

# Brookhaven National Laboratory State Pollutant Discharge Elimination System (SPDES) Permit Modification

*Presentation to the Community Advisory Council  
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# Topics for Discussion

## Part I: Overview of Current SPDES Permit

- Purpose
- History and Regulatory Background
- Water Quality Standards
- Monitoring Program and Performance

## Part II: Permit Renewal

- Renewal Process
- Permit Changes and Impacts
  - Effluent Limit Changes
  - Quantification and Removal Study
  - Mercury Minimization Program
- Summary

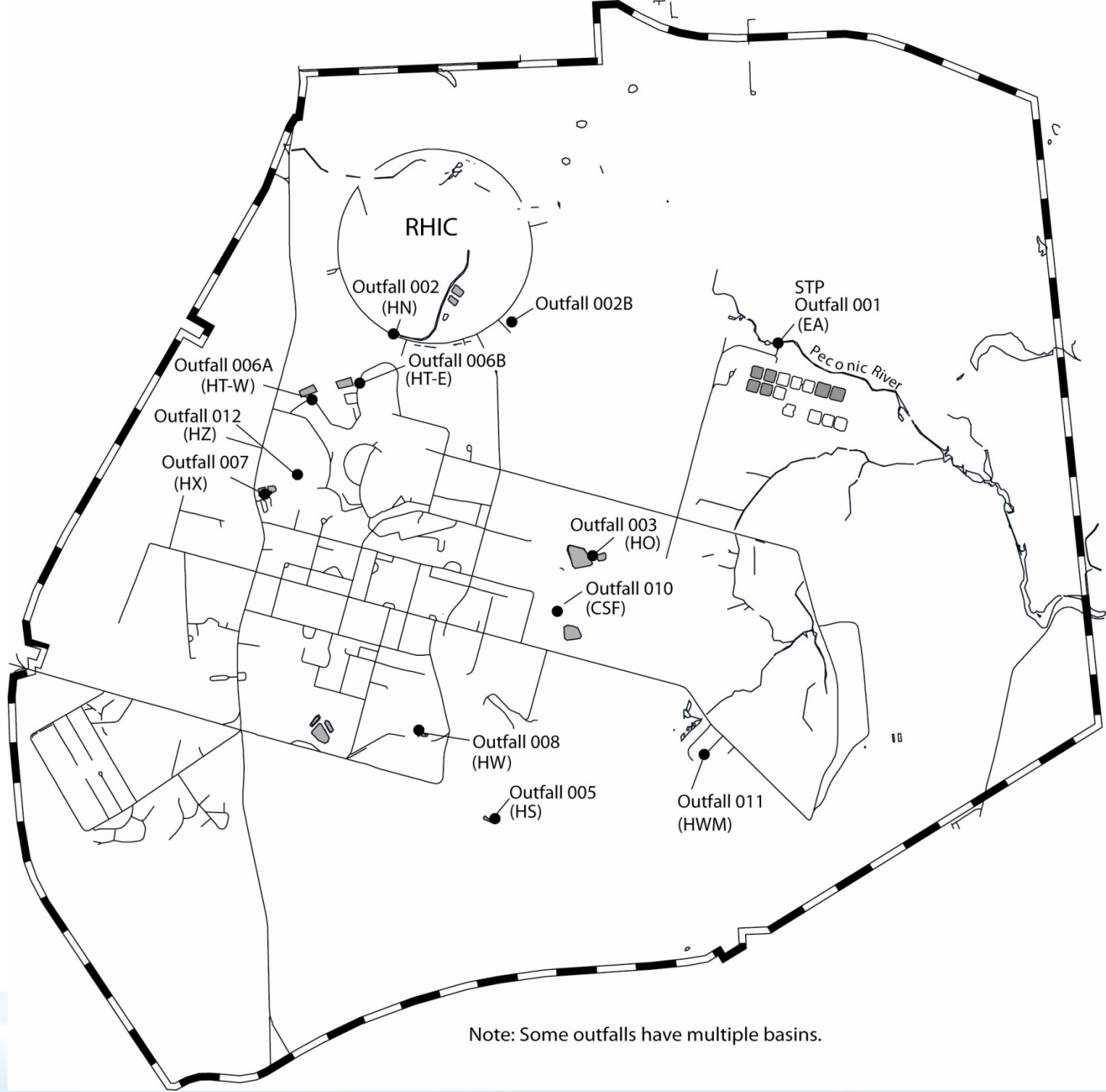
# Purpose

- Educate and inform CAC
  - Purpose and effect of the SPDES Permit
  - Help prepare you to comment on the Draft Permit
  
- Discuss the challenges the proposed target limits present
  - Highlight differences between current permit and proposed permit
  - Discuss potential impacts
  
- Identify possible outcomes of the permit renewal process
  - Revised effluent discharge limits
  - Process and Treatment system changes
  - Impacts of changes
  
- Describe the public involvement process
  - To ensure adequate opportunity for input

# Overview: BNL SPDES Permit

- BNL has had a SPDES permit since 1978
  - Last comprehensive renewal occurred in 1995
  - Current permit expires in March 2010
  - New York State Department of Environmental Conservation (NYSDEC) initiated permit revision process in 2007
  - Revised draft SPDES permit issued 02/09/09
- SPDES permit
  - Authorizes discharges of wastewater to surface water and groundwater
  - Establish limits on certain contaminants
  - Specifies monitoring requirements
- BNL has 12 SPDES permitted outfalls
  - Sewage treatment plant (STP)
  - 7 Recharge basins
  - 3 Ground surface releases
  - Small individual cesspools and drywells
- BNL is in compliance with SPDES regulations 99.99%

# Outfall Locations



Note: Some outfalls have multiple basins.

# Overview: Regulatory Background

- Permit system established by
