">Georgia*</a>	<a href="#">XML</a>	<a href="#">XML</a>
<a href="#">Indiana*</a>	<a href="#">XML</a>	<a href="#">XML</a>
<a href="#">Kentucky*</a>	<a href="#">XML</a>	<a href="#">XML</a>
<a href="#">Maine</a>	<a href="#">XML</a>	<a href="#">XML</a>
<a href="#">Maryland</a>	<a href="#">XML</a>	<a href="#">XML</a>

# Application 3

## Water Quality Watch E-mail Warning System

# Automated Water Quality Watch Notification

<u>Station</u>	DO Instantaneous	DO 24-hr average	Temperature	pH (min and max)	Turbidity	Salinity
Delaware River at Trenton, NJ 01463500	✓	✓	✓	✓	✓	
Delaware River at Pt. Pleasant, PA 01460200	✓	✓	✓	✓	✓	
Delaware River at Ben Franklin Bridge 01467200		✓	✓	✓	✓	
Delaware River at Chester, PA 01477050		✓	✓	✓	✓	
Delaware River at Reedy Island Jetty 01482800		✓	✓	✓	✓	
Lehigh River at Easton, PA 01454720						
Brandywine at Chadds Ford, PA 01481000	✓	✓		✓	✓	

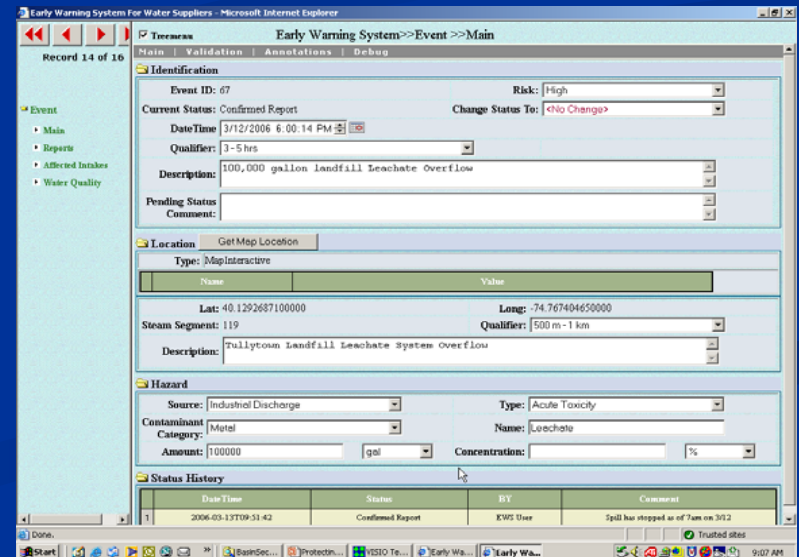
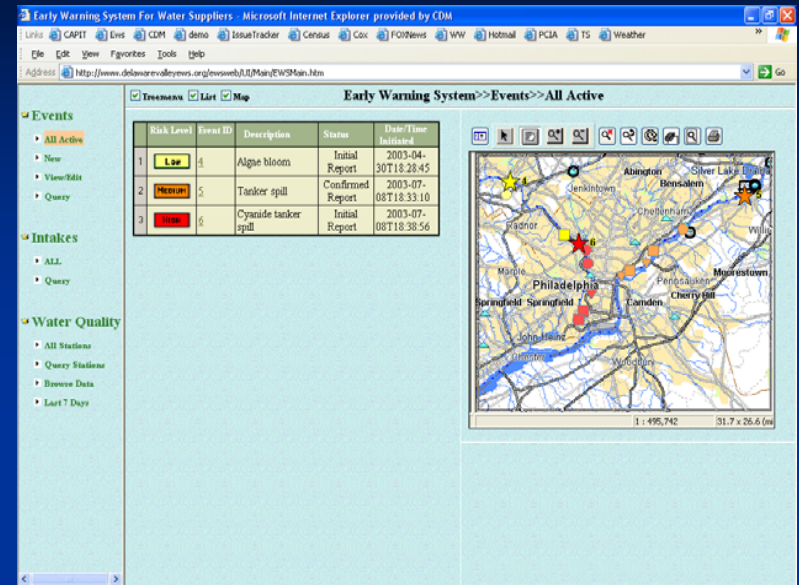
- DRBC developed an automated application that performs the following *daily* tasks:
  - Retrieves real time water quality observations from 7 USGS monitoring stations;
  - Compares observations to WQ criteria;
  - Generates and sends e-mail to a list server if observations are outside criteria;
- Operational now, official roll-out next spring.

