

Field Procedures and Results of Low Level Mercury Monitoring

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NJDEP/WM&S

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Background

- Existing Mercury Criteria for NJ Surface Waters

Human Health - 0.05 ppb (total recoverable)

Acute Aquatic Life - 1.4 ppb (dissolved)

Chronic Aquatic Life - 0.77 ppb (dissolved)

Available laboratory reporting limits.

USGS National Laboratory - 0.01 ppb

NJDHSS Laboratory Reporting Limit - 0.04 ppb

Background

- 94% of Ambient Surface Water Network Data collected in Water Year 2004 was below these reporting limits.
- In 2005, USGS' Wisconsin Water Science Center's Mercury Laboratory, using EPA method 1631, established a reporting limit for total mercury of 0.04 ppt.

Project Design

- A synoptic study was developed by NJDEP and USGS to more accurately measure ambient dissolved Hg levels in New Jersey streams.
- **Station Selection:**
 - Selected reference stations to determine Hg levels in areas where landuse impacts are minimal or non-existent

Project Design

- **Station Selection con't :**
 - Selected stations within a typical Northern New Jersey watershed (Upper Passaic Basin, Morris County)
 - Selected stations within a typical Southern New Jersey watershed (Rancocas Creek, Burlington County)

Project Design

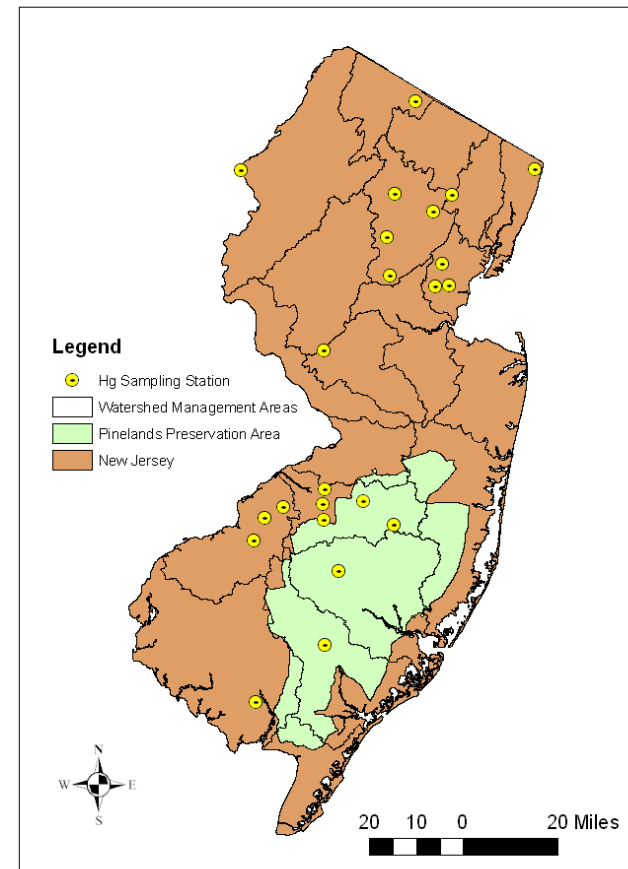
- **Station Selection con't :**
Selected stations in an urban watershed in Northern New Jersey (Rahway Area)
 - At each station take two samples; one under base flow and one under elevated flow conditions. This could determine impacts from development, dischargers and run-off.

Project Design

- **Station Selection con't :**
 - Selected stations in an urban watershed in Southern New Jersey (Camden Area)
 - At each station two samples were collected; one under baseflow and one under elevated flow conditions. This could determine impacts from development, dischargers and run-off.
 - Baseflow was defined as being below long-term daily median flow with less than 10% change in 24 hours.
 - Elevated flow was defined as being 20% or more above long-term daily median flow.

Project Design

- **Station Selection con't :**
 - Selected stations within the Pinelands to evaluate that unique environment.



Map showing stations selected for low level mercury monitoring

Project Costs

- The cost per sample was approximately \$340.00 (2005). This includes one filtered environmental sample, one field blank, and equipment that was pre-cleaned, pre-packaged and quality assured by the laboratory. The laboratory provided quality-assured Teflon sample bottles, blank water, acid-rinsed tubing, filters and preservation acid.

Project Costs

- 33 ambient samples, with associated field blanks were collected.



Sample Collection

- Sample collection required two staff members due to the requirement of Ultra-Clean Methods techniques.
“Clean Hands/Dirty Hands”
- Sample collection required the use of disposable polyethylene suits and particle masks to prevent contamination.

Sampling Procedures and Equipment Used in the Mercury Synoptic Study



Low Level Mercury Sample Collection Required The Use Of “Clean Hands/Dirty Hands” Methods.

Polyethylene Suits And Particle Masks Were Required To Prevent Sample Contamination.

All Sample Containers And Filtering Equipment Was Pre-Cleaned, Double-Bagged And Quality Assured By USGS’ Wisconsin Water Science Center’s Mercury Laboratory.

All Equipment, Which Came In Contact With Samples, Was Made Of Teflon Or Polyethylene.

All Sampling Equipment Was Kept Inside The Processing Chamber To Prevent Possible Contamination From Air And Wind Borne Particles.

Gloves Were Changed Often, Especially When Handling Various Equipment.

Field Blanks Were Collected Inside The Processing Chamber Prior To Sampling.



