Toward National Application of a Real Time Water Quality E-mail Notification System

IOOS Workshop

January 2010

John Yagecic, P.E.

Delaware River Basin Commission

This presentation…

- Some thoughts (opinions) about customers;
- Describe an existing application that functions at the local regional level;
- Discuss how a different local application was scaled up to a national product;
- Some thoughts (opinions) about Users vs. Relevance.

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Who Manages Water Quality?

- USGS?
- NOAA?
- EPA?
- States & interstates?
- Universities and Academia?
- Laboratories and Consultants?

Mostly the states (& interstates)
Under the framework of the
Clean Water Act!

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Developing Tools for the Customer

Who uses data and tools?

- ~~Decision Makers?~~ *Indirectly*
- Mid level technical staff? *The filter*
- ~~The general public?~~ *Mostly Indirectly (except for flood victims)*

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Water Quality Watch
E-mail Warning System

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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;
- Worlds 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.

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And Spills Do Happen…

1970 1980 1990 2000

- Explosion and Fire at Allied Signal closes Baxter water intakes
- Tanker near Claymont Delaware spills 300,000 gallons
- Tanker Kentucky spills 12,000 gallons at Mobil Oil refinery in Paulsboro
- Tanker Jahre Spray spills 40,000 gallons at Coastal Eagle Point Refinery
- Tanker Anitra spills 10,000 gallons of oil in Delaware Bay
- Small fuel oil spill near Petty's Island
- Tanker ATHOS 1 Leaked between 30,000 and 475,000 gallons of heavy crude oil near Tinicum Island
- PP&L Martins Creek generating station fly ash basin failure releases 100,000,000 gallons of water and ash to Delaware River upstream of Easton
- all diesel l from ship esedente rmienta at Beckett erminal
- 17,000 gallons spilled at Sun Oil Hog Island Terminal
- Tanker Niki spills 1,500 gallons of fuel at Star Refinery
- Tanker Mystras spills 3,000 to 10,000 gallons of crude
- Explosion at Motiva spills 100,000 gallons sufuric acid
- Up to 1,000,000 gallons of raw sewage from Camden sewer repair
- 19,000 gallons of untreated leachate from GROWS landfill

Photos of Athos 1 courtesy U.S. Coast Guard

Background - Parallel Needs

- WQ Standards
- 2004 Integrated Assessment process realized that WQ standards were sometimes being violated;
- Violations were not identified until well after the event was over;
- Lost opportunities for more refined monitoring.

- Drinking water concerns
- November 2004 Athos 1 spilled 473,000 gallons of crude oil into Delaware Estuary;
- Ash basin leak at PPL's Martin's Creek power plant August 23rd-27th, 2005 released ~100 million gallons of ash and water into the Delaware River.