  - Federal Clean Water Act (1972) and Oil Pollution Control Act (1990)
- Laws established two high-level goals:
  - Achieve water quality which provides for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water.
  - Eliminate the discharge of pollutants into waters of the U.S.
- Laws required all states to establish:
  - A system of national effluent standards (pretreatment standards) for industries
  - Water quality standards
  - A national permitting program where standards are translated into effluent standards (National Pollutant Discharge Elimination System program - NPDES)
  - Provisions for oil spills and chemical releases
  - A construction loan program for infrastructure upgrades.
- EPA delegated authority for NPDES to the states in the mid 1970's
  - NYS extended regulation to groundwater

# Overview: Types of BNL SPDES Outfalls

## Surface Water Discharges

- Sewage Treatment Plant
  - Outfall 001
  - Discharges to Peconic river
  - Approximately 300,000 gal/day
- Discharge is subject to Ambient Water Quality Standards (AWQS Class C) and Groundwater Effluent Standards (Class GA)
- Some BNL limits are set higher than the standards due to recognized system characteristics
  - e.g., copper limits are not achievable if you have copper pipes

## Groundwater Discharges

- 11 outfalls
  - 7 Recharge basins (Outfalls 002, 003, 005, 006, 007, 008, and 012): Class GA
  - 2 Ground surface releases (Outfalls 002B, 010 and 011): Class GA
  - Small individual cesspools and drywells (Outfall 009): Class GA
- Must meet Groundwater Effluent Standards

# Overview: Two Water Quality Standards for BNL

## Ambient Water Quality Standard - Class C

- Discharges to surface waters, e.g. Peconic River
- Established to protect freshwater organisms and to ensure water is suitable for fishing and recreation
- Very low limits for metals, e.g., mercury, copper, lead, due to impacts on aquatic organisms
- Applicable only to BNL sewage treatment plant