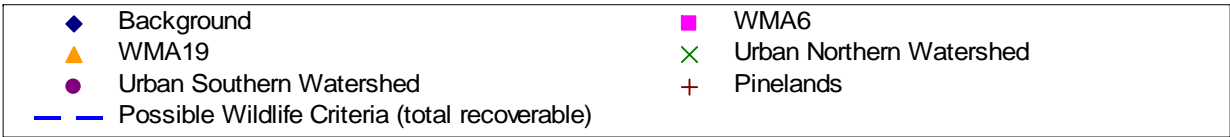
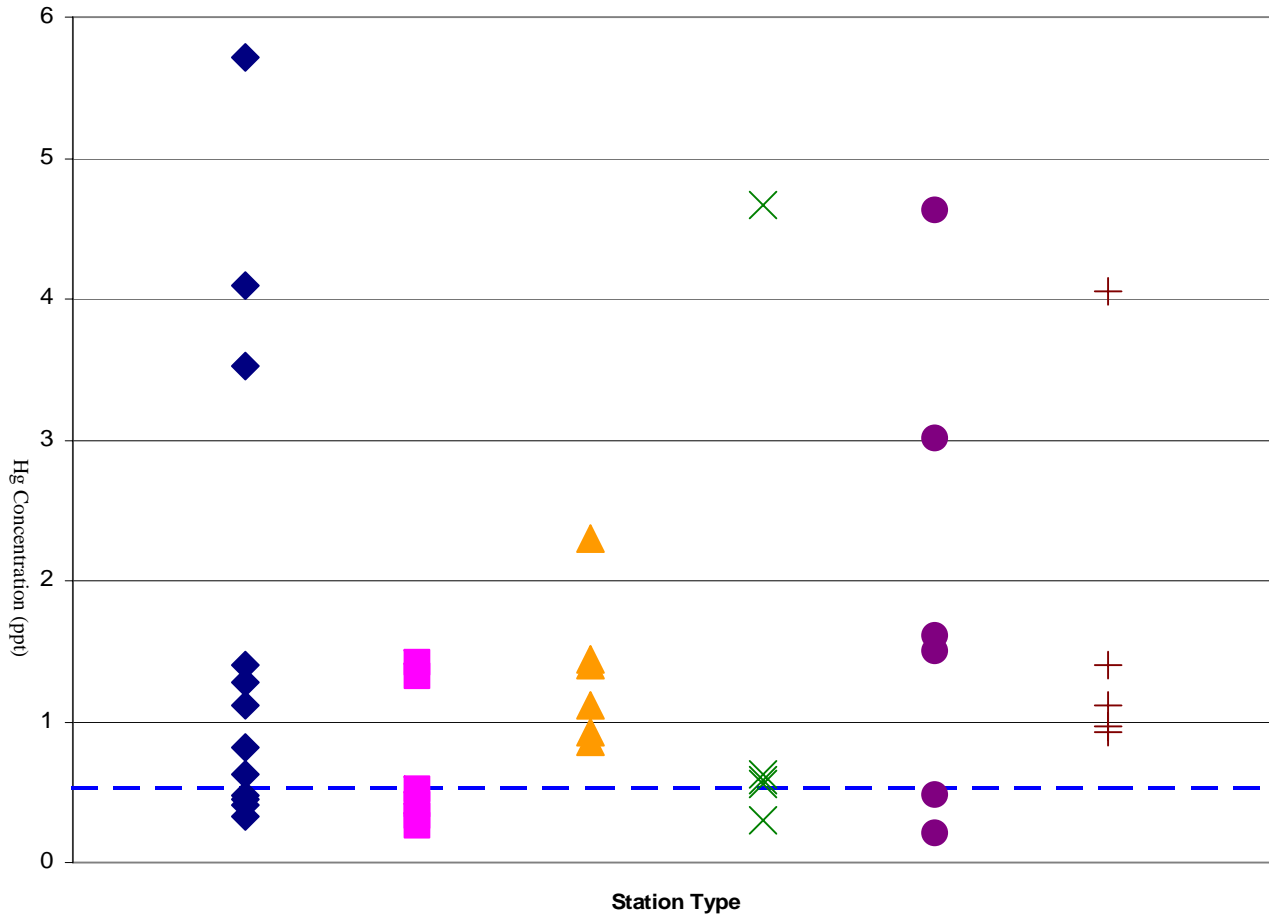
Results

- Blanks
 - 30 of 33 equipment blank results were at the Laboratory reporting limit of 0.04 ppt.
 - The highest result was 1.04 ppt. Field notes indicate windy conditions that day, which may have contaminated the sample.
- Stream concentrations of Mercury ranged from 0.21 to 5.71 ppt, which is well below the lowest current surface water criteria.

Results

- Station type and location were not good predictors of dissolved mercury concentrations.
- All data was within the range found at reference stations.

Low Level Hg Results by Station Type



Surface Water Quality Standards

Acute Aquatic Life Criteria
1400 ppt dissolved (1.4 ppb)

Chronic Aquatic Life Criteria
770 ppt dissolved (0.77 ppb)

Human Health Criteria
50 ppt total recoverable (0.05ppb)

Possible Wildlife Criteria
0.53 ppt total recoverable

Summary Statistics

Minimum Value: 0.21 ppt

Median Value: 0.96 ppt

Maximum Value: 5.71 ppt

Results

- Data suggests that air deposition is the dominant factor in Hg concentrations in surface water.
- The only correlation appeared to be between dissolved Hg concentration and stream flow. Dissolved Hg concentration generally increased with elevated flow.

Comparison of Hg Concentrations (ppt) at Stream Flows Above and Below Long-term Daily Median Flow