An Automated Water Quality e-mail Notification System

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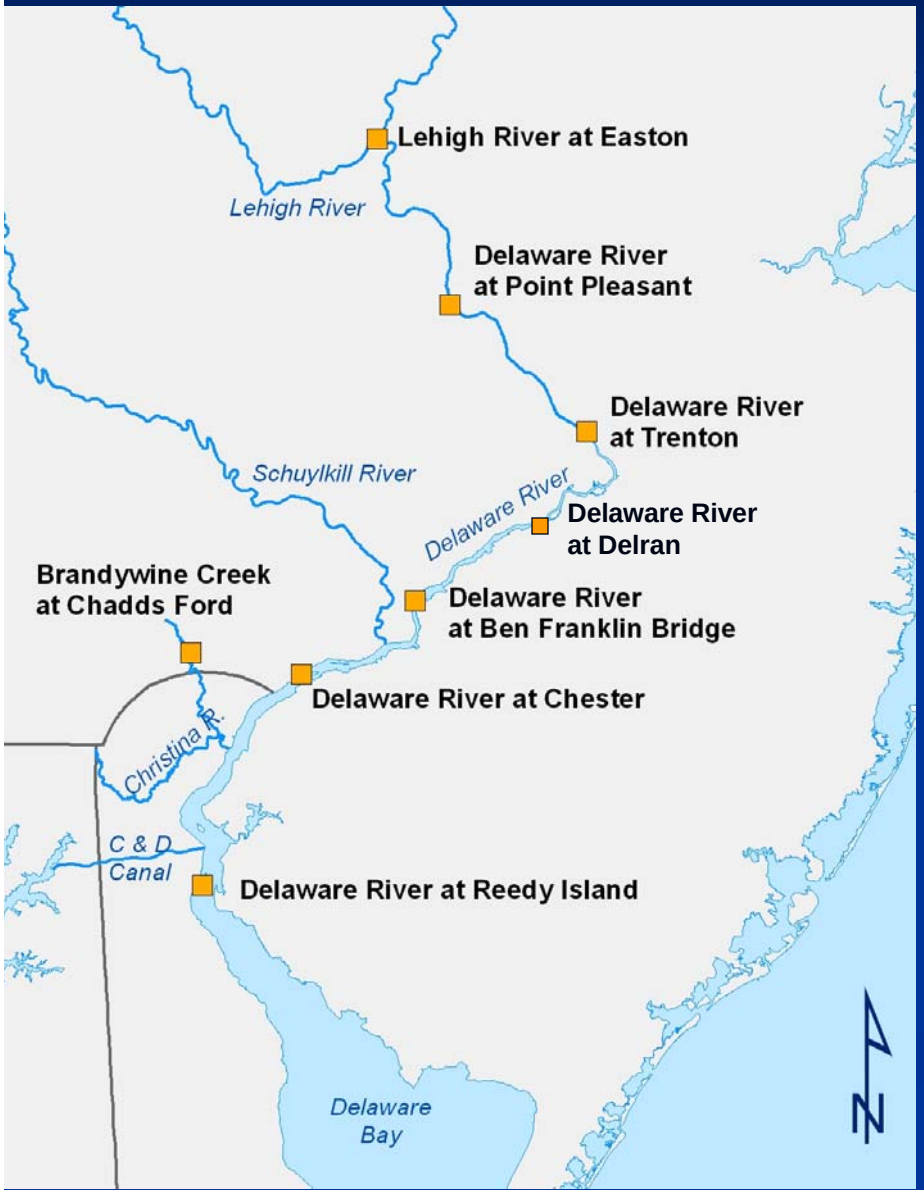

- DRBC developed an automated application that performs the following *daily* tasks:
  - Retrieves real time water quality observations from 8 USGS monitoring stations (VBA program);
  - Compares observations to WQ criteria;
  - Generates and sends e-mail to a list server if observations are outside criteria;
- Operational since August 2006

Automated Water Quality Watch Notification

Station	DO Instantaneous	DO 24-hr average	Temperature	pH (min and max)	Turbidity	Conductance (surrogate for TDS)
Delaware River at Trenton, NJ 01463500	✓	✓	✓	✓	✓	✓
Delaware River at Pt. Pleasant, PA 01460200	✓	✓	✓	✓		✓
Delaware River at Delran, NJ 01467029		✓	✓	✓	✓	
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	✓	✓		✓	✓	

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  - Retrieves real time water quality observations from 8 USGS monitoring stations;
  - Compares observations to WQ criteria;
  - Generates and sends e-mail to a list server if observations are outside criteria;

Benefits of this system

- Fast notification of apparent WQ standard violations;
- Adaptive Monitoring;
- Faster recognition & repair of monitor malfunctions;
- Seeing in real time the linkages in parameters (i.e. pH violations upstream one week – DO violations downstream the following week);
- Fewer surprises at Integrated Assessment time;
- Increase visibility and value of continuous monitors to management and funders;
- Better communication among states and other agencies in interstate waters.

Sample e-mail

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Subject: [DRBC_WQ_Watch] pH Water Qual. Notice, Delaware River at Trenton, NJ , 5/5/2008 5:00:10 AM
From: John Yagecic <John.Yagecic@drbc.state.nj.us>
Sender: DRBC_WQ_Watch@yahoogroups.com
Reply-To: DRBC_WQ_Watch@yahoogroups.com
Date: 5/5/2008 5:00 AM
To: DRBC_WQ_Watch@yahoogroups.com

Visit Your Group

5/5/2008 5:00:10 AM Delaware River
This is a report generated from an automated daily scan of
real time USGS water quality monitors.