# Overview: Two Water Quality Standards for BNL

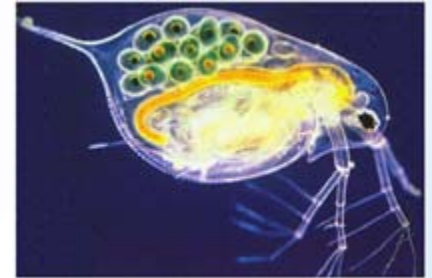
## Groundwater Standards – Class GA

- Discharges that result in groundwater recharge, e.g., recharge basins
- Established to protect groundwater sources of potable water
- Very low limits for organic chemicals due to mobility
- Applicable to all BNL discharges (recharge basins and sewage treatment plant) since Peconic river is also considered a recharging river



# Overview: SPDES Monitoring Program

- BNL routinely monitors discharges
  - To ensure discharges are below established limits
  - To ensure the limits are protective of fresh water organisms
  - BNL submits a monthly Discharge Monitoring Report (DMR) to NYSDEC
- Monitoring Requirements - Sewage Treatment Plant
  - Monthly: metals, organics, conventional (BOD, T, TSS, nitrogen, phosphorous)
  - Quarterly: pesticides/PCBs, semi-volatiles, whole effluent toxicity
  - Quarterly: Whole effluent toxicity to determine effects on freshwater organisms
- Monitoring Requirements – other 11 Outfalls
  - 7 Outfalls monitored Monthly: metals, organics, oil and grease, pH, flow, and cooling tower treatment residuals
  - 4 Outfalls do not require monitoring (stormwater, non-contact cooling water)



# Performance

- BNL is in compliance with SPDES regulations 99.99%
- Sewage Treatment Plant: Outfall 001
  - Consistently meets discharge limits for all contaminants, except nitrogen
  - Periodically exceed limit for nitrogen, however recent changes seem to have improved performance on nitrogen removal
- Whole Effluent Toxicity Testing
  - Shows no significant effect on survival or reproduction of aquatic species tested
  - Demonstrates current limits are protective
- Other outfalls: Consistently meet discharge limits
- Continual Improvement
  - We routinely seek pollution prevention opportunities to drive contaminant levels in discharges as low as we can



# SPDES Permit Renewal Process

- NYSDEC initiated permit renewal in May 2007
  - Requested full SPDES renewal application
    - Description of outfalls
    - Full suite of chemical analyses for all outfalls
  - BNL completed application and sampling in August 2007
- NYSDEC issued draft permit February 9, 2009
  - On behalf of the Community Advisory Council, BNL immediately requested extension for public comment period
  - Comment period extended to 90 days (May 26, 2009)
  - NYSDEC considers comments and then issues final permit
  - BNL has one year to complete special studies as required
  - NYSDEC considers results of special studies, and may reopen permit depending on results
- If permit is not reopened, the public may not have an opportunity to comment on potentially significant changes to operations

# SPDES Permit – What Changed?

- Significant changes focused on sewage treatment plant discharge to Peconic River (Outfall 001)
  - Outfalls 002 – 012 groundwater discharges - No significant changes
- Summary of significant changes for sewage treatment plant discharge
  - Interim limits for six elements (metals) (page 4)
  - Quantification and Removal Study (page 15)
  - Mercury Minimization Program (page 14)
- Less significant changes
  - Short term monitoring of effluents – 3 month study of effluent concentrations of certain chemicals from specific outfalls
  - Best Management Practices Plan (update) – BMP identifies good housekeeping practices to prevent contamination in run-off
  - Water Treatment Chemical Notification (update) – List of all water treatment chemicals used in cooling/heating systems on-site
  - Whole Effluent Toxicity Testing – To be continued under the current permit using only the water flea (most sensitive receptor)

# SPDES Changes: Lower Metal Limits for STP

- Interim limits established for six metals
  - Copper, iron, lead, mercury, nickel, and zinc
  - All interim limits are consistent with current discharges
  - Interim limits apply until studies are completed
  
- Target limits for same six metals based upon AWQS
  - Discharge to Peconic River, a Class C receiving water
  - Target limits significantly less than interim limits for copper, lead, mercury, nickel, and zinc
  - Freshwater organisms very susceptible to low-level concentrations of copper, lead, mercury, nickel, and zinc
  
