Innovative Integration of a Source Water Protection Plan

Lori A. Burkert
Entech Engineering, Inc.
lburkert@entecheng.com
610-373-6667

Worst Nightmare Becomes Reality …

Elk River Chemical Spill, *January 2014*

DRINKING WATER CONTAMINATION!

Elk River Chemical Spill, *January 2014*

DRINKING WATER CONTAMINATION!

Freedom Industries | Failed Containment

DRINKING WATER CONTAMINATION!

Lake Erie Toxic Algae Plume

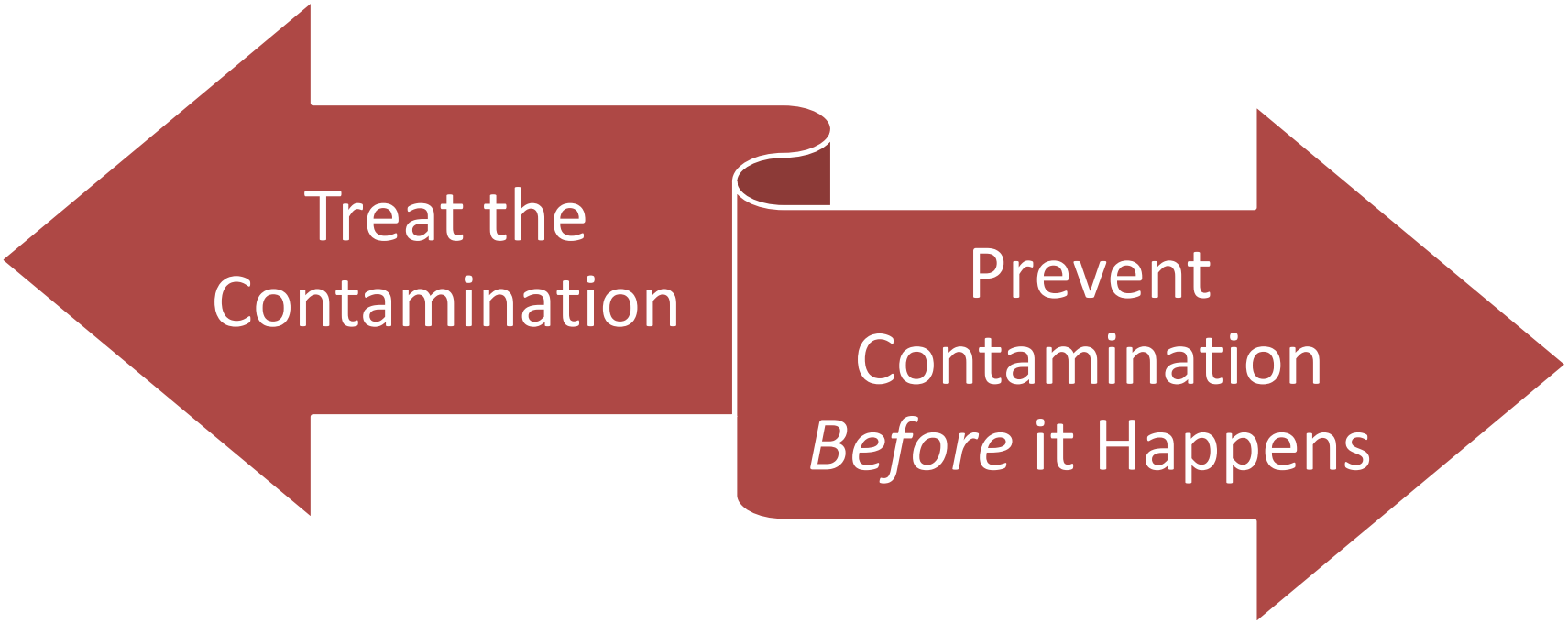
August 2014

DRINKING WATER CONTAMINATION!

