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## Memorandum

**To:** John Barten, Three Rivers Park District  
**From:** Meg Rattei, Barr Engineering Company  
**Subject:** Scope: 2007 Water Quality Monitoring  
**Date:** March 22, 2007  
**Project:** Bassett Creek Watershed Management Commission

The Bassett Creek Watershed Management Commission (BCWMC) and Three Rivers Park District will monitor Westwood and Crane Lake as part of its lake monitoring program during 2007. In addition, as part of the BCWMC's Sweeney Lake TMDL study, Three Rivers Park District will monitor Sweeney Lake and a Sweeney Lake inflow site. Generally, Three Rivers Park District will collect and analyze lake and inflow water quality samples and Barr Engineering Company will analyze phytoplankton and zooplankton samples, complete macrophyte surveys, and prepare a report. The detailed tasks to be completed by the Three Rivers Park District and Barr Engineering are outlined as follows. A cost estimate for Three Rivers Park District tasks is also provided. Separate discussions are provided for Westwood and Crane Lakes, Sweeney Lake in-lake monitoring, and Sweeney Lake inflow monitoring.

### 1. Westwood Lake and Crane Lake Monitoring

#### GENERAL

- A. Sampling: Samples will be collected from one representative lake sampling station in Westwood Lake and one representative lake sampling station in Crane Lake. The Westwood and Crane Lake sample stations shall be in the deepest location of each lake. Each lake will be monitored on six occasions from April through September. It should be noted that both lakes are shallow (i.e., less than 2 meters in depth). Details follow:
1. One sample will be collected within two weeks of ice out
  2. One sample will be collected in mid-June
  3. One sample will be collected in mid-July
  4. Two samples will be collected in August (biweekly)
  5. One sample will be collected during the first week of September

- B. Sampling Parameters: Table 1 lists the water quality parameters and specifies at what depths the samples or measurements will be collected.

**Table 1 Lake Water Quality Parameters**

<b>Parameters</b>	<b>Depth (Meters)</b>	<b>Sampled or Measured During Each Sample Event</b>
Dissolved Oxygen	Surface to bottom profile at one meter intervals	X
Temperature	Surface to bottom profile at one meter intervals	X
Specific Conductance	Surface to bottom profile at one meter intervals	X
pH	Surface to bottom profile at one meter intervals	X
Secchi Disc	—	X
Total Phosphorus	0-1 Meter Composite Sample	X
Total Phosphorus	One near bottom sample from 0.5 meters above the bottom.	X
Soluble Reactive Phosphorus	0-1 Meter Composite Sample	X
Total Nitrogen (or Nitrogen Species Needed to Determine Total Nitrogen)	0-1 Meter Composite Sample	X
Chlorophyll <i>a</i>	0-1 Meter Composite Sample	X
Phytoplankton	0-1 Meter Composite Sample	X
Zooplankton	Bottom to Surface Tow with a zooplankton net	X

Dissolved oxygen, temperature, specific conductance, pH, and Secchi disc transparency will be measured in the field. Water samples will be analyzed in the Three Rivers Park District laboratory for total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorophyll *a*. Samples for phytoplankton and zooplankton will be analyzed in the Barr Engineering Company Laboratory.

- C. Water Quality Analyses: Analysis of total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorophyll *a* will be completed by Three Rivers Park District.

- D. **Phytoplankton and Zooplankton Sampling and Analyses:** Phytoplankton and zooplankton samples will be collected during each sample event during April to September 2007. Samples will be collected by Three Rivers Park District and analyzed by Barr Engineering. Details follow.
- i. **Phytoplankton**—A composite 0-1 meter sample will be collected from each lake using a water sampler such as a Van Dorn or Kemmerer water sampler during each water quality sampling event. All samples will be analyzed.
  - ii. **Zooplankton**—A zooplankton sample will be collected (i.e., bottom to surface tow with a zooplankton net) from each basin during each water quality sampling event. All samples will be analyzed.
- E. **Macrophytes**—Macrophyte surveys will be completed by Barr Engineering staff during June and August.

### **Three Rivers Park District Tasks: Westwood and Crane Lakes**

1. **Collect samples:** Three Rivers Park District will collect samples from Westwood and Crane Lakes on six sample occasions.
2. **Complete laboratory analyses:** Three Rivers Park District will complete laboratory analyses of the total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorophyll *a* samples collected on each sample occasion.
3. **Deliver phytoplankton and zooplankton samples:** Three Rivers Park District will deliver phytoplankton and zooplankton samples to the Barr Engineering Company office following conclusion of the sample program.
4. **Summarize laboratory data:** Three Rivers Park District will summarize all laboratory data and send an electronic file of the data to Barr Engineering Company staff at the conclusion of the sample program.

