Improving Water Quality Modeling for NYC Beach Advisory and Closure Guidance

Great Lakes Environmental Center (GLEC); NOVA Consulting; Stevens Institute of Technology

for New York City Department of Environmental Protection (DEP) and Department of Health and Mental Hygiene (DOHMH)

Background and Objectives

Background

New York City Area Beaches

Located in Marine Waters of NY Harbor

- 10 Public Beaches
- 15 Private Beaches

Over 2 Million Visit Public Beaches Annually

Elevated Bacteria Levels Observed After Rainfall

NYC DOHMH/DEP

- Responsible for Public Health and Safety

Problem Definition

Stormwater Outfalls and over 400 Combined Sewers Discharge to NY Harbor

SW and CSO are Triggered by Rainfall and are a Significant Source of Pathogen Bacteria

Elevated Pathogen Levels Limit Beach Use

- Closures
- Wet – Weather Advisories

Must Comply With 2012 EPA RWQ Criteria

Technical Goals

Upgrade Beach Wet-Weather Advisories

Comply With 2012 EPA RWQ Criteria

- Geometric Mean – 30 CFU/100 mL
- Standard Threshold Value – 90th Percentile 110CFU/100mL
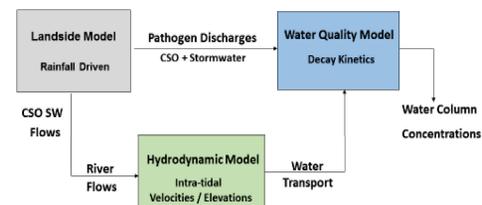- Beach Action Value – 60CFU/100mL

Apply Most Advanced Mathematical Models

- Landside – NYCDEP LTCP InfoWorks Framework
- Hydrodynamics – High Resolution NYHOPS Model (Stevens Institute)

Methodology

Application of Mathematical Models

Modeling Framework

Landside - Computes Pathogen Discharges From CSO/SW

Hydrodynamic – Computes Water Movement Within Tidal Cycle

Water Quality – Tracks the Fate Pathogens in Time and Space

Model Calibrations

Models Calibrated With Many Historical DEP Projects

- Most Recent – Present LTCP (CSO Abatement)

Landside Calibration

- Flow Monitoring Data
- STP Flow
- CSO Concentration
  - Mixture of Raw Sanitary and Stormwater
  - Varies over Time of Rainfall Event

Model Calibrations

Hydrodynamic Calibration
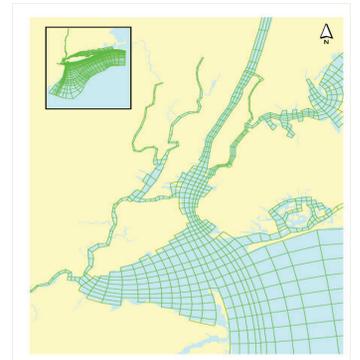
- Salinity
- Tidal Elevations an Velocities

Water Quality Calibrations

- Pathogens Concentrations (Space and Time)
- Fecal Coliforms
- Enterococcus

Implementation

Assessment and Analysis

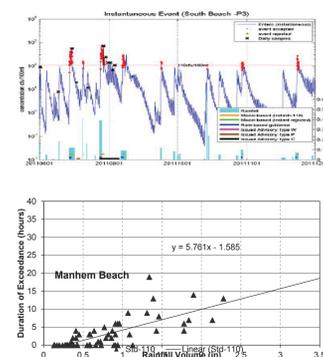Model Assessment (Updated Stevens NYHOPS Model)

- Compare Model Results/Beach DOH Data

Develop Correlations

- Duration of Exceedance (i.e. 110)
- vs Rainfall Volume (24 hours)
- All Public and Private Beaches

Execution

Develop Wet-Weather Advisory Guidelines

- From Duration/Rainfall Correlations
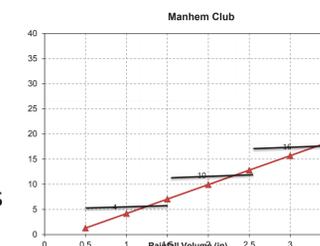- Approximations for Predicting Exceedances

Test Advisory Guidelines With Model Results

- 85% Agreement Between Model/Guidelines

DOHMH Retrospective Analysis (Impact of 2012 Criteria)

- 31 day Increase in Pollution Advisory Days
- 6 day Increase in Closure Days per Year

Next Steps

Adapt New Trigger Stepwise Curves, with STV - BAV-focus, as Wet-Weather Advisories for NYC Beach Season Management

Integrate Results into DOHMH Website/Signage to Optimize Notification