Colorado Mine Spill on Animas River, *August 2015*

- **3 million gallons of heavy-metal polluted mine water**
- **Multiple municipalities stopped pumping water until plume passed**
- **Affected drinking water systems in multiple states**
- **Bottom sediments laced with heavy metals**

Reactive vs. Proactive Approach



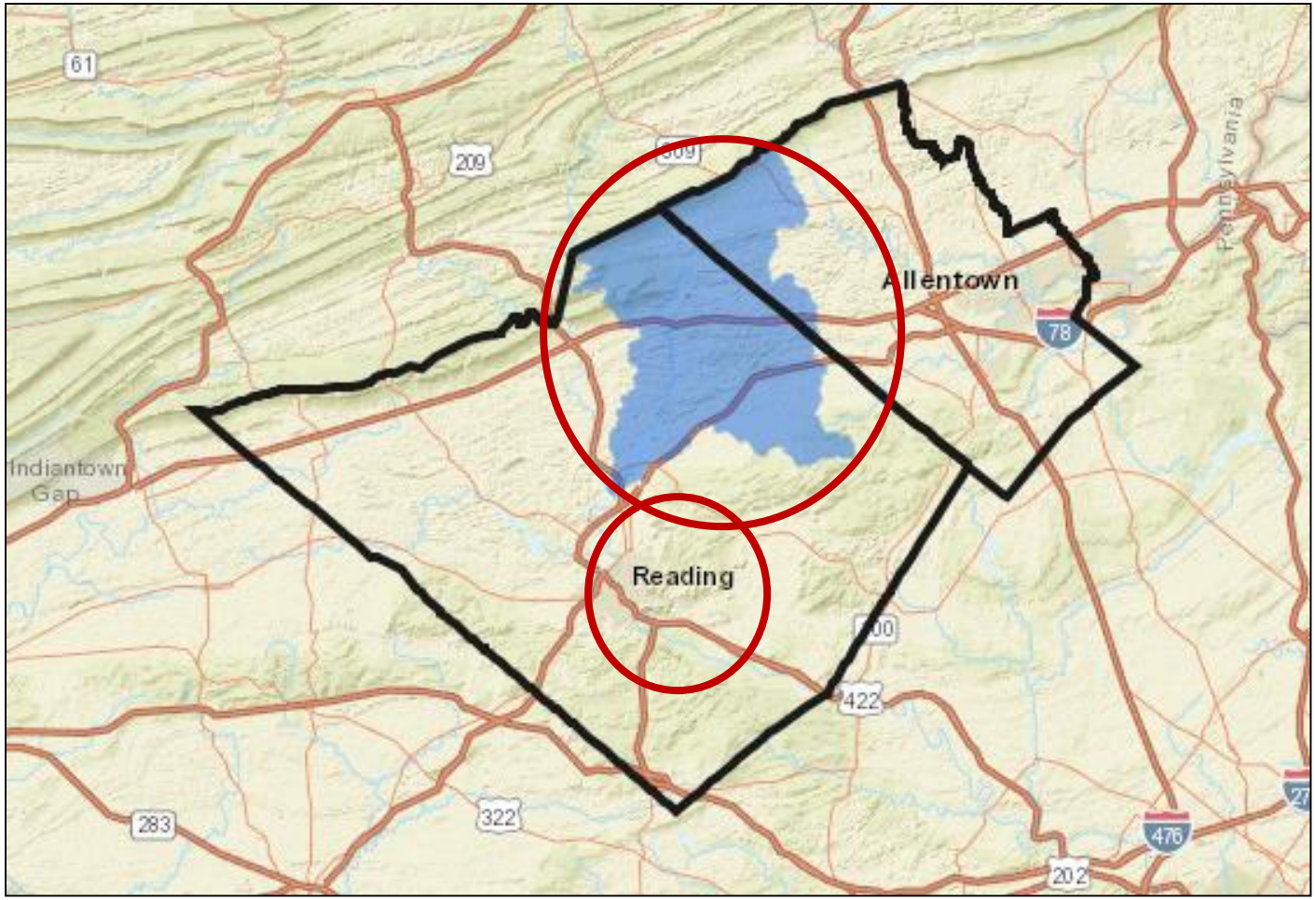
Source Water Protection

"Source Water Protection (SWP) is a **voluntary** effort to take action to **prevent contaminants** from entering **public drinking water** sources. The goal of source water protection is to protect both **groundwater sources** (also called "wellhead protection") and **surface water sources** (lakes, streams, rivers) used for drinking water."

