# NYS Resiliency Institute for Storms & Emergencies (NYS RISE)

Consortium of Stony Brook University, New York University, Columbia University, Cornell University, CUNY, and Brookhaven National Laboratory

## Work Unit 2.4 Flooding Impacts on Freshwater Distribution Systems

## Workshop Presentation, June 24, 2014


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# Work Unit 2.4. Objectives

•Guide for preparedness, response and recovery of NYS Water Supply Systems, using NYSDOH and USEPA water supply database (with facility identifiers, zip code locator, and size) by identifying:

(a) Where to expect water supply system damage at the component level for water delivery,

(b) Generic locational and operational water supply system characteristics in NYS vulnerable to flooding, and

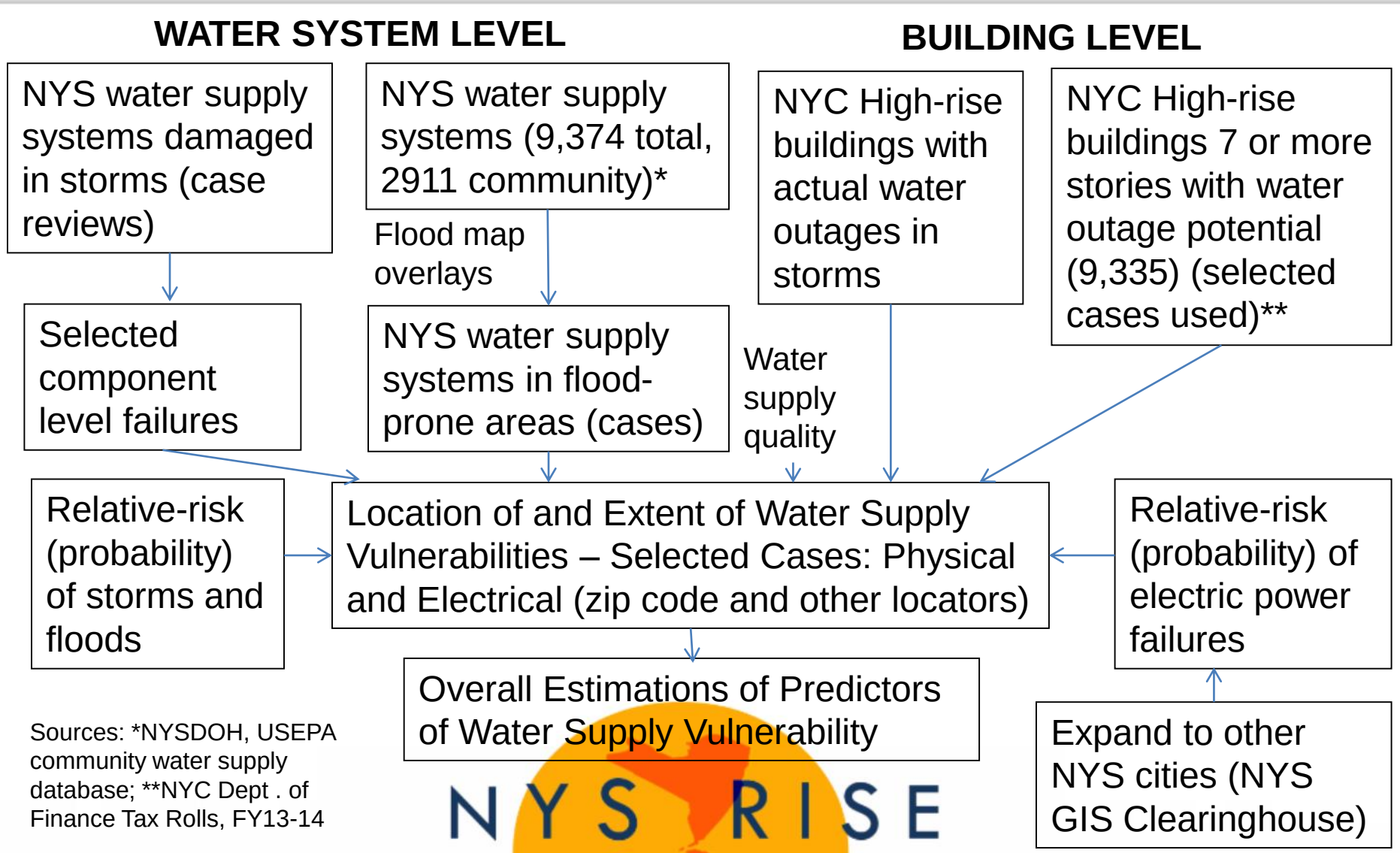
(c) Damage potential from interdependencies between water supply & other infrastructures, e.g., electric power, supply chains.

