

Surface-Water Sampling  
and Evaluation  
2002 – 2003

Township of Cranbury  
Environmental Commission

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# **Surface-Water Sampling and Evaluation 2002-2003**

## **Introduction**

This report presents the results of three surface-water monitoring events conducted in 2002 and 2003 in the Township of Cranbury, Middlesex County, New Jersey.

The Cranbury Environmental Commission obtained a grant from the New Jersey Department of Environmental Protection (NJDEP), Environmental Services Program. The purpose of the grant is to support the costs associated with the collection, analysis, and evaluation of surface-water samples from a lake and from streams within or impacting the Township of Cranbury. The costs of the program were shared equally between NJDEP and the township.

Land use in Cranbury is changing rapidly as more areas of the town are developed, both residentially and commercially. This development affects surface-water bodies, both in the short term due to increased siltation during construction, and in the long term as runoff quantity is increased after impermeable cover replaces open land. Often, runoff quality deteriorates as well, because runoff from paved areas can transport oil and grease associated with parking areas, and runoff from residential areas can transport pesticides and fertilizers to receiving water bodies.

## **Purpose and Objectives**

The purpose of the project is to characterize surface-water quality in Cranbury. The results of the testing indicate the current surface-water quality, and they will provide a baseline for comparison to future surface-water data to evaluate any potential changes as development progresses. The ultimate goal is to help protect Cranbury's surface-water bodies, which are ecological resources used as a habitat by wildlife and by Cranbury residents for fishing, canoeing, and other recreational activities.

The objectives of the surface-water monitoring program are as follows:

- Conduct sampling events in the summer, fall, and spring, to monitor any seasonal variations in surface-water chemistry.
- Collect samples from six locations during each sampling event, including two locations in Brainerd Lake, two locations in Cranbury Brook (one upstream and one downstream from Brainerd Lake), one location in Cedar Brook, and one location in the Millstone River.
- Analyze each sample at an NJDEP-certified analytical laboratory for general water-quality parameters.
- Tabulate and evaluate the results compared to standards and targets for surface-water quality for similar lakes and stream.

## Monitoring Locations

The monitoring locations are shown in the map in Figure 1. Six locations were selected as representative of the surface-water bodies in Cranbury Township. They are designated as follows:

- BL-01: Brainerd Lake near Route 130
- BL-02: Brainerd Lake near Main Street
- AR-03: Cranbury Brook upstream of Brainerd Lake, at Applegarth Road
- MS-04: Cranbury Brook downstream of Brainerd Lake, behind the firehouse
- CB-05: Cedar Brook at Plainsboro Road
- MR-06: Millstone River at Old Trenton Road

## Sampling Events

Samples were collected from all six locations three times during the year:

- Summer collection: July 15, 2002
- Fall collection: October 23, 2002
- Spring collection: April 14, 2003

## Collection Procedures

At each sampling event, samples were collected into bottles pre-filled with preservatives as appropriate, 11 bottles for each lake location and six bottles for each stream location. In addition, water temperature and pH were determined using an electronic probe generously provided by Pine Environmental Services, East Windsor NJ.

## Sample Analyses

Surface-water samples were analyzed by Accutest Laboratories, Dayton NJ (NJDEP Certification No. 12129).

Samples from all six sampling locations were analyzed for the following parameters:

<b>Parameter</b>	<b>Method</b>
Biological Oxygen Demand (5-day)	EPA 405.1/ SM19 5210B
Nitrogen as Nitrate <sup>a</sup>	EPA 353.2/ SM184500
Nitrogen, Nitrate + Nitrite	EPA 353.2
Nitrogen as Nitrite	SM19 4500NO2B
Dissolved Oxygen	EPA 360.1
Petroleum Hydrocarbons	EPA 418.1
Total Phosphorus	EPA 365.3
Total Suspended Solids	EPA 160.2
Sulfate	EPA 300/ SW846 9056

a – Calculated as (Nitrogen, Nitrate + Nitrite) – (Nitrogen as Nitrite)