PROVISIONAL Observations indicate that the Delaware River at Trenton, NJ

was outside DRBC's criteria for pH not higher than 8.5
including the following dates, and times:

Gage	Date and Time	Measurement
Trenton	05/04/08 04:00 PM	8.6
Trenton	05/04/08 06:00 PM	8.7
Trenton	05/04/08 07:00 PM	8.7
Trenton	05/04/08 08:00 PM	8.7
Trenton	05/04/08 09:00 PM	8.6

For more information, visit the USGS web page at
http://waterdata.usgs.gov/nwis/current/?type=quality
WARNING: This message is based on PROVISIONAL unconfirmed
observations.
Values outside criteria do not necessarily indicate a violation of water
quality standards.
This service is subject to periodic outages and interruptions beyond DRBC
control.
Please do not rely solely on this e-mail alert for water quality information.
Please do not respond to this e-mail. For questions about the e-mail Contact
John.Yagecic@drbc.state.nj.us or
DRBC, 609-883-9500, or visit the DRBC web site at www.drbc.net

Messages Generated

August 29, 2006 to May 14, 2008

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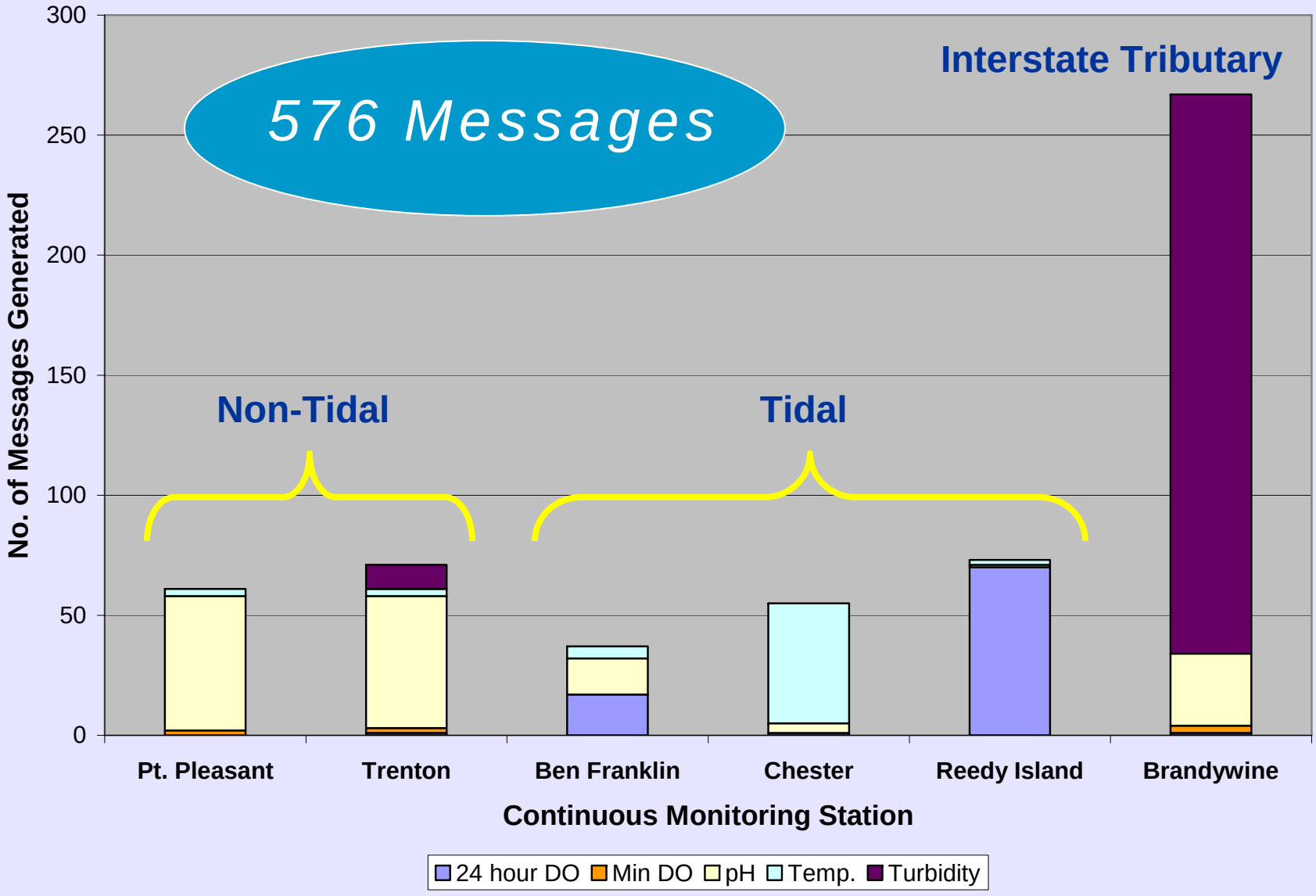