-www.sourcewaterpa.org

Reading Area Water Authority

Reading Area Water Authority



City of Reading

Maiden Creek Watershed

- Schuylkill / Delaware River Basin
- 216 Square Miles
- > 2,100 Miles of Streams
- Berks and Lehigh Counties
- 24 Municipalities

- Varied Land Use
  - Rural, Suburban, and Small Urban Communities
  - Agriculture
  - Forest and Recreation
  - Scattered Industry
  - Major Highways (I-78, Rt. 222)

Raw Water Reservoir – Lake Ontelaunee

Constructed in 1926 | 1,082 Acres | 3.9 Billion Gallons

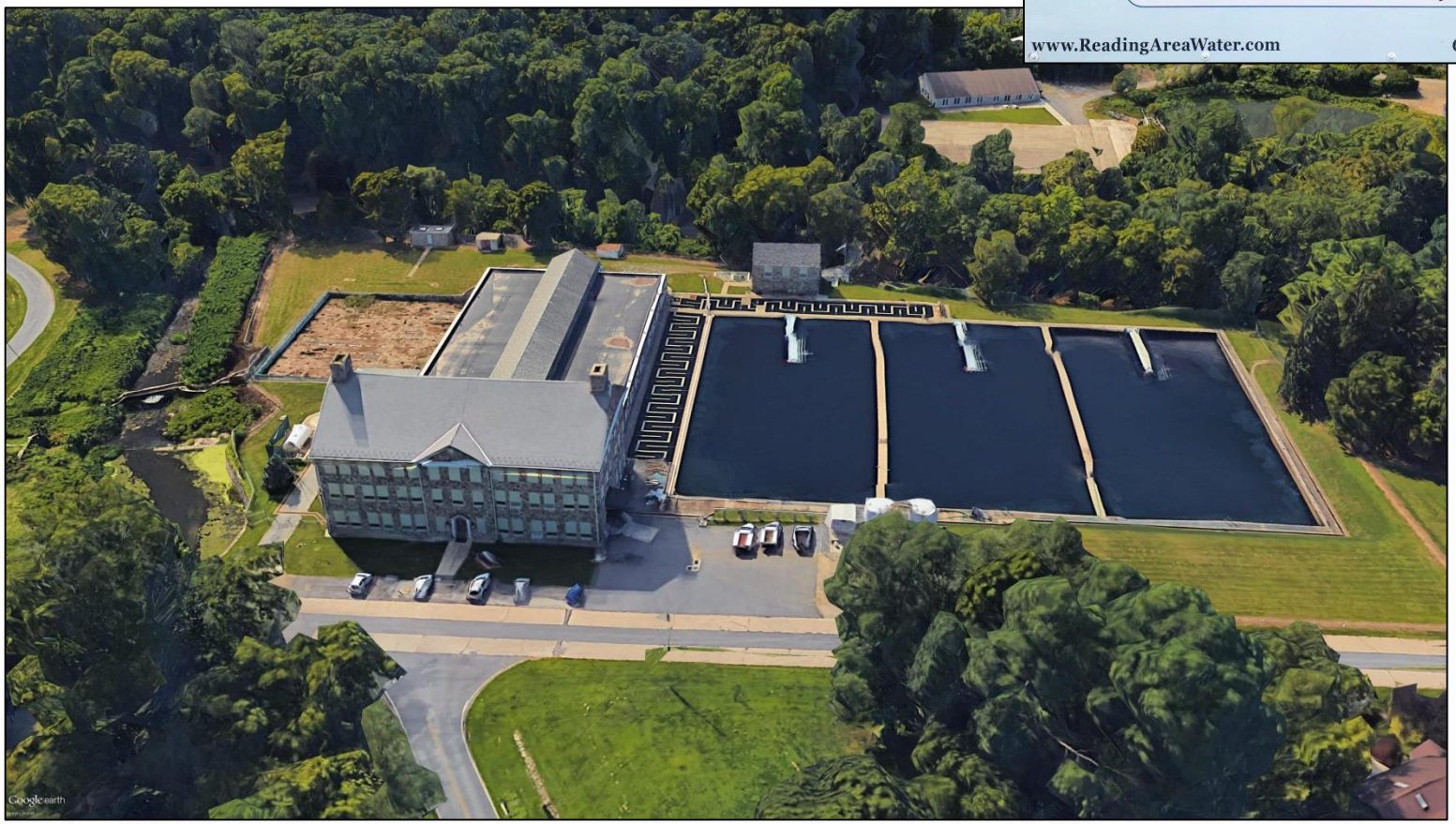
Reservoir Management

- Raw Water Sampling
- Ongoing Surveillance of Lake
- Watershed Management
- Dredging