### **Barr Engineering Tasks: Westwood and Crane Lakes**

1. **Phytoplankton and zooplankton analyses:** Barr Engineering Company will analyze the phytoplankton and zooplankton samples. Phytoplankton and zooplankton samples will be identified and enumerated in the laboratory to provide information on species diversity and abundance.
2. **Macrophyte survey:** Barr staff will complete the macrophyte survey. The macrophytes will be surveyed to determine species locations, composition, and abundance.
3. **Report:** At the conclusion of the monitoring program, Barr Engineering Company will prepare a report. The report will follow the format used in previous years and discuss the water quality

data, historical trends, recreational suitability, macrophytes, phytoplankton, zooplankton, and conclusions.

## **Three Rivers Park District Cost Estimate: Westwood and Crane Lakes**

Three Rivers Park District costs to sample Westwood and Crane Lakes and complete laboratory analyses are expected to total \$1,380. Details follow.

- Three Rivers Park District -- \$100 per sample event to sample the two lakes, a total of \$600 for the six sample events. Sample collection costs include travel time to Barr Engineering Company at the conclusion of the sampling program to deliver phytoplankton and zooplankton samples.
- Three Rivers Park District Lab analyses costs for samples collected from Westwood and Crane Lakes total \$780:
  - 24 total phosphorus samples @ \$13/sample = \$312
  - 12 soluble reactive phosphorus samples @ \$13/sample = \$156
  - 12 total nitrogen samples @ \$13/sample = \$156
  - 12 chlorophyll *a* samples @ \$13/sample = \$156

## 2. Sweeney Lake Monitoring (In-Lake Monitoring)

### General

- A. Sampling: Samples will be collected from two representative lake sampling stations in Sweeney Lake. The two Sweeney Lake stations shall be at the deepest location of the lake's two basins; one near the south end of the lake and one near the north end of the lake. The lake will be monitored on twelve occasions from April through October. Samples will be collected at a frequency of one sample event each month during April and October and two sample events each month during May through September.
- B. Sampling Parameters: Table 1 lists the water quality parameters and specifies at what depths the samples or measurements will be collected.

**Table 1 Lake Water Quality Parameters**

<b>Parameters</b>	<b>Depth (Meters)</b>	<b>Sampled or Measured During Each Sample Event</b>
Dissolved Oxygen	Surface to bottom profile at one meter intervals	X
Temperature	Surface to bottom profile at one meter intervals	X
Specific Conductance	Surface to bottom profile at one meter intervals	X
pH	Surface to bottom profile at one meter intervals	X
Secchi Disc	—	X
Total Phosphorus	0-2 Meter Composite Sample	X
Total Phosphorus	One sample above the thermocline	X
Total Phosphorus	One sample below the thermocline	X
Total Phosphorus	One near bottom sample from 0.5 meters above the bottom.	X
Soluble Reactive Phosphorus	0- 2 Meter Composite Sample	X
Total Nitrogen (or Nitrogen Species Needed to Determine Total Nitrogen)	0-2 Meter Composite Sample	X
Chlorophyll a	0-2 Meter Composite Sample	X
Phytoplankton	0-2 Meter Composite Sample	X
Zooplankton	Bottom to Surface Tow with a zooplankton net	X

Dissolved oxygen, temperature, specific conductance, pH, and Secchi disc transparency will be measured in the field. Water samples will be analyzed in the Three Rivers Park laboratory for total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorophyll *a*. Phytoplankton and zooplankton samples will be analyzed in the Barr Engineering Company Laboratory if analysis is deemed warranted.

- C. Water Quality Analyses: Analysis of total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorophyll *a* will be completed by Three Rivers Park District.
- D. Phytoplankton and Zooplankton Sampling and Analyses: Phytoplankton and zooplankton samples will be collected during each sample event during April to October 2007. Samples will be collected by Three Rivers Park District. Samples will be analyzed by Barr Engineering Company if analysis is deemed warranted. Details follow.
  - i. **Phytoplankton**—A composite 0-2 meter sample will be collected from each lake basin using a water sampler such as a Van Dorn or Kemmerer water sampler during each water quality sampling event. Samples will be analyzed if analysis is deemed warranted.
  - ii. **Zooplankton**—A zooplankton sample will be collected (i.e., bottom to surface tow with a zooplankton net) from each lake basin during each water quality sampling event. Samples will be analyzed if analysis is deemed warranted.
- E. Macrophytes: Macrophyte surveys will be completed by Barr Engineering staff during June and August.