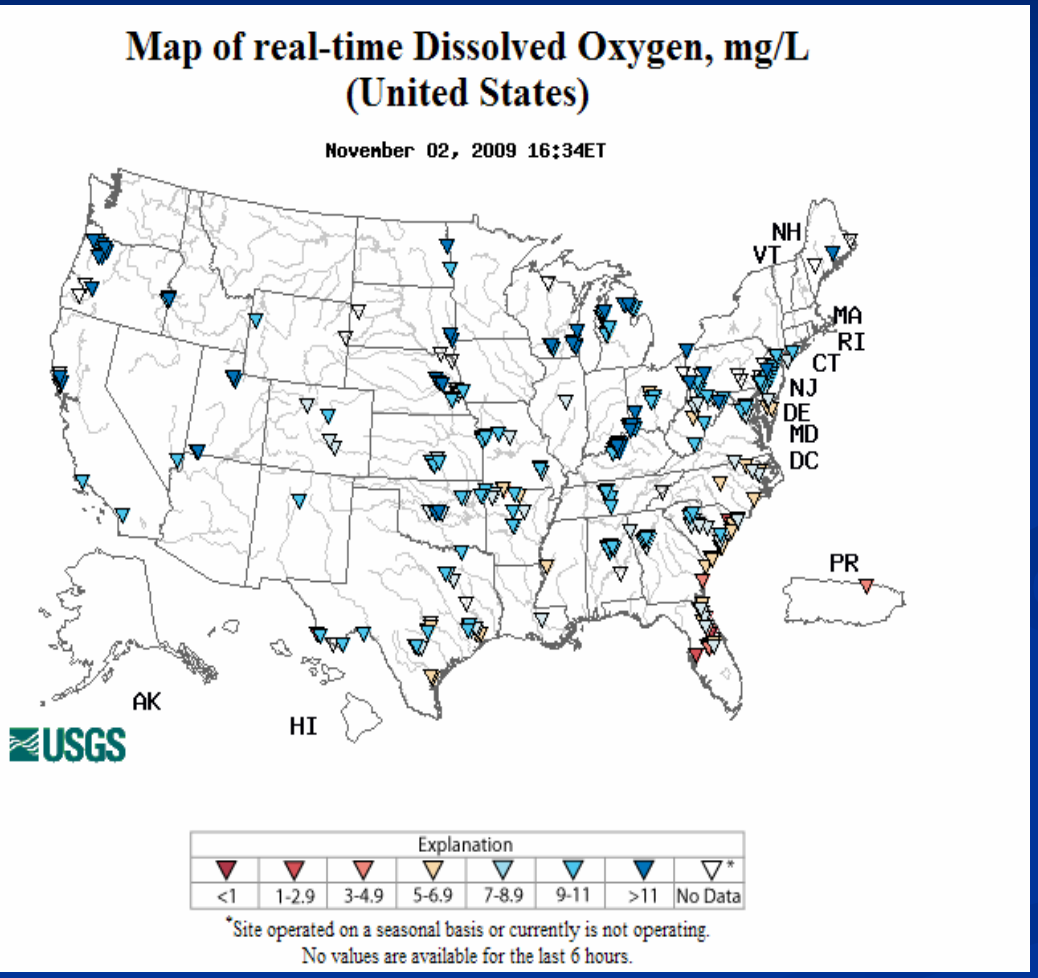
To Subscribe…

Go to:

http://tech.groups.yahoo.com/group/DRBC_WQ_Watch/

- No Charge;
- Targeted toward organizations with a water quality mission, but open to anyone;
- Prospective subscribers must e-mail back a brief statement acknowledging system limitations.

Is there Potential for a National Application?