Reserve Intake

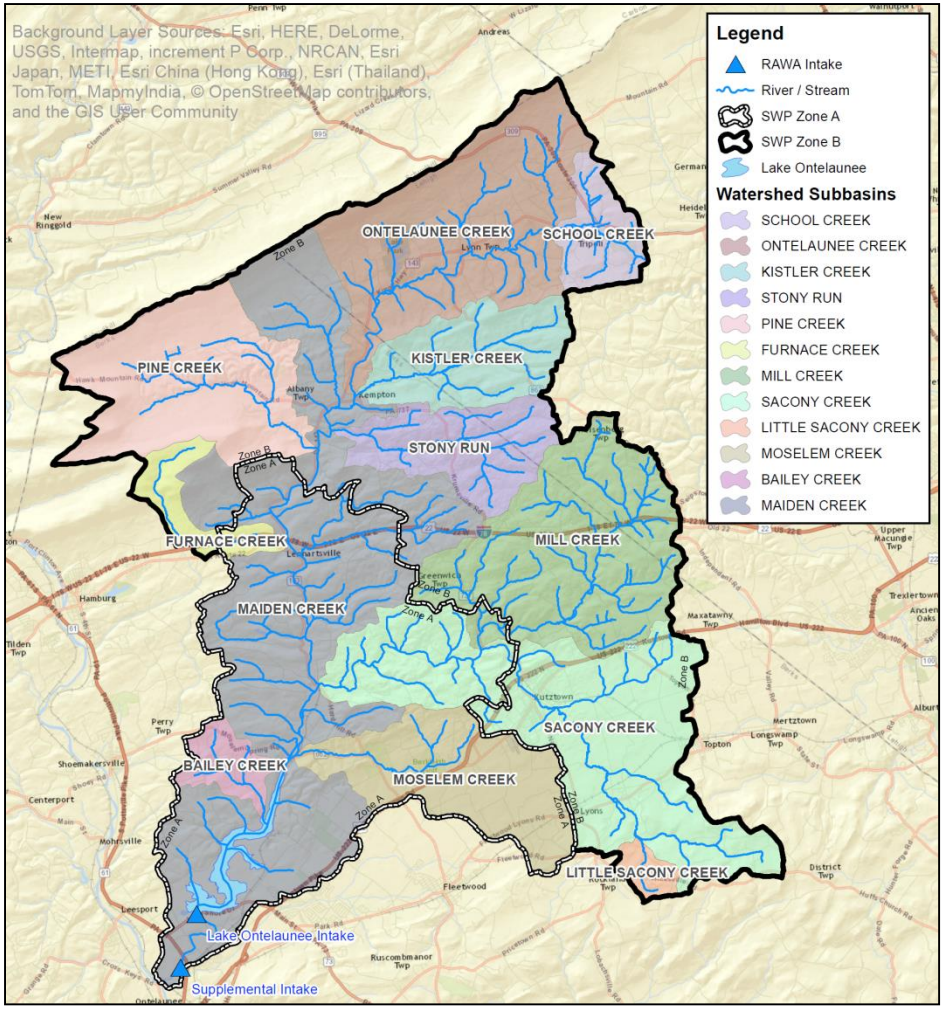
Secondary Intake on the Maiden Creek

Maiden Creek Filter Plant



40 MGD Capacity | Demand 10 - 15 MGD

Source Water Protection Plan

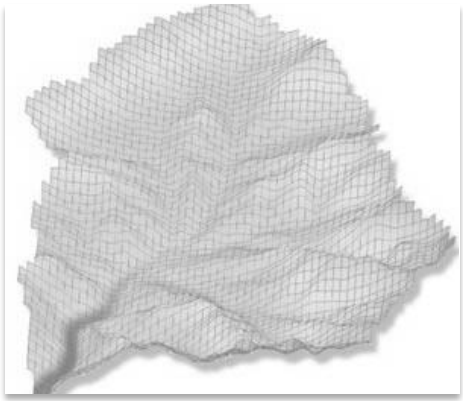


- **Approved by DEP in 2007**
  - **Time-of-Travel (TOT) Delineation**
  - **Zone A = 5 Hr TOT**
  - **Zone B = 25 Hr TOT**
  - **Inventory of Potential Sources of Contamination**
  - **Management Options**
- **Recipient of the AWWA Exemplary Source Water Protection Award in 2013**

RAWA'S GOAL

Enhance Response to Contaminant Spills and Releases

Management Approach

IDENTIFY RISKS	ASSESS	RESPOND
		