- Final limits will be developed pending results of:
  - Quantification Removal Study
  - Mercury Minimization Program

# Proposed Limits for STP

| Contaminant       | Current Limit   | Interim Limit                            | Target Limit<br>Class C Effluent<br>Std. | Typical Range<br>of Discharge | Groundwater<br>Effluent Limit<br>Class GA Std. |
|-------------------|-----------------|--|--|-------------------------------|--|
| <b>Copper</b>     | <b>150 ug/L</b> | <b>150 ug/L</b>                          | <b>3.7 ug/L</b>                          | <b>24 – 124 ug/L</b>          | <b>400 ug/L</b>                                |
| <b>Iron</b>       | <b>370 ug/L</b> | <b>300 ug/L</b>                          | <b>300 ug/L</b>                          | <b>50 – 450 ug/L</b>          | <b>600 ug/L</b>                                |
| <b>Lead</b>       | <b>19 ug/L</b>  | <b>19 ug/L</b>                           | <b>1.5 ug/L</b>                          | <b>&lt; 1 – 7 ug/L</b>        | <b>50 ug/L</b>                                 |
| <b>Nickel</b>     | <b>110 ug/L</b> | <b>110 ug/L</b>                          | <b>21 ug/L</b>                           | <b>5 – 24 ug/L</b>            | <b>200 ug/L</b>                                |
| <b>Zinc</b>       | <b>100 ug/L</b> | <b>100 ug/L</b>                          | <b>34 ug/L</b>                           | <b>21 – 124 ug/L</b>          | <b>5,000 ug/L</b>                              |
| <b>Mercury</b>    | <b>800 ng/L</b> | <b>200 ng/L</b><br><b>(50 ng/L 2012)</b> | <b>0.7 ng/L</b>                          | <b>&lt;30 – 160 ng/L</b>      | <b>1,400 ng/L</b>                              |
| Silver            | 15 ug/L         | 15 ug/L                                  | 100 ug/L                                 | < 1 – 3 ug/L                  | 100 ug/L                                       |
| BOD5              | 20 mg/L         | 5 mg/L                                   | 5 mg/L                                   | < 2 mg/L                      | No Limit                                       |
| Ammonia           | 2.0 mg/L        | 1.5 mg/L                                 | 1.5 mg/L                                 | < 0.1 – 0.7<br>mg/L           | No Limit                                       |
| Total N           | 10 mg/L         | 10 mg/L                                  | 10 mg/L                                  | 4 – 11.6 mg/L                 | 10 mg/L  |
| Total N<br>(Load) | No Limit        | 20 #/day<br>(5/15 – 10/15)               | 20 #/day                                 | 5 – 31 #/day                  | No Limit                                       |

mg/L = ppm, ug/L = ppb, ng/L = ppt

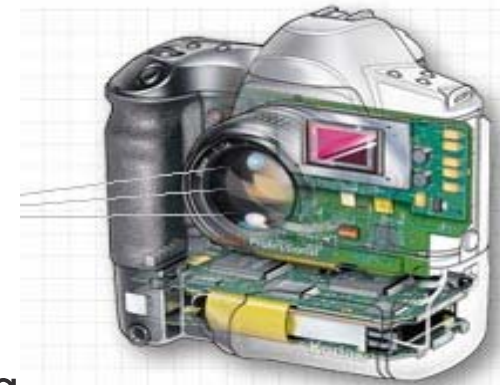
# Quantification and Removal Study

- Purpose
  - Identify and minimize releases from sources in pursuit of Target Limits, specifically for copper, iron, lead, nickel, and zinc
- Elements of the Study
  - Identify and quantify sources of contaminants
  - Sample process discharges for copper, iron, lead, nickel, and zinc
  - Evaluate feasibility to achieve Target Limits based on AWQS
  - Identify and provide treatment or alternate disposal options
  - Study to be completed one year after issuance of the Final Permit
- NYSDEC will review results and determine
  - Final effluent limits
  - Pollution prevention, treatment, or disposal options that should be implemented
- BNL will have until January 1, 2012 for implementation of options to achieve revised limits



