Rathbun Lake Monthly Water Quality Monitoring near Honey Creek Resort Park (HCRP)

Pre-Construction Phase
October 2006
Event 6

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Rathbun Lake Monitoring for HCRP
October 2006 – Event 6

Introduction

Water samples were collected for the sixth time on October 3, 2006, at several sites on Rathbun Lake to monitor base-line conditions before construction begins at the Honey Creek Resort Park (HCRP). Previously monthly monitoring events were conducted on April 18, May 8, June 19, July 19 and August 16, 2006. Presently lake monitoring events are performed on a quarterly basis. The initial monthly report from April 2006 contained introductory information on the planned park and on the reservoir itself.

Samples were collected at Rathbun Reservoir near the planned Honey Creek Resort Park at three locations as shown on the following map. Sites RL-1 and RL-2 are located approximately 75 feet from the lakeshore on either side of the peninsula where the HCRP lodge will be located. Site RL-1 is located in an unnamed creek embayment just to the west of the resort area. Site RL-2 is located in the Honey Creek embayment just east of the resort area. Site RL-3 is located in the main lake down-lake from the other two sites. Monitoring at these locations is intended to alert developers, in a timely manner, to any contamination of the lake that may be due to construction activities. This monitoring is supplemental to stormwater pollution abatement and monitoring activities that are also being undertaken. Recent first flush stormwater samples were collected on October 3 from storm events that occurred between August 26 and September 23, as before, only the sampler at site NC was full (see attached map). Static stormwater samplers were set at three additional sites on October 3. Also the groundbreaking ceremony was held on this date.

Construction Activities in Progress

Pre-construction phase, the only activity has been surveying. The first bid package is being negotiated which includes grading for entire site.

Hydrology, Climatology and Sampling Conditions

On October 3 the lake level was 900.42 feet NGVD (COE). The inflow from the Chariton River as measured near Chariton, Iowa (USGS gage 06903400) was 1 ft$^3$/s on October 3, the peak flow since the last monitoring event on August 16 was 16 ft$^3$/s on August 21. The inflow from the South Fork Chariton River as measured near Promise City, Iowa (USGS gage 06903700) was 6 ft$^3$/s on the sampling day, with a peak flow of 200 ft$^3$/s since the last monitoring event. The outflow from Rathbun Reservoir (USGS gage 06903900) was 41 ft$^3$/s, ranging from 35 ft$^3$/s to 41 ft$^3$/s over this same time period.

Recent weather has been cooler and drier than usual. There was no precipitation during the previous 72 hours at Rathbun Dam (NWS-COOP Station RAD14) and precipitation since the last monitoring event on August 16 was 5.18 inches. The most recent significant rain event (>0.5 inch) at Rathbun Dam occurred on September 22 (0.53 in). Weather conditions during sampling were sunny and unseasonably warm with ambient temperatures of 90°F.

Boating pressure in the area is measured by the number of boat trailers in the existing Honey Creek ramp area. Upon arrival on October 3 there were 16 boat trailers.

Field Results
Water samples were collected between 1140 and 1400 CDT. Field tests were conducted at the site or within 24 hours of collection. Lake water appeared greenish at all sites, with similar water clarity at all locations. Secchi disc depths measure clarity. The Secchi disc depths at Sites RL-1, RL-2 and RL-3 were 0.73 m, 0.77 m and 0.82 m, respectively. The water depths at Sites RL-1, RL-2 and RL-3 were 4 meters (m), 6 m and 8.2 m, respectively. Discrete depth samples were collected at two depths (0.25 m under the surface and 1m from the bottom) for water temperature, pH, dissolved oxygen, total alkalinity, total hardness, turbidity and specific conductance. Results from the above parameters at all three sites were mostly similar with depth at each site and between sites indicating the lake water in these locations was fairly well mixed. All results from field analyses are listed in accompanying data tables.

Lab Results

The Environmental Engineering Research Laboratory, part of Iowa State University’s Department of Civil, Construction and Environmental Engineering, conducted all remaining chemical and biological analyses. All results are listed in accompanying data tables. A six-foot PVC sampler was used to obtain integrated depth samples for solids and nutrient samples. Samples for all other parameters (bacteria, metals, organics and pesticides) required direct collection into sample bottles and thus were collected from just under the water surface.

**Integrated water column samples**

- **Solids**- A suite of solids parameters was analyzed. Solids results were higher and more variable than previously seen, with total solids ranging from 200 mg/l (RL-2) to 253 mg/l (RL-1). Total solids were higher this month, with the highest concentration being seen at RL-1 (253 mg/l). Total volatile solids (organic material) comprised 40% to 60% of the total solids concentration, as compared to 40% in August. Total suspended solids were similar and ranged from 7 mg/l (RL-3) to 11 mg/l (RL-2).

- **Nutrients**- Ammonia and nitrite plus nitrate nitrogen was low at all sites. Organic nitrogen (measures proteins and peptides, nucleic acids and urea; and synthetic organic materials) was somewhat higher at all locations averaging 1.06 mg/l. Total phosphorus was similar at all sites averaging only 0.01 mg/l with orthophosphorus at or below the detection limit. Orthophosphorus is the plant available form of phosphorus which has been depleted by algal utilization. Nutrient results are very low compared to Iowa’s other reservoirs (Saylorville and Red Rock reservoirs on the Des Moines River and Coralville Reservoir on the Iowa River). Total nitrogen concentrations at the surface of the main basins of Saylorville, Red Rock and Coralville reservoirs in October were significantly higher than August and averaged 4.57 mg/l, 5.09 mg/l and 10.4 mg/l. Total phosphorus concentrations at Saylorville, Red Rock and Coralville Reservoirs during October were lower than August and averaged 0.09 mg/l, 0.21 mg/l and 0.16 mg/l, respectively.