- Most real time water quality monitoring sites probably have water quality standards for that site.
- Develop the architecture that would allow water quality managers to input the standard and specify an e-mail or RSS feed

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A Brief Case Study in going from a Regional to National Scale

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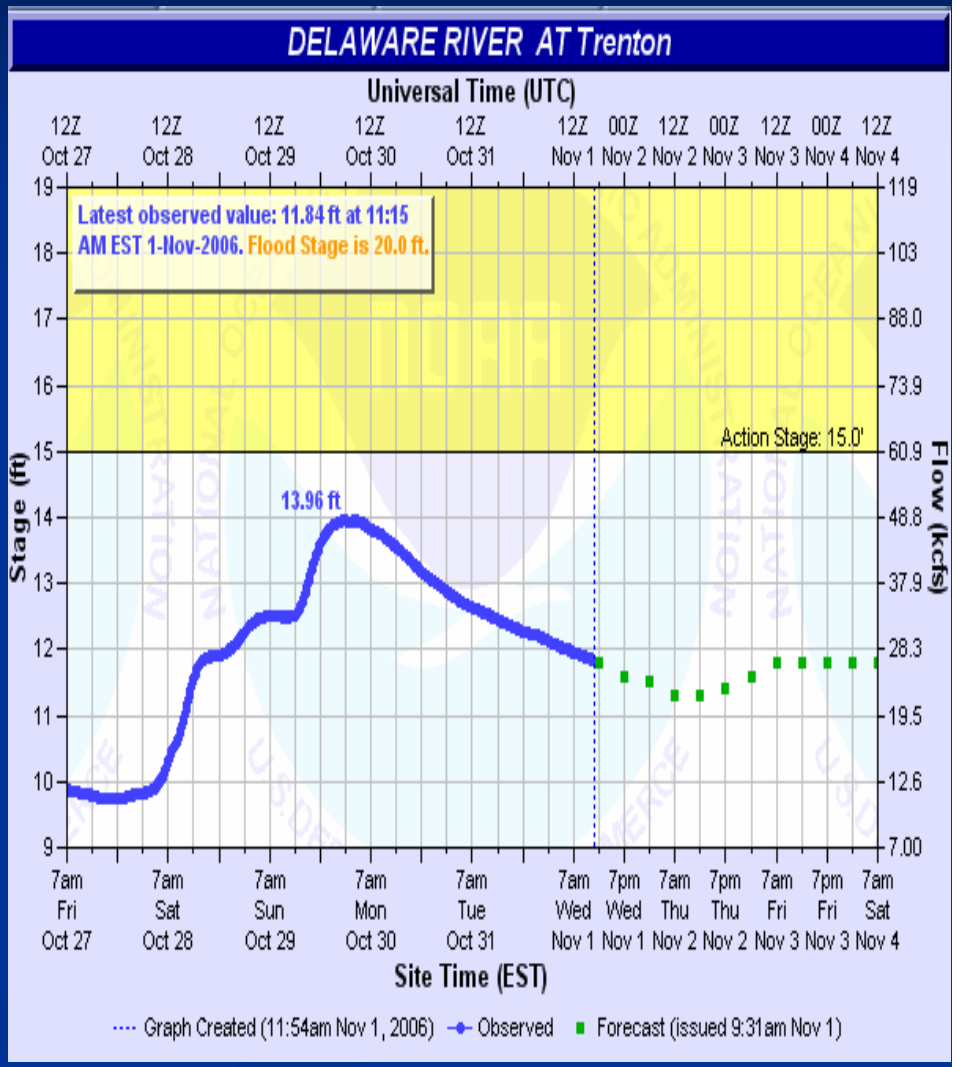
- DRBC developed automated app for *daily* tasks:
  - Retrieves river forecast from 8 stations from National Weather Service's Advanced Hydrologic Prediction Service (AHPS);
  - Generates and sends e-mail to a list server if stage exceeds Flood Action criteria.
- NOAA modified the code to develop a nationwide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



NOAA Incorporated the same algorithms to develop a National Product

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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:
- For example - Vibrio
- Then, send a warning to JohnSmith@comcast.net

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Active Users vs. Relevance of Application

- WQ e-mail system has only 15 subscribers. Why? Is that a failure?
- Universe of Water Quality Managers, interested parties is small;
- Public depends on professionals;
- System is important and effective, but the customer base is small;
- As you increase customization of applications, customer base will shrink;
- Beneficiaries ≠ Active Users ≠ Relevance of app

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Questions?

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