# Quantification and Removal Study: Past Accomplishments

- BNL has already implemented many Pollution Prevention opportunities to reduce contaminant discharges, for example
  - Conversion to Digital Photography
    - Eliminating metals discharges related to wet film processing
  - Redesign of printed circuit board manufacturing
    - Eliminated lead from the plating bath and discharges
  - Redesign of metal cleaning facility
    - Eliminated use of strong acids and reduced metals in wastewater
  - Established stringent controls for sink discharges
  - Developed process maps for all industrial processes



# Quantification and Removal Study

- Examples of treatment technologies and alternative disposal options that we will consider
  - Installation of point of generation waste water treatment systems
    - Ion exchange systems to treat process discharges
    - Package sanitary plant treatment of specific discharges
    - Redirection of process water to recharge
  - Upgrade or reconfiguration of Sewage Treatment Plant process
    - Install ion exchange treatment or other metals removal technology
    - Consider redirection of discharge to groundwater
  - Collect waste water from specific processes and dispose off-site
  
- Possible outcomes of the Study
  - Lower effluent limits – Note: target limits will be unattainable even with treatment for some metals
  - Increased resources for monitoring, installation, operation and maintenance of process treatment systems
  - Reduced or eliminated flow from STP to Peconic river due to collection of waste streams or redirection of discharges

# Mercury Minimization Program

- Purpose: Identify and minimize releases from sources in pursuit of Target Limits
  - Interim limit = 200 ng/L, Limit in 2012 = 50 ng/L, Target = 0.7 ng/L
  - Current discharge ranges from <30-160 ng/L
- Elements of the Program:
  - Monitor and quantify the reduction in mercury over time
    - Monitor STP influent and effluent, key locations in collection system, and known or potential sources
  - Development of a control strategy
    - To reduce mercury discharges via cost effective measures
    - Include control of process waste streams, remediation, and/or installation of new or improved treatment facilities
  - Submit of an Annual Status Report
    - Summarize monitoring, sources, actions taken, actions planned, and progress toward the goal
- Goal of the Mercury Minimization Program will be to implement pollution prevention and treatment/disposal options to achieve the 50 ng/L target