Contaminant Inventory & Mapping	Watershed & Lake Modeling	Spill Time-of-Travel Tracking

SWP Plan Revisions

Revise Contaminant Inventory

- 427 potential sources of contamination ***found***
- 157 potential sources of contamination designated ***priority***

Update Time-of-Travel (TOT) Assessment

- Revise stream TOT
- Stormwater runoff modeling of contaminant inventory
- Reservoir flow modeling
- Low flow, average flow, and high flow conditions

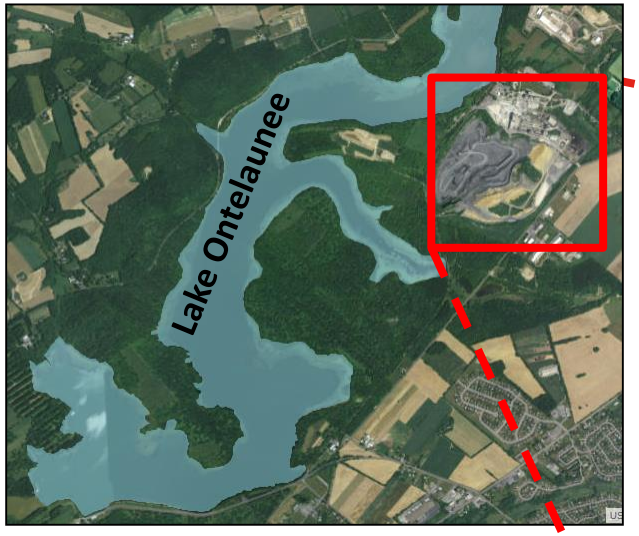
Online TOT Mapping Tool

Potential Sources of Contamination

Industry and Manufacturing

- **Accidental Release of Toxic Chemicals**
- **Spills**
- **Containment Failure**
- **Polluted Stormwater Runoff**

