Lake George and Lake Louise Sediment Assessment

City of River Falls Utility Board Meeting
March 21st, 2016

Marty Melchior
Regional Director
Outline / Scope of Work

- Sediment volume
  - Topographic and bathymetric survey
  - Sediment depth probing
  - Sediment volume analysis
- Sediment characterization
  - Sediment sampling plan
  - Laboratory analysis
- Technical Memorandum
- Public meetings
SEDIMENT VOLUME

- **Surveying**
  - Topography (land) and bathymetry (water, top of sediment) completed using sonar and standard survey equipment (GPS, total station)
SEDIMENT DEPTH PROBING

- Probing is done by pushing carbon fiber or aluminum rods to refusal (compacted historic floodplain, clay, gravel, cobble, boulder or bedrock)
- Feel or sound of material can give clues to type
Sediment Depth Probing

- Probe density - 15 cross-sections with additional points in upper pond
- Near the dam, probing was done during contaminant sampling
SEDIMENT DEPTH PROBING

- Probe density - 16 cross-sections with additional points in upper pond
SEDIMENT DEPTH

- Bathymetry and refusal surfaces are compared in AutoCAD

Proposed core sample location

Lake George
SEDIMENT DEPTH
SEDIMENT VOLUME ANALYSIS

- Total Sediment volume = Depth to refusal – top of impounded sediment
- Sediment evacuation volume
  - Assumes rapid drawdown or long term staged drawdown
- Based on hydraulic analysis for various flows up to the 5 year flood (frequent flows)
### Sediment Volume

<table>
<thead>
<tr>
<th>Analysis</th>
<th>L. George</th>
<th>L. Louise</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total volume of impounded sediment</td>
<td>167,000</td>
<td>164,000</td>
<td>331,000</td>
</tr>
<tr>
<td>Expected evacuation volume</td>
<td>74,000</td>
<td>45,000</td>
<td>119,000</td>
</tr>
<tr>
<td>Evac as % of total</td>
<td>44%</td>
<td>27%</td>
<td>36%</td>
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</table>

- **Volumes in Cubic Yards (CY)**
- **Lake George** 80% sand, 20% silt and clay
- **Lake Louise** 65% sand, 35% silt and clay
- Evacuation estimate assumes a 55 ft wide bankfull channel with 3:1 bank slopes
- Most of the deposition since the 2006 study has occurred in the main channel
Contaminant Sampling Locations

Lake George

Contaminant Sampling Locations

Lake George
CONTAMINANT SAMPLING LOCATIONS

Lake Louise
Contaminant Sampling

- Barge mounted vibrocore
- Manual core
### CONTAMINANT RESULTS

- **Parameters tested**

<table>
<thead>
<tr>
<th>Category</th>
<th>Specific Parameters</th>
<th>Laboratory Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals</td>
<td>As, Cd, Cr, Cu, Pb, Ni, Zn Hg</td>
<td>EPA 6010C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EPA 7471B</td>
</tr>
<tr>
<td>Organics</td>
<td>PCBs</td>
<td>EPA 8082A</td>
</tr>
<tr>
<td></td>
<td>PAHs</td>
<td>EPA 8310</td>
</tr>
<tr>
<td></td>
<td>organochlorine pesticides</td>
<td>EPA 8081B</td>
</tr>
<tr>
<td></td>
<td>Oil and Grease</td>
<td>EPA 9071B</td>
</tr>
<tr>
<td>Physical</td>
<td>Particle size (sieve)</td>
<td>ASTM C136-84A</td>
</tr>
<tr>
<td></td>
<td>Percent total organic carbon (TOC)</td>
<td>L-Kahn/9060A</td>
</tr>
</tbody>
</table>

- **PCBs examined only in upper floodplain cores**
- **Organochlorine pesticides/herbicides were tested only in the channel core downstream of the treatment plant**
Definitions

- **Consensus Based Sediment Quality Guidelines** – used by national and state programs in the U.S.

- **Threshold Effects Concentration (TEC)** – Threshold below which effects are unlikely

- **Probable Effects Concentration (PEC)** – Threshold above which effects to biota are probable
CONTAMINANT RESULTS

- Lake George
  - PCBs detected in trace amounts, only one sample slightly exceeded the TEC
  - Trace metals found in channel sediments, but generally below TEC
  - Mercury found above TEC in 3 floodplain cores
  - Four of the PAH compounds tested showed values above the TEC
  - Other PAH compounds were detected but below TEC
CONTAMINANT RESULTS

- **Lake Louise**
  - PCBs were not detected
  - Trace metals found in channel sediments, but generally below TEC (mercury and nickel exceeded TEC at one floodplain site each)
  - Arsenic found above PEC in 1 channel core
  - DDD values above the TEC (LL-C2)
  - Lindane values above the PEC (LL-C2)
  - Ten of the PAH compounds tested showed values above the TEC in site LL-C3, four PAH compounds were above the PEC in site LL-F2A
  - Other PAH compounds were detected but below TEC
SUMMARY

- Sediments have a high percentage of sand content
- Potentially mobile sediment is roughly 40% of the total sediment volume
- Sediment is relatively clean, likely allowing for mechanical removal without special handling
- Some passive release of sediment may be possible
SEDIMENT MANAGEMENT

- In either a dam-in or dam out scenario, mechanical removal would be part of the solution.
- Passive removal amounts may be limited by potential short-term ecological impacts downstream.

Table 3. Costs for active sediment removal, based on a unit cost of $30 per CY.

<table>
<thead>
<tr>
<th>Impoundment</th>
<th>Total Impoundment Volume (CY)</th>
<th>10%</th>
<th>25%</th>
<th>50%</th>
<th>100%</th>
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</thead>
<tbody>
<tr>
<td>Lake George</td>
<td>73,900</td>
<td>$221,700</td>
<td>$554,250</td>
<td>$1,108,500</td>
<td>$2,217,000</td>
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<tr>
<td>Lake Louise</td>
<td>45,100</td>
<td>$135,000</td>
<td>$337,500</td>
<td>$675,000</td>
<td>$1,350,000</td>
</tr>
</tbody>
</table>
THANK YOU

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