Samples from both lake locations were also analyzed for pesticides, metals, and coliform bacteria:

<b>Pesticides<sup>a</sup></b>	
Aldrin	Endrin
alpha-BHC	Endosulfan sulfate
beta-BHC	Endrin aldehyde
delta-BHC	Endosulfan-I
gamma-BHC (Lindane)	Endosulfan-II
Chlordane	Heptachlor
Dieldrin	Heptachlor epoxide
4,4'-DDD	Methoxychlor
4,4'-DDE	Toxaphene
4,4'-DDT	

a - Methods SW848081A and SW846 3510C

<b>Metals</b>	<b>Method</b>
Arsenic	EPA 200.7
Barium	EPA 200.7
Cadmium	EPA 200.7
Chromium	EPA 200.7
Lead	EPA 200.7
Mercury	EPA 245.1
Selenium	EPA 200.7
Silver	EPA 200.7

<b>Coliforms</b>	<b>Method</b>
Fecal coliforms	SM18 9222D
Total coliforms	SM18 9222B

## **Results**

Reports of the test results from Accutest Laboratories are appended as Attachments A, B, and C. Results of analyses with measurable quantities of analyte are summarized in Table 1. Surface water quality criteria cited are the NJDEP standards for “Fresh-Water 2 Non-Trout” (FW2-NT) surface-water bodies.

### **Water Temperature**

Temperatures were generally comparable across locations during each of the three sampling events, and temperatures during each event reflected the seasonal air temperature, with higher water temperatures in July 2002. The Stony Brook Millstone Watershed Association recommends that water temperatures should be less than 29.4 °C. None of the sites tested exceeded that target.

## **pH**

The NJDEP standard for pH is 6.5 to 8.5. Many of the pH levels recorded were less than 6.5, including all of the values obtained on October 23, 2003. However, no one site had low values at all three sampling times. It seems likely that low values resulted from problems with the pH meters rather than from actual low pH (high acidity) in the surface waters.

## **Total Suspended Solids**

Total suspended solids were at low levels in all surface-water samples except for the Cedar Brook sample on July 15, 2002. The concentration in this sample (81 mg/L) exceeded the NJDEP standard of 40 mg/L. This result was consistent with visual observations of the turbidity of the water in the Cedar Brook at that time, which was during a period of low water flow.

## **Dissolved Oxygen**

Results for dissolved oxygen ranged from 7.5 to 11.6 mg/L. The NJDEP standard for dissolved oxygen is “not less than 4.0 mg/L”.

## **Nitrate**

Nitrate concentrations in all samples were less than the NJDEP standard of 10 mg/L.

## **Sulfate**

All reported concentrations were considerably less than the standard of 250 mg/L.

## **Total Phosphorus**

The NJDEP standard for total phosphorus in lakes is 0.05 mg/L. Total phosphorus levels in the two samples from Brainerd Lake in July 2002 were 0.053 and 0.076 mg/L. The NJDEP standard for total phosphorus in streams is 0.1 mg/L. Total phosphorus was below this standard in all stream samples except for one sample from the Cedar Brook. The total phosphorus concentration in the sample of July 2002 was 0.62 mg/L.

All results for total phosphorus in October 2002 and April 2003 in both the lake and the streams were less than the reporting limit of 0.050 mg/L.

Excess phosphates can stimulate aquatic plants and cause excessive plant growth. However, plant growth in Brainerd Lake does not appear excessive. The phosphorus observed in the July 2002 lake samples may be the result of fertilizer runoff from areas adjacent to the lake and Cranbury Brook.

## **Coliforms**

Fecal coliforms and total coliforms were determined for the two sampling locations in Brainerd Lake during each sampling event. Fecal coliforms should not exceed a geometric average

of 200 col/100 mL, nor should more than 10% of the samples taken during any 30-day period exceed 400 col/100mL. All counts obtained for fecal coliforms were well below these limits, with the highest levels (105 and 125 col/100mL) obtained in July 2002.