# Mercury Minimization Program: Past Accomplishments

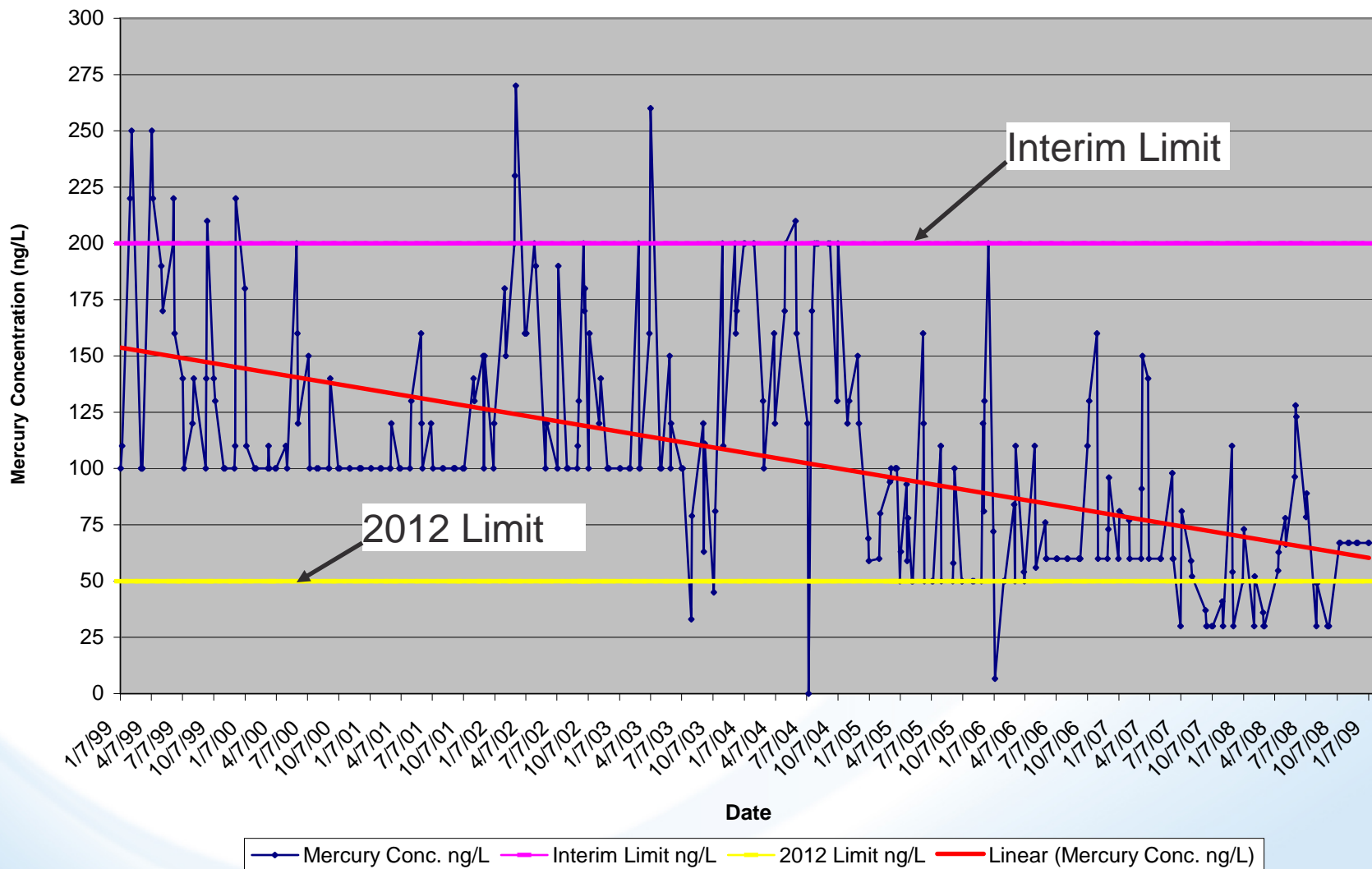
- BNL has a long history of mercury minimization
  - Targeted by Pollution Prevention program since 1998
  - Established as goal for EPA Performance Track program in 2004
  - Reduced mercury inventory 65% from 1999 levels
    - Replaced over 450 thermometers
    - Removed ~370 lbs of mercury
    - Retired mercury containing equipment
    - Replaced mercury bearing switches
  - Periodic removal of mercury from plumbing systems
    - Sanitary main replacements/relining
    - Cleaning of sanitary lines, manholes, and sink traps
  - Peconic River Remediation
    - Removed sediment contaminated by STP discharges