# Application 4

## Delaware Valley Early Warning System

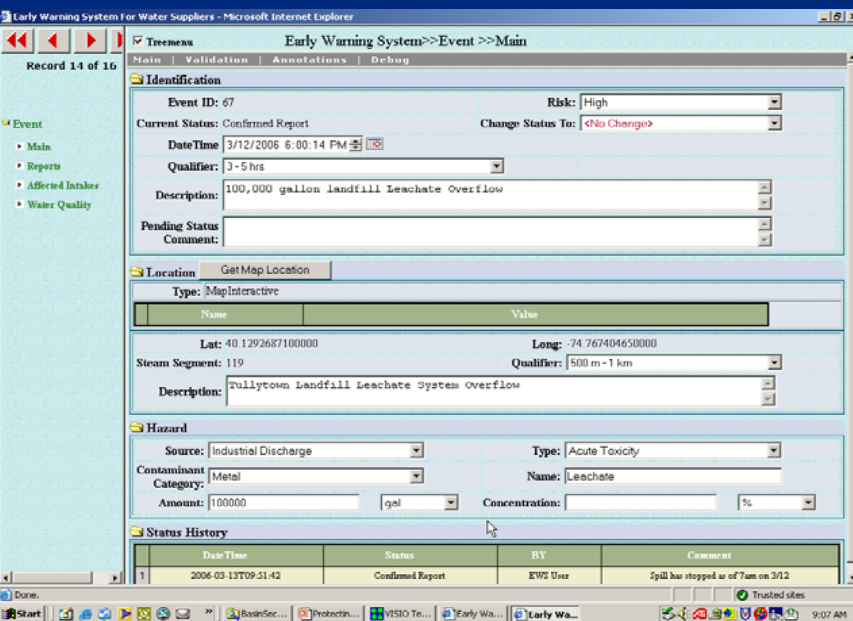
# Delaware Valley Early Warning System

- Philadelphia Water Department developed and maintains the system
- Web Based clearinghouse for notifications of spill and water quality events
- Telephone and e-mail notifications
- Water Purveyors (currently)
- Secure web system linking automated intake monitoring



# How the Pieces fit Together

## A Very Brief Case Study of the March 2006 Leachate Spill



Early Warning System for Water Suppliers - Microsoft Internet Explorer

Record 14 of 10

Treeview: Early Warning System >> Event >> Main

Main | Validation | Annotations | Debug

Event ID: 67 Risk: High

Current Status: Confirmed Report Change Status To: <No Change>

Date Time: 3/12/2006 6:00:14 PM

Qualifier: 3-5 hrs

Description: 100,000 gallon landfill Leachate Overflow

Pending Status: Pending Status Comment:

Location: Get Map Location

Type: MapInteractive

Name	Value
Lat: 40.1292687100000	Long: -74.767404650000
Stream Segment: 119	Qualifier: 500 m - 1 km
Description: Tullytown Landfill Leachate System Overflow	

Hazard

Source: Industrial Discharge Type: Acute Toxicity

Contaminant Category: Metal Name: Leachate

Amount: 100000 gal Concentration: %

Status History

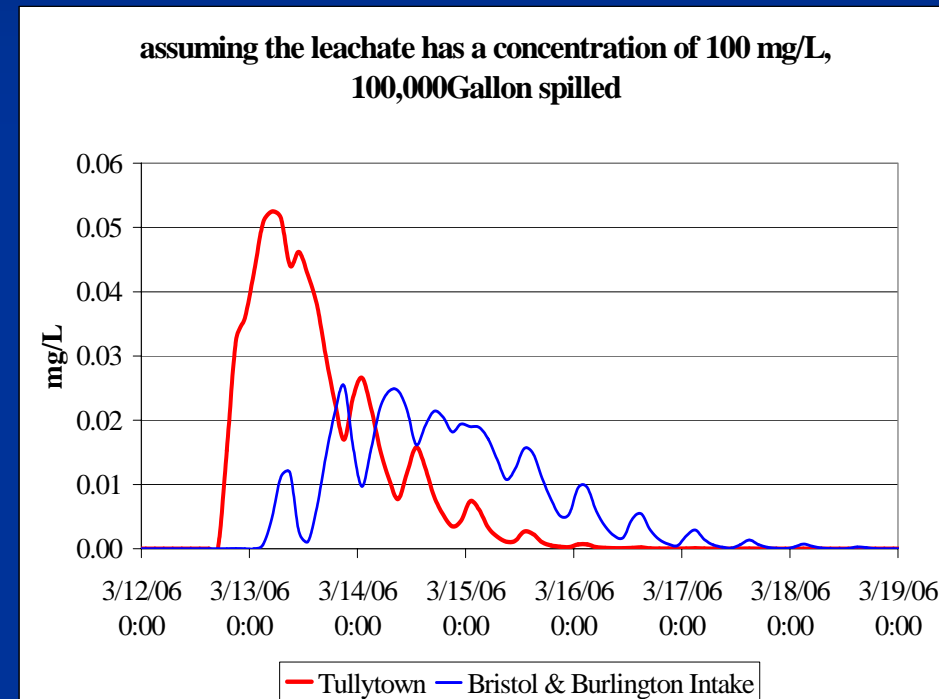
Date Time	Status	BY	Comment
2006-03-13T09:51:42	Confirmed Report	EWI User	Spill has stopped as of 7am on 3/12

- Early Warning System Notice
  - 100,000 gallons of untreated leachate spilled from landfill in Tullytown, PA to Delaware River - March 13, 2006
- Real time estuary model had run the night before;

- DRBC entered volume, location, and time of discharge into the water quality model;
  - tracked likely movement and concentration of pollutant.

# Results of Water Quality Model

- By 5 PM that same day, had contacted 3 water intakes;
- Were able to tell them approximately when the pollutant would be at its highest concentration and when it would abate.



# Possibilities for future work

- Could develop automated applications to combine information from unrelated data sets to watch for resource-specific set of conditions. For example:  
If...
  - Salinity > x; and
  - Water temp. > y; and
  - DO < z; and
  - No rain forecasted for the next 36-hours:
- Then, send a warning to [JohnSmith@comcast.net](mailto:JohnSmith@comcast.net)

# Recommendations and Conclusions

- Real time data is increasingly available via the web;
- DRBC has developed applications to utilize, process, and disseminate this information;
- Could develop resource-specific applications, using complex data combinations, to watch for specific conditions;
- Need increased dialogue with resource managers to identify potential applications.

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## Questions?



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