•Guide for Building Level Water Supplies Dependent on Electricity (Buildings 7+ stories in NYC, then selected NYS cities) by:

(a) Identifying geographic locations of high rises using zip codes

(b) Evaluating electric power outage vulnerability and relative risk

# Work Unit 2.4. Framework and Approach: Water Supply systems and High-Rises




Sources: *NYSDOH, USEPA community water supply database; **NYC Dept . of Finance Tax Rolls, FY13-14

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# Work Unit 2.4. Water Supply Systems: Preliminary Locations and Attributes, NYS

A database of water supply facilities is under construction based on data obtained from NYS DOH and U.S. EPA with zip code location and contacts to locate sites more specifically to combine with flood area location using ArcGIS. A subset of these are being analyzed for flooding vulnerability. According to NYS DOH's 2013 database:*

- NYS has 2,911 community public water systems (out of 9,374 total systems), accounting for 31% of all NYS systems and 85.5% of the population (double-counted) served by public water systems.
- NYS has 588 systems that rely directly on surface water (not including purchased surface water), accounting for 6.3% of systems, but 58.2% of the population (double-counted) served.
- Most groundwater systems are on Long Island (see SBU section).

*Source: computed from NYS DOH (July 2013) Drinking Water Program: Facts and Figures

# Work Unit 2.4. Water Supply Systems: Preliminary Water Quality Findings, NYS

Maintaining the integrity of water quality after storms depends on the water quality sampling program to capture impacts of storm events on quality. In NYC, for example, according to NYC DEP*:

- Since March 1997, NYC DEP has maintained 965 sampling stations. Locations are based on "population density, water pressure zones, proximity to water mains, and accessibility"
- "The stations rise about 4 1/2 feet above the ground and are made of heavy cast iron."
- The total cost of installation and construction of the stations is estimated at $11 million.

*Source: http://www.nyc.gov/html/dep/html/drinking_water/sampling.shtml

# Work Unit 2.4. Water Supply Systems: Preliminary Component Disruption Findings, Selected Subareas

In other NYS areas, numerous water supply systems north of NYC experienced component disruptions in storms. Understanding these can provide a guide for other areas with similar components. Examples:

- In Hurricane Sandy, several disruptions occurred in Poughkeepsie*
- Rochester water supply was severely damaged by hurricanes and flooding.
- The towns of Jay and Black Brook, Essex County and the Town of New Windsor, Orange County had broken water lines from Hurricane Irene and Tropical Storm Lee (NYS August 2012)
- During Hurricanes Irene and Tropical Storm Lee, NYS set up a fund (HELP) recognizing water supply system needs

*Alstadt and Morris 11/12/12, Poughkeepsie flooded pump well

SIRR, p. 214

# Work Unit 2.4. Water Supply Systems: Interdependencies

- The U.S. Department of Homeland Security has identified numerous dependencies and interdependencies between water supply systems and other critical infrastructure and social and economic activities.
- Impairment of water supplies therefore jeopardize the functionality of these other activities.