# Mercury Minimization Program

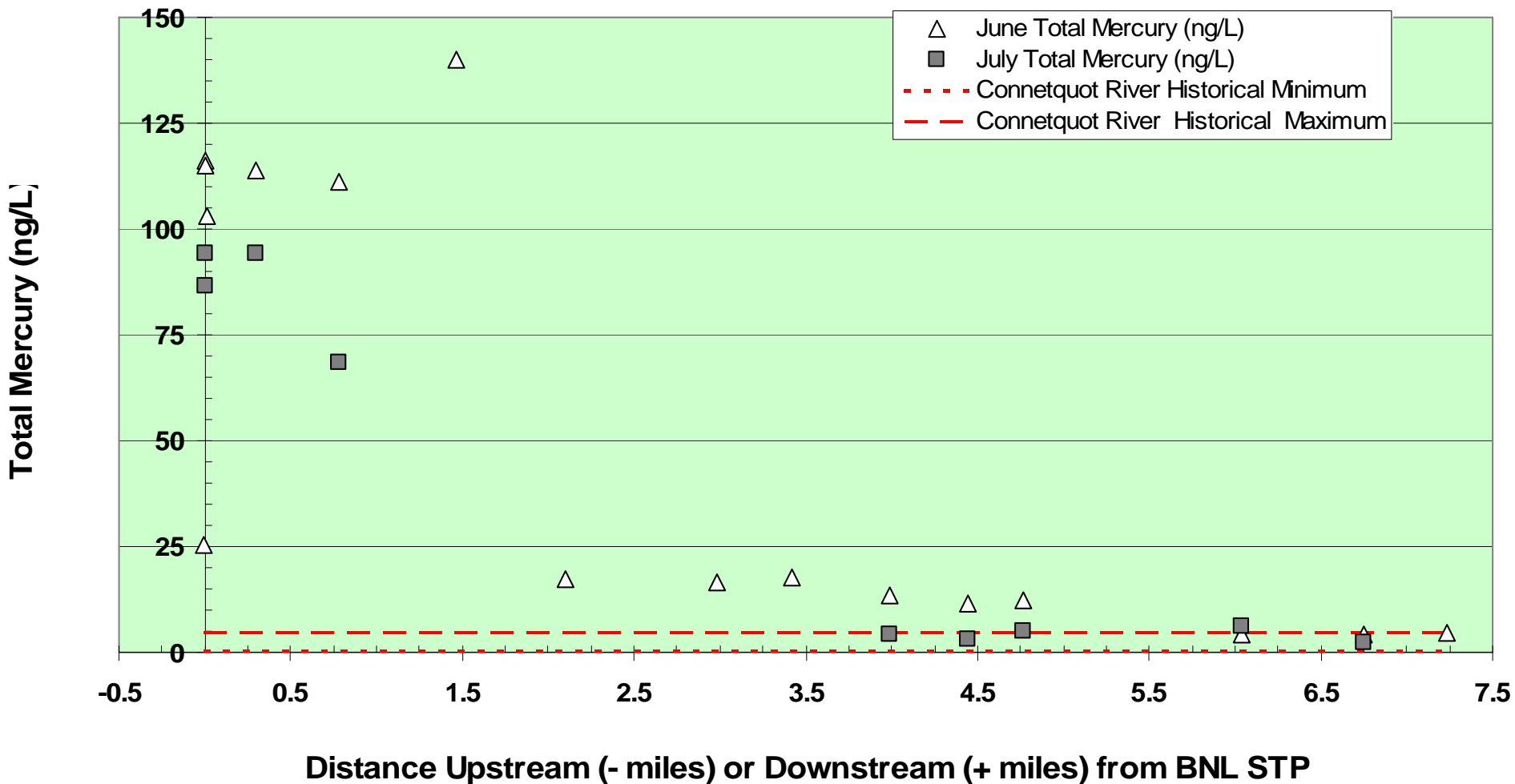
- Examples of treatment technologies and alternative disposal options that we will consider
  - Identification and removal of mercury sources
    - Continue piping system replacement and clean out
  - Installation of point of generation waste water treatment systems
    - Mercury filtration technology (experimental)
    - Redirection of process water to recharge
  - Upgrade or reconfiguration of Sewage Treatment Plant process
    - Mercury filtration technology (experimental)
    - Consider redirection of discharge to groundwater
  - Collect waste water from specific processes and dispose off-site
- Possible outcomes of the Program
  - Increased resources for installation and operation of treatment systems
  - Reduced or eliminated flow from STP to Peconic river due to collection of waste streams or redirection of discharges
- Additional factors to consider regarding mercury
  - STP effluent trends
  - Peconic River water monitoring program
  - Peconic River fish monitoring program