Potential Sources of Contamination



Resource Extraction

- **Cement Plant**
- **NPDES Discharge to Reservoir**
- **Partnership**

Potential Sources of Contamination

Vehicle Accident W/ Spill In Construction Zone

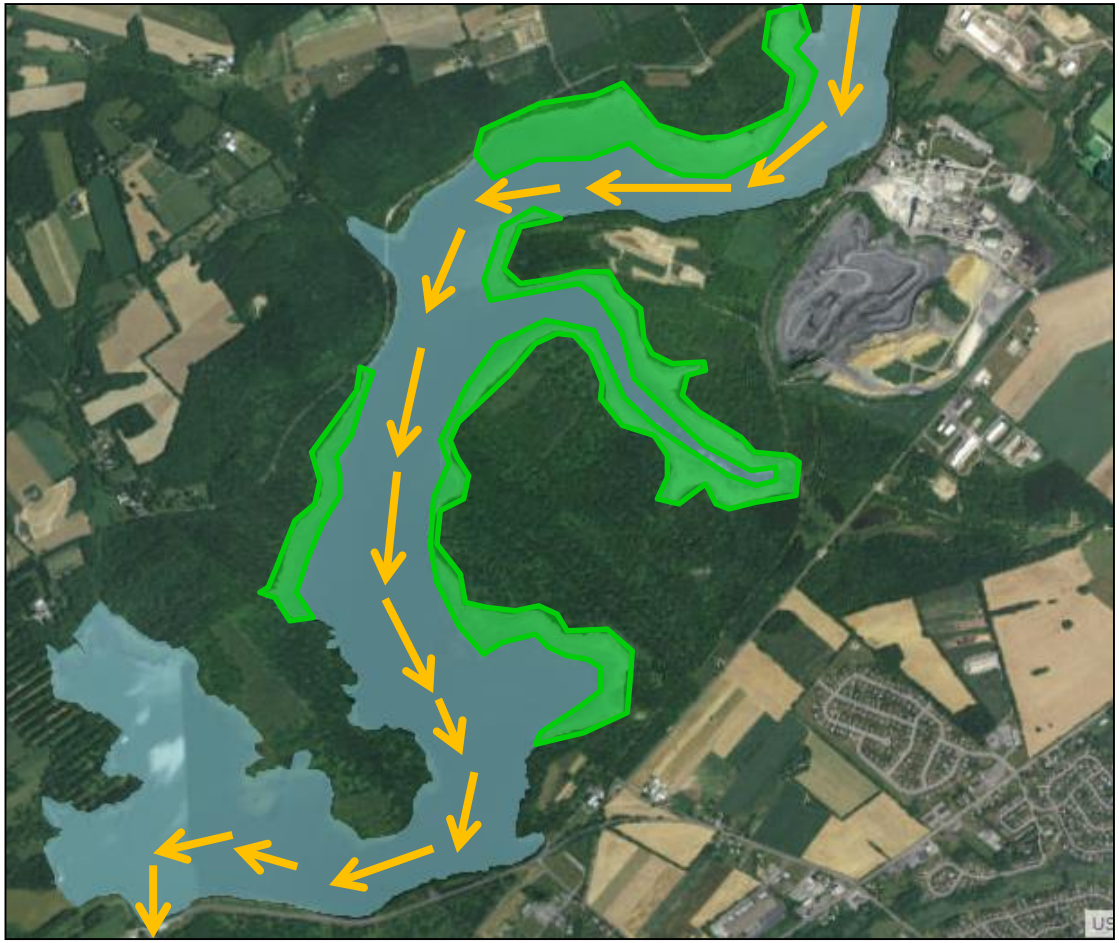
Monday, April 13, 2015 Engine 5111 & Utility 5191 responded to I-78 WB near the Berks County line for a non-injury accident involving 2 tractor trailers that collided in a construction zone. Utility 2691 (Tri Clover) was called to assist w/ controlling the widespread fluid spill that coated both WB lanes.