### **Three Rivers Park District Tasks: Sweeney Lake Monitoring (In-Lake Monitoring)**

1. **Collect samples:** Three Rivers Park District will collect samples from Sweeney Lake on twelve sample occasions
2. **Complete laboratory analyses:** Three Rivers Park District will complete laboratory analyses of the total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorophyll *a* samples collected on each sample occasion.
3. **Deliver phytoplankton and zooplankton samples:** Three Rivers Park District will deliver phytoplankton and zooplankton samples to the Barr Engineering Company office following conclusion of the sample program.

4. **Summarize laboratory data:** Three Rivers Park District will summarize all laboratory data and send an electronic file of the data to Barr Engineering Company staff at the conclusion of the sample program.

### **Barr Engineering Tasks: Sweeney Lake Monitoring (In-Lake Monitoring)**

1. **Phytoplankton and zooplankton analyses:** If analysis is warranted, Barr Engineering Company will analyze the phytoplankton and zooplankton samples. If analyzed, phytoplankton and zooplankton samples will be identified and enumerated in the laboratory to provide information on species diversity and abundance.
2. **Macrophyte survey:** Barr staff will complete the macrophyte survey. The macrophytes will be surveyed to determine species locations, composition, and abundance.
3. **TMDL Study and Report:** At the conclusion of the monitoring program, the BCWMC will use the data to complete a Total Maximum Daily Load (TMDL) study and report.

### **Three Rivers Park District Cost Estimate: Sweeney Lake Monitoring (In-Lake Monitoring)**

Three Rivers Park District costs to sample Sweeney Lake and complete laboratory analyses are expected to total \$3,384. Details follow.

- Three Rivers Park District -- \$100 per sample event to sample Sweeney Lake, a total of \$1,200 for the 12 sample events. Sample collection costs include travel time to Barr Engineering Company at the conclusion of the sampling program to deliver phytoplankton and zooplankton samples.
- Three Rivers Park District Lab analyses costs for samples collected from Sweeney Lake total \$1,820:
  - 96 total phosphorus samples @ \$13/sample = \$1, 248
  - 24 soluble reactive phosphorus samples @ \$13/sample = \$312
  - 24 total nitrogen samples @ \$13/sample = \$312
  - 24 chlorophyll *a* samples @ \$13/sample = \$312

### 3. Sweeney Lake Inflow Monitoring

#### General

- A. Sampling: Samples will be collected from a Sweeney Lake Inflow site. Up to 30 samples will be collected. It is estimated that a total of up to 54 trips to the inflow sample site will be required to complete the Sweeney Lake inflow monitoring program as needed to sample significant runoff events.
- B. Sampling Parameters: Table 1 lists the water quality parameters to be collected from the Sweeney Lake inflow site during each sample event.

**Table 1 Lake Water Quality Parameters**

<b>Parameters</b>	<b>Sampled During Each Sample Event</b>
Total Phosphorus	X
Soluble Reactive Phosphorus	X
Total Nitrogen	X
Ammonia Nitrogen	X
Total Suspended Solids	X

- C. Water Quality Analyses: Analysis of total phosphorus, soluble reactive phosphorus, total nitrogen, ammonia nitrogen, and total suspended solids will be completed by Three Rivers Park District.

#### **Three Rivers Park District Tasks: Sweeney Lake Inflow Monitoring**

1. **Collect samples:** Three Rivers Park District will collect samples from the Sweeney Lake inflow up to 30 sample occasions
2. **Download Data:** Three Rivers Park District will download data from the flow logger on each sample occasion. The electronic file of the flow data will be sent to Barr Engineering Company staff following each sample event.
3. **Complete Laboratory Analyses:** Three Rivers Park District will complete laboratory analyses of the total phosphorus, soluble reactive phosphorus, total nitrogen, ammonia nitrogen, and total suspended solids samples collected on each sample occasion.

4. **Summarize laboratory data:** Three Rivers Park District will summarize all laboratory data and send an electronic file of the data to Barr Engineering Company staff at the conclusion of the sample program.

## **Three Rivers Park District Cost Estimate: Sweeney Lake Inflow Monitoring**

Three Rivers Park District costs to complete Sweeney Lake inflow monitoring and laboratory analyses are budgeted not to exceed up to \$7,410. Details follow.

- Three Rivers Park District -- \$100 per site trip, up to \$5,400 for up to 54 site trips
- Three Rivers Park District Lab analyses costs for samples collected from Sweeney Lake are budgeted not to exceed \$2,010:
  - Up to 30 total phosphorus samples @ \$13/sample = \$390
  - Up to 30 soluble reactive phosphorus samples @ \$13/sample = \$390
  - Up to 30 total nitrogen samples @ \$13/sample = \$390
  - Up to 30 ammonia samples @ \$13/sample = \$390
  - Up to 30 total suspended solids samples @ \$15/sample = \$450