### Mercury 10 yr. Trend (Outfall 001)



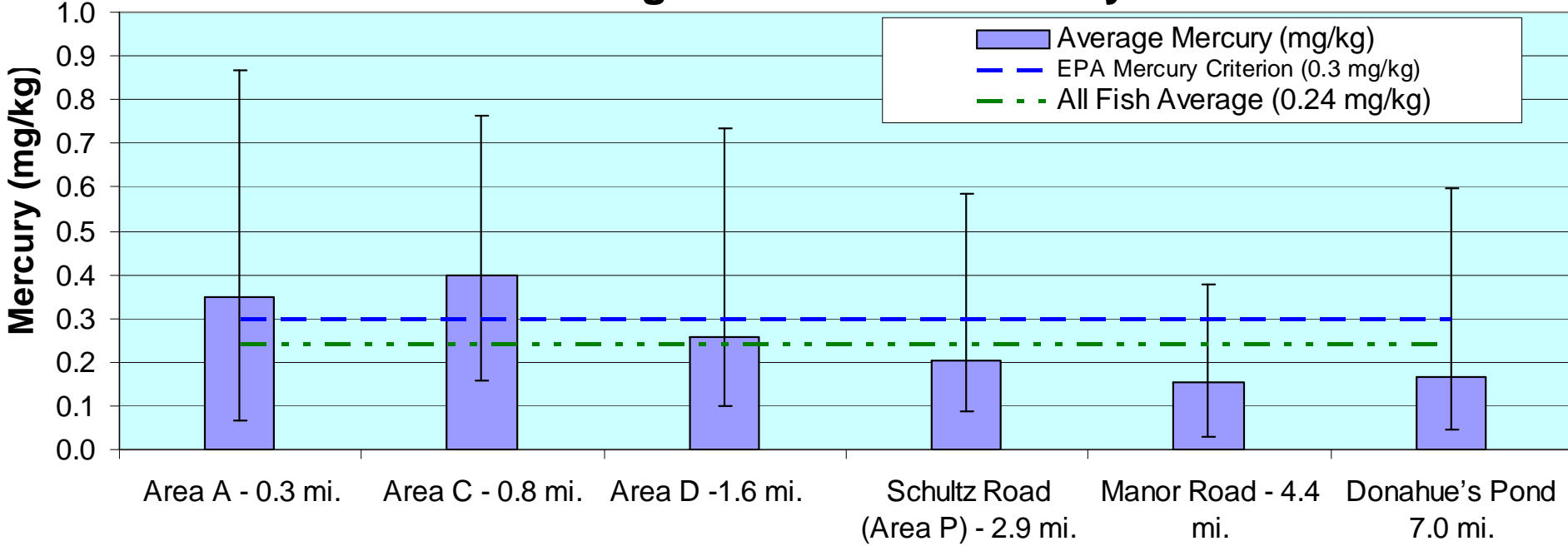
# Peconic River Monitoring – Water Data

**Figure 3-2. 2008 Peconic River Surface Water Total Mercury Less than 150 ng/L**



# Peconic River Monitoring – Fish Data

## Figure 4-2 2008 Peconic River Average Fish Tissue Mercury



**Collection Area and Approximate Downstream Distance**  
(Error Bars show the minimum and maximum for each location.)  
Distance is from BNL STP to mid-point of fish collection area.



# SPDES Permit Summary

- Permit open for public comment until 5/26/09
  - May not have additional opportunity for comment
- Target effluent limits much lower for Sewage Treatment Plant
  - Target limits will be challenging to achieve
- Changes require BNL to evaluate waste streams and identify treatment options to try to achieve target limits
  - Quantification and Removal Study
  - Mercury Minimization Program
- Possible outcomes
  - Reduced effluent limits and contaminant releases
  - Installation of treatment systems to reduce effluent concentrations
  - Reduced or eliminated flow to the Peconic
  - Reduced impacts on water quality and fish (mercury)
  - Increased cost for monitoring and maintenance (significant)