Source: U.S. DHS (2010) Water and Wastewater Systems Sector-Specific Plan An Annex to the National Infrastructure Protection Plan 2010, p. 20, http://www.dhs.gov/xlibrary/assets/nipp-ssp-water-2010.pdf

# Work Unit 2.4. Water Supply Systems: Summary of Preliminary findings (Surface Water Systems)

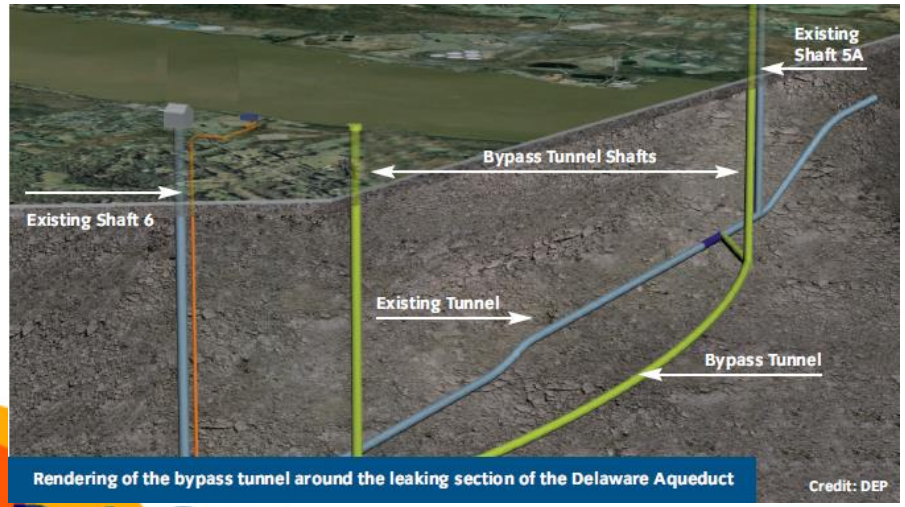
- Water supply system components are identified through a literature review and risk-ranking based on storm-related flooding potential and electric power related impairment. Examples for component *function*: electric power driven communication & control systems, pumps, water treatment); Examples by *location*: low-lying facilities.
- Representative, surface water supply systems in upper NYS have been identified for in-depth vulnerability analysis cases (e.g., electric power dependencies), e.g, Poughkeepsie (Hurricane Sandy), Albany, Syracuse, Rochester (Hurricane Agnes; other flooding), small towns.
- State-wide database construction has begun from available U.S.EPA and NYS DOH inventories to identify flood-prone systems.
- Evaluation of measures for plant protection and conveyance system improvements has begun for improved service recommendations.

# Work Unit 2.4. Water Supply Systems: Selected Observations to improve Resiliency

A portfolio of strategies exists to improve water supply resiliency:

- New York City identified measures to increase NYC upstate water supply storage and distribution system flexibiilty (SIRR, p. 218*) as a model for other areas.
- For Hurricanes Irene and Lee, NYS set up a Hurricane Emergency Loan Program (HELP) that included water supply systems
- NYS has allocated $56 million from its Disaster Assistance Program Allocation from The Disaster Relief Appropriations Act of 2013 (P.L. 113-2) for drinking water
- Methods for short- and long-term protection identified for wastewater apply to water supply (elevation, flood-proofing, barriers, etc.).
- Alternative water supplies exist should power fail (Poughkeepsie).
- Emergency staffing/resource networks.

*See: http://nytelecom.vo.llnwd.net/o15/agencies/sirr/SIRR_singles_Hi_res.pdf



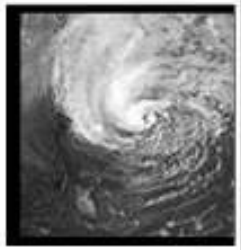

SIRR, p. 218*

# Work Unit 2.4. NYC Hi-rises: Summary of Preliminary Observations and Findings

NYC and NYS reports show New York City water supply system within and owned by NYC largely unaffected by Hurricane Sandy, however other water vulnerabilities exist. According to *A Stronger, More Resilient New York*:*

- Many NYC high-rise buildings in NYC Buildings Department's jurisdiction rely on pumps for water above 7 floors, and power outages affect pumps.
- We calculated 9,335 NYC buildings 7 stories or higher; about three quarters are in Manhattan. Regardless of whether or not they are also flood-prone, water supplies are at risk from electric power outages
- Fire-fighting commonly relies on drinking water sources, and facilities such as hydrants are subject to physical damage, flooding, and corrosion, reducing fire-fighting (e.g., Breezy Point fires during Hurricane Sandy)*
- Future storm events from heavy downpours may also be challenging since they can result in increased runoff which adds pathogens, contaminants and turbidity to the water in the reservoirs used by the city.*