**Surface samples**

- Chlorophyll-Chlorophyll pigments are measured as an indication of algal productivity and biomass. Concentrations of viable chlorophyll a ranged from 21 mg/m$^3$ to 32 mg/m$^3$, with the highest concentrations at RL-2.
- Bacteria- Total fecal coliform and *Escherichia coli* (E coli) bacteria concentrations were all low, being below 5 organisms/100 ml. The state standard for *E coli* bacteria in recreational waters (Class A1) states that the geometric mean (not less than 5 samples in 30 days) should not exceed 126 organisms/100 ml and a single sample should not exceed 235 organisms/100 ml.

- Metals- Samples were analyzed for the trace metals copper, lead and zinc. There were no results for total copper, lead or zinc above their respective detection limits of 1 µg/l, 4 µg/l or 0.6 µg/l. These results are similar to the previous month.

- Organics- Contamination of water resources by petroleum products (gasoline, diesel and oil) can be detected by the parameters referred to as “oil and grease”, “BTEX” and “MTBE”. The oil and grease method refers to materials soluble in n-hexane, such as biological lipids and mineral hydrocarbons. The BTEX group of contaminants consists of benzene, ethyl benzene, toluene, and three isomers of xylene. These organic chemicals make up a significant percentage of petroleum products (about 20% in gasoline) and are known to have adverse health affects. MTBE (methyl tertiary-butyl ether), a fuel additive, is also quantified. For samples collected October 3 there was no detectable concentrations of oil and grease, BTEX or MTBE.

- Pesticides- During the pre-construction phase the only pesticides to be monitored are atrazine and dieldrin. Atrazine is being monitored since the reservoir is already impaired by atrazine. Dieldrin is being measured as a marker for older pesticides that could be transported to the lake during land alteration even without additional use. No increase in atrazine or dieldrin concentrations is anticipated however. In the future additional herbicides and insecticides will be monitored once they are being used in landscaping activities at HCRP golf course and park. Dieldrin concentrations were below the detection limit of 0.04 µg/l (ppb). Concentrations of atrazine at Sites RL-1, RL-2 and RL-3 were 0.45 µg/l (ppb), 0.48 µg/l and 0.43 µg/l, respectively, which were significantly lower than concentrations last month (1.00 µg/l, 0.94 µg/l and 1.11 µg/l, respectively).
Major inflows to Rathbun Reservoir, August 17 – October 2, 2006.

Outflow from Rathbun Dam for the period August 17 – October 2, 2006.
Precipitation between monitoring events in August and October 2006.

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Water column data from YSI meter.
# Rathbun Lake Monitoring for HRCP Development

**Sampling Conditions and Field Parameters**

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**Comments:**

*mg/l as CaCO3

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*note: negative number indicates the bottom value was higher than the surface value

flows from USGS; elevation from Corps
Report of Chemical Analysis
Environmental Engineering Research Laboratory

123 Town Engineering  Bldg. Iowa State University Ames, Iowa 50011 (515) 294-8579

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<td>Chlorophyll a</td>
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<td>24</td>
<td>32</td>
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<td>Chlorophyll b</td>
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<td>4</td>
<td>1</td>
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<td>Chlorophyll c</td>
<td>mg/m³ Surface grab</td>
<td>3</td>
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<tr>
<td>Corr Chlorophyll a</td>
<td>mg/m³ Surface grab</td>
<td>21</td>
<td>31</td>
<td>19</td>
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<tr>
<td>Phoephynin a</td>
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<td>2</td>
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<tr>
<td>Fecal Coliform Bacteria</td>
<td>/100 ml Surface grab</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>E. Coli Bacteria</td>
<td>/100 ml Surface grab</td>
<td>2</td>
<td>4</td>
<td>2</td>
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<tr>
<td>Total Copper</td>
<td>µg/l Surface grab</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<tr>
<td>Total Lead</td>
<td>µg/l Surface grab</td>
<td>&lt;4</td>
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<tr>
<td>Total Zinc</td>
<td>µg/l Surface grab</td>
<td>&lt;0.6</td>
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<td>Atrazine</td>
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<td>Dieldrin</td>
<td>µg/l Surface grab</td>
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Notes:
- mg/l equals ppm
- µg/l equals ppb
- IDS is integrated depth samples
- µg/l equals ppb

Project: Rathbun Lake 6
Report Date: 10/13/2006
Sample Collection Date: 10/3/2006
Sample Submittal Date: 10/4/2006
By: DS
### Report of Chemical Analysis

**Environmental Engineering Research Laboratory**

123 Town Engineering  Bldg. Iowa State University Ames, Iowa 50011 (515) 294-8579

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#### Project Information

- **Project:** Rathbun Lake 6
- **Report Date:** 10/13/2006
- **Sample Collection Date:** 10/3/2006
- **Sample Submittal Date:** 10/4/2006
- **By:** DS

#### BTEX Analysis

<table>
<thead>
<tr>
<th>Compound</th>
<th>µg/l</th>
<th>RL-1</th>
<th>RL-2</th>
<th>RL-3</th>
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<td>benzene</td>
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<td>toluene</td>
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<tr>
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#### PAH Analysis

<table>
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<tr>
<th>Compound</th>
<th>µg/l</th>
<th>RL-1</th>
<th>RL-2</th>
<th>RL-3</th>
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