I-78

Widespread Fluid Spill

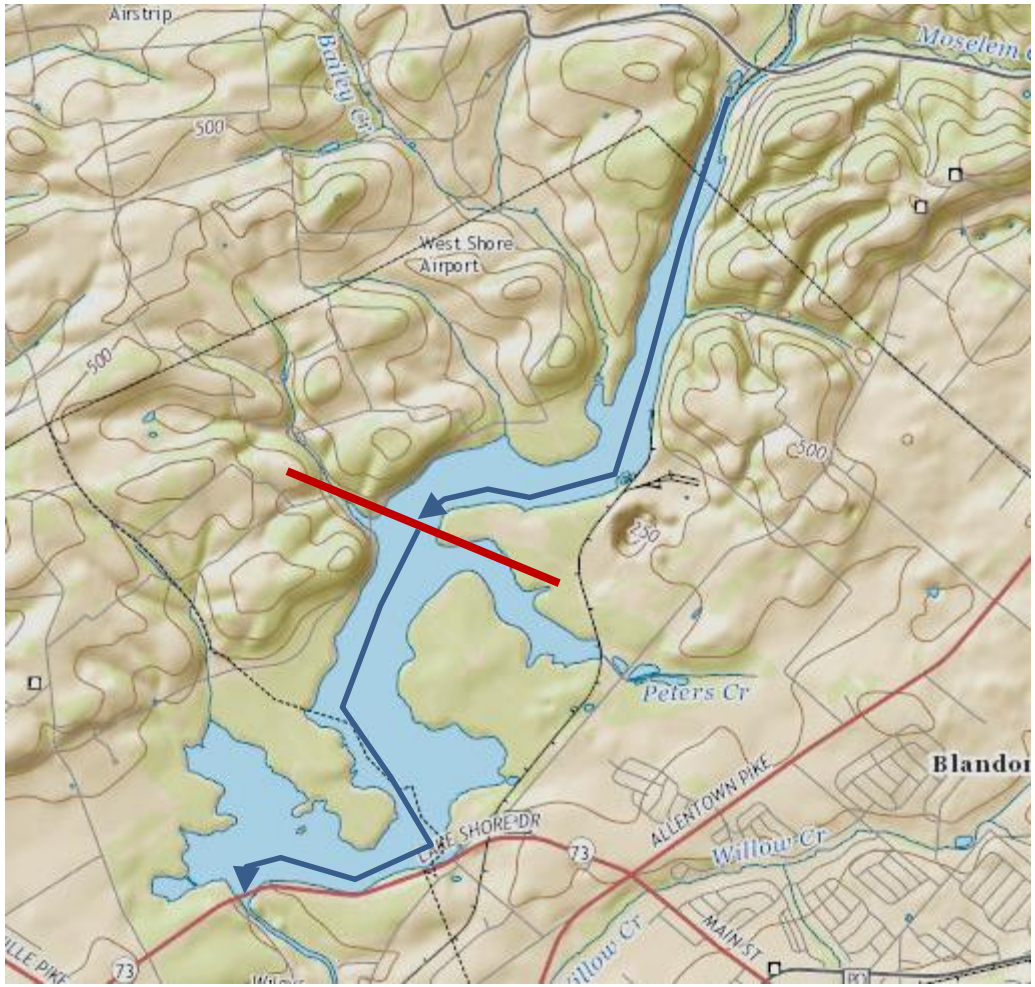
Reservoir Modeling

- Preferential Flow Paths
- Stagnation Zones
  - Algae growth
  - Contaminant build-up
  - Compromised water quality
  - Taste and odor issues



Reservoir Time-of-Travel

- Low, average and high flow conditions
- 20% of the travel time through upper half of the lake
- 80% of travel time through lower half of the lake