*See: http://nytelecom.vo.llnwd.net/o15/agencies/sirr/SIRR_singles_Hi_res.pdf , Bill Gustin 04/01/2013 Changes in High-Rise Buildings: Is It Time to Change Your Procedures? Fire Engineering. http://www.fireengineering.com/articles/print/volume-166/issue-4/features/changes-in-high-rise-buildings-is-it-time-to-change-your-procedu.html



# FLOODING IMPACTS ON FRESHWATER DISTRIBUTION SYSTEMS IN NASSAU AND SUFFOLK COUNTIES

**TR-4-14-02**

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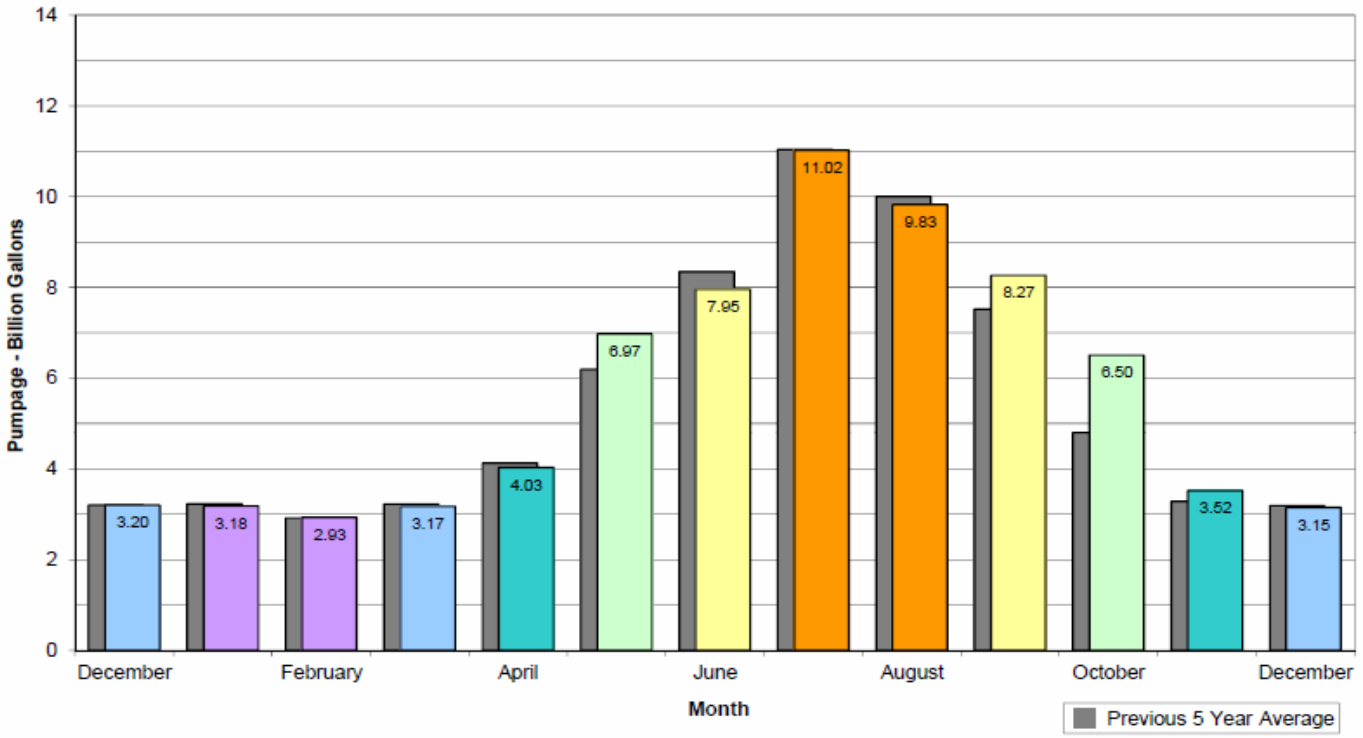
July 24, 2014