### **Parameters with Very Low Concentrations**

Analytes with results uniformly below or only slightly above the reporting limits are listed in Table 2. These included nitrogen as nitrite and petroleum hydrocarbons. Biological oxygen demand was low in all samples except for the sample obtained from the Cedar Brook in July 2002 – 16.6 mg/L vs. a reporting limit of 3.3 mg/L. This value indicates the presence of a demand for oxidation of organic material. This finding correlates with the higher levels of suspended solids and total phosphorus found in the Cedar Brook in July 2002.

### **Lake Samples with Very Low Concentrations**

Parameters determined on samples from Brainerd Lake that were below the reporting limits at all sampling times are summarized in Table 3. These included all of the pesticides and all of the metals that were analyzed, with one exception. The concentration of lead in the sample from Brainerd Lake 2 on October 23, 2002 was reported to be 3.6 mcg/L, vs. a reporting limit of 3.0 mcg/L. This level does not exceed the NJDEP standard of 5 mcg/L.

## **Summary**

The Cranbury Environmental Commission conducted surface-water sampling events in July 2002, October 2002, and April 2003. Samples were collected from six sites: two locations in Brainerd Lake, two locations in Cranbury Brook (one upstream and one downstream from Brainerd Lake), one location in Cedar Brook, and one location in the Millstone River. The samples were analyzed at an NJDEP-certified testing laboratory for general water-quality parameters.

The results of the analyses of the surface-water samples indicate the following:

- The test results were acceptable overall and generally met NJDEP surface-water quality criteria.
- All of the samples from Brainerd Lake were within NJDEP standards for coliforms, pesticides, and metals.
- Total phosphorus levels in Brainerd Lake in July 2002 were slightly elevated. The higher levels may have resulted from fertilizer runoff from areas adjacent to the lake and Cranbury Brook. Phosphorus levels were low in all lake samples at the other two sampling times.
- Samples obtained from the Cedar Brook had elevated values for total suspended solids, biological oxygen demand, and total phosphorus on July 15, 2002, which was during a period of low water flow. Results on these parameters from this site at the other two sampling times were acceptable.

- Other parameters for which all test results were acceptable for both the lake and the stream samples included dissolved oxygen, nitrogen, sulfate, and petroleum hydrocarbons.

The results of this testing program document the current quality of the surface waters in the Township of Cranbury, and they provide a baseline for comparison to future surface-water data, to evaluate any potential changes.

**Table 2: Analytes with Results Below or Only Slightly Above Reporting Limits**

5-Day Biological Oxygen Demand<sup>a</sup>  
Nitrogen as Nitrite  
Petroleum Hydrocarbons

a - Cedar Brook on 15Jul02 = 16.6 mg/L vs. Reporting Limit of 3.3 mg/L.

**Table 3: Lake Samples Below Reporting Limit at All Sampling Times**

<u>Pesticides</u>		<u>Metals</u>
Aldrin	4,4'-DDT	Arsenic
alpha-BHC	Endrin	Barium
beta-BHC	Endosulfan sulfate	Cadmium
delta-BHC	Endrin aldehyde	Chromium
gamma-BHC	Endosulfan-I	Lead <sup>a</sup>
(Lindane)	Endosulfan-II	Mercury
Chlordane	Heptachlor	Selenium
Dieldrin	Heptachlor epoxide	Silver
4,4'-DDD	Methoxychlor	
4,4'-DDE	Toxaphene	

a - Brainerd Lake 2 on 23Oct02 = 3.6 mcg/L vs. Reporting Limit of 3.0 mcg/L.  
(NJDEP Quality Criterion is < 5 mcg/L.)

# **Surface-Water Sampling and Evaluation 2002-2003**

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