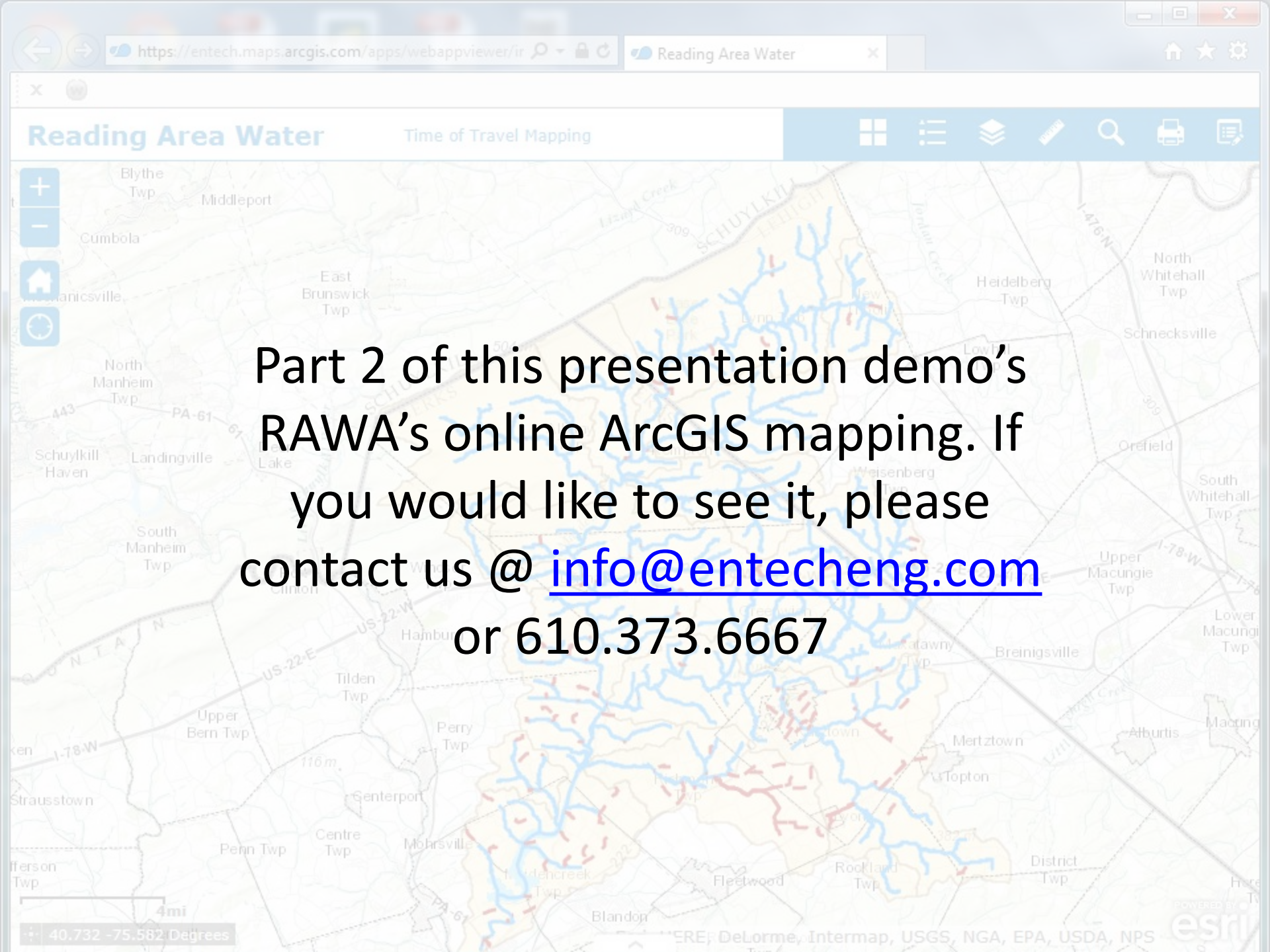
Time-of-Travel Study Findings

Location	Original TOT	Revised TOT
Top of Lake Ontelaunee	2 hours	½ day to 35 days
Rt. 78 Stream Crossing	4 hours	¾ day to 40 days
Furthest Stream	25 hours	1 day to 50 days

- **Watershed and lake time-of-travel is much longer than previously modeled**
- **Once contamination enters the reservoir, it may linger in the water and/or sediments for long periods of time**

PREVENTING CONTAMINATION FROM REACHING THE LAKE IS HIGH PRIORITY

Questions?


https://entech.maps.arcgis.com/apps/webappviewer/ir
Reading Area Water
Reading Area Water
Time of Travel Mapping
Part 2 of this presentation demo's RAWA's online ArcGIS mapping. If you would like to see it, please contact us @ info@entecheng.com or 610.373.6667
Blythe Twp
Middleport
Cumbola
East Brunswick Twp
North Manheim Twp
Schuylkill Haven
Landingville
South Manheim Twp
Heidelberg Twp
North Whitehall Twp
Schnecksville
Orefield
South Whitehall Twp
Upper Macungie Twp
Breinigsville
Lower Macungie Twp
Alburtis
Mertztown
Topton
Hamburg
Tilden Twp
Upper Bern Twp
Perry Twp
Strausstown
Centerport
Penn Twp
Centre Twp
Mohrsville
Fleetwood
Rockland Twp
District Twp
Blandon
4mi
40.732 -75.582 Degrees
DeLorme, Intermap, USGS, NGA, EPA, USDA, NPS
esri