NEW YORK STATE RESILIENCY INSTITUTE
FOR STORMS AND EMERGENCIES

**Total System Pumpage**
**December 2013 & Previous 12 Months With 5 Year Average**

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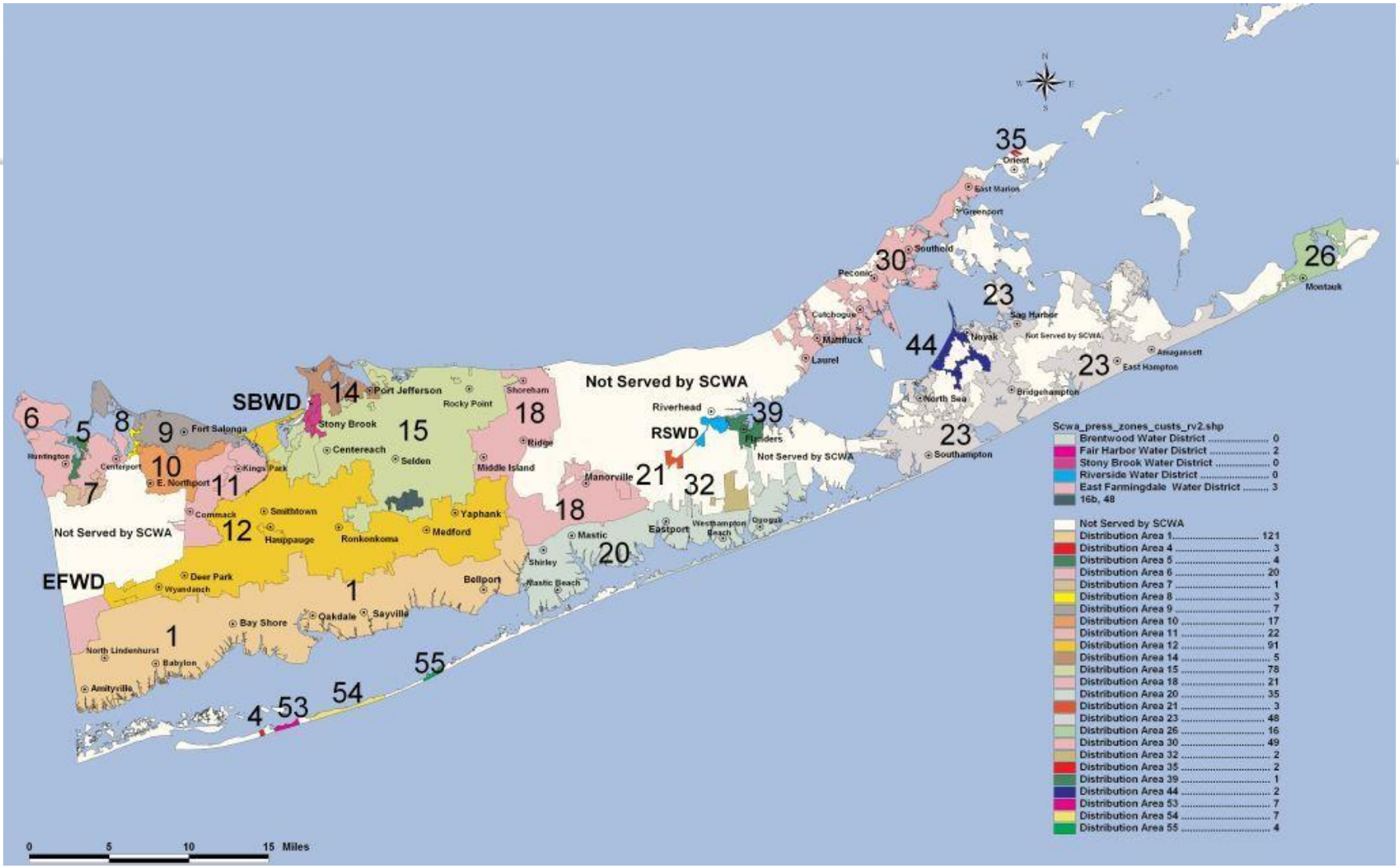


