MEMORANDUM

To: Klamath Basin Monitoring Program ListServe

From: Rick Carlson
Physical Scientist

Subject: Klamath Hydroelectric Settlement Agreement (KHSA) Interim Measure (IM) 15 Baseline Microcystin Monitoring – Link Dam to Keno Dam Reach of the Upper Klamath River - 2015

The Reclamation Klamath Basin Area Office (KBAO) has been assisting with KHSA IM 15 water quality baseline monitoring since 2009. The KHSA IM 15 Program consists of two parts, baseline monitoring and public health monitoring. Unlike other down river KHSA monitoring entities (PacifiCorp contractors, Karuk and Yurok Tribes), KBAO staff do not collect samples as part of the public health monitoring component, only baseline monitoring. However, the baseline monitoring does include sampling for microcystin, but samples are collected at lower frequencies than at Lower Klamath River public health monitoring sites. The baseline designation originally was decided in the early planning stages when microcystin levels were thought not to exceed public health advisory criteria in the Upper Klamath River. Sample results greater than 10 microgram per liter (µg/L) exceed the Oregon Health Authority’s (OHA) criteria for issuing a public health advisory. Indeed, no microcystin detections exceeding public health advisory levels were detected from 2009 through 2014 in the Upper Klamath River during baseline monitoring.

KBAO field staff employees are collecting baseline water samples at three locations within the reach (Link River Dam, Miller Island Boat Ramp, and Keno Dam) (Figure 1). Microcystin samples are collected, stored, and shipped following Reclamation Standard Operating Procedures and Protocols on file at KBAO. Samples are frozen and sent overnight delivery to the Environmental Protection Agency (EPA) Region 9 Laboratory in Richmond, California. Laboratory analysis is performed using an enzyme-linked immunosorbent assay for total microcystins having a quantification detection limit of 0.18 (µg/L). Samples also are collected for phytoplankton density and biovolume, but results typically are not available until the following spring and only microcystin results are presented in this memorandum.
As scheduled in the IM 15 Water Quality Monitoring Plan for 2015, baseline sample collection for analysis of microcystin began on May 5, 2015. Laboratory results from this initial sampling detected microcystin below the reporting limit at the Miller Island Boat Ramp and Keno Dam sampling site. Similar results were observed from samples collected at the Miller Island Boat Ramp during the next scheduled monitoring event on June 9. Increasing concentrations in microcystin were observed starting on July 7 at all three sampling locations. The first observed microcystin result exceeding the OHA public health advisory action level was 14 µg/L from a sample collected at Link River Dam on July 21. Subsequent monitoring on August 4 and August 18 documented exceedances for all samples collected. The latest samples collected on September 1 continue to show OHA exceedances at Link River Dam (20 µg/L) and at Miller Island Boat Ramp (40 µg/L), but the result (8.5 µg/L) at Keno Dam was slightly below the OHA criteria. Laboratory results from all microcystin sampling events are summarized in Table 1.

As a result of this monitoring and other non-KHSA monitoring, the OHA expanded an earlier health advisory on Upper Klamath Lake to include the Upper Klamath River from Link River Dam to Keno Dam on July 29, 2015. The OHA as part of their health advisory protocols have posted warning signs in areas on the upper river frequented by the public. Subsequent water sampling and analysis continues to show microcystin levels above OHA guidelines and the current OHA health advisory and postings remain in effect. Reclamation, within the KHSA IM 15 Monitoring Plan framework and in coordination with the Klamath Basin Monitoring Program (KBMP), OHA, EPA, and the U.S. Geological Survey, will continue to sample and submit water samples for laboratory analysis and anticipate continued monitoring until microcystin concentrations decrease to safe levels.

**Figure 1.** Map showing Upper Klamath River – Link River Dam to Keno Dam Reach KHSA monitoring locations with river miles.
Table 1. Microcystin concentrations in micrograms per liter (μg/L) by date and location.

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<tbody>
<tr>
<td>Link River Dam</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>9.9</td>
<td>14</td>
<td>14</td>
<td>11</td>
<td>20</td>
<td>Scheduled</td>
<td>Scheduled</td>
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<tr>
<td>Miller Island Boat Ramp</td>
<td>0.17 J</td>
<td>NS</td>
<td>0.16 J</td>
<td>NS</td>
<td>2.7</td>
<td>NS</td>
<td>110</td>
<td>NS</td>
<td>40</td>
<td>NS</td>
<td>Scheduled</td>
<td>NS</td>
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<tr>
<td>Keno Dam</td>
<td>0.16 J</td>
<td>NS</td>
<td>ND</td>
<td>NS</td>
<td>4.7</td>
<td>NS</td>
<td>32</td>
<td>NS</td>
<td>8.5</td>
<td>NS</td>
<td>Scheduled</td>
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NA = No sampling scheduled  
ND = Not Detected  
J = Below Quantitation Limit of 0.18 μg/L. The result should be considered an estimated value.

Reclamation staff appreciates review of this memorandum by Randy Turner (KBMP), Jake Kann (Aquatic Ecosystem Sciences LLC), and Mike Deas (Watercourse Engineering Inc.) prior to this release.

If you have any questions, please contact Rick Carlson via email at racarlson@usbr.gov or at 541-880-2562.