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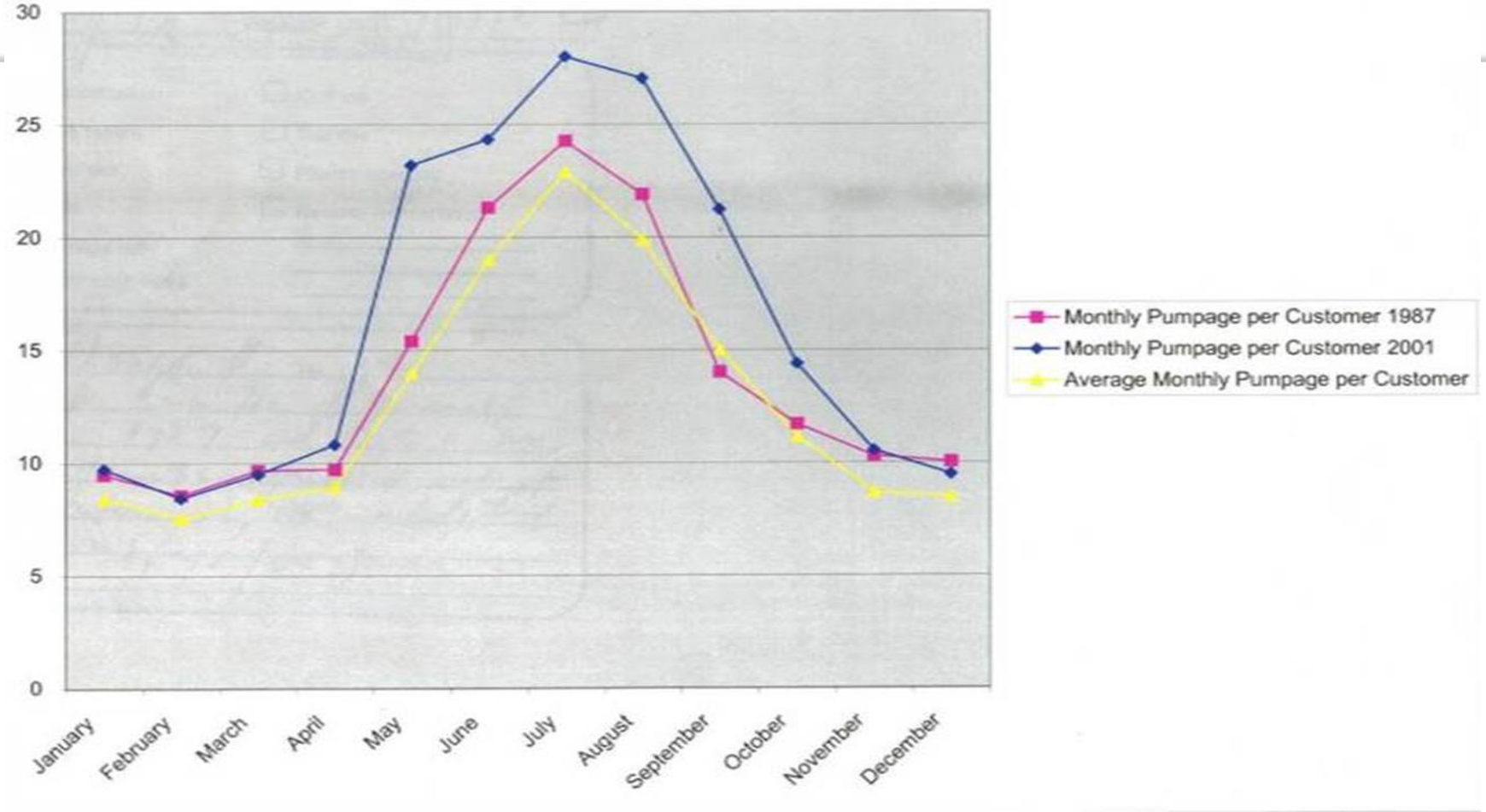
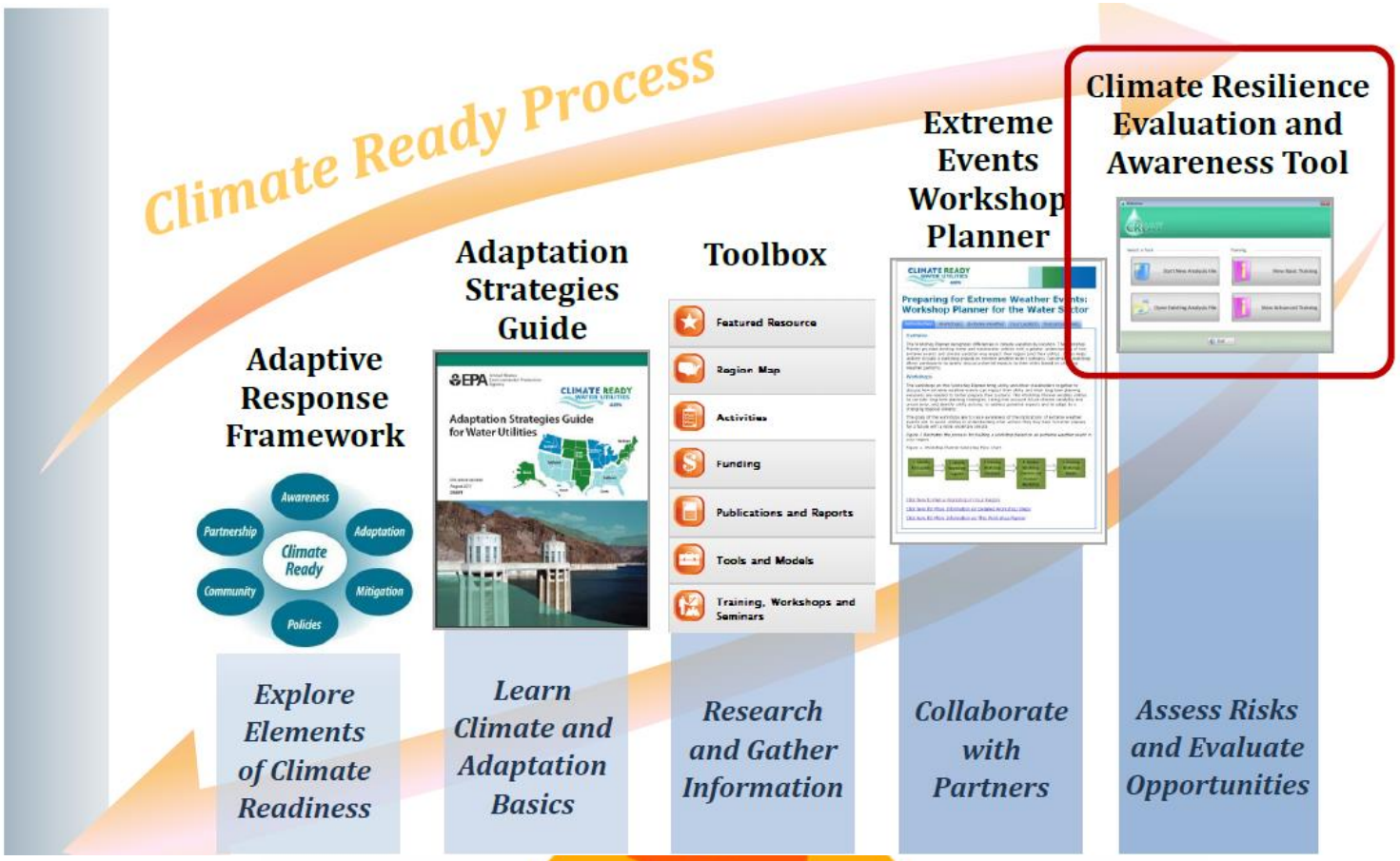
SoMAS : surveying shoreline protection on Fire Island post-Sandy,  January 24, 2013

## Monthly Pumpage Per Customer 1987 and 2001

### Suffolk County Water Authority



# Climate Ready Water Utilities

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