



Barr Engineering Company  
332 West Superior Street • Duluth, MN 55802  
Phone: 218-727-5218 • Fax: 218-727-6450

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Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO

September 24, 2007

Mr. Tom Kintzinger, M.D.  
Vice President, Secretary, and Website Administrator, Round Lake Property Owners Association  
PO Box 67  
Hayward, WI 54843

**Re:** Response to Questions Regarding Round Lake Water Levels

Dear Mr. Kintzinger:

The Round Lake Property Owners Association (RLPOA) developed a list of questions related to the Round Lake water levels. The questions were developed to gain a better understanding of the implications of various technical issues presented at recent discussions between Sawyer County and the regulatory agencies. This letter responds to those questions.

The responses to the questions are based upon previous work conducted by Barr Engineering on the Round Lake water levels from 2003-2005. This previous work included hydrologic and hydraulic analyses, and evaluation of the controls for the Round Lake water levels. The questions and responses follow on the attach sheets.

The elevations presented in these responses all correspond to the adjusted local datum as described in *County Highway NN and Round Lake Flood Analysis, January 4, 2005*, and *A Study of the Cause of Shoreline Loss at Hausman Property on Round Lake During 2002/2003, January 4, 2005*. Using this system, the structures are all relative to the same datum and the conversion to local datum is constant.

We appreciate the opportunity to work for the RLPOA. Please feel free to call if you have any questions. I can be reached by phone at 218-529-8224 or by email at [ndent@barr.com](mailto:ndent@barr.com).

Sincerely yours,

A handwritten signature in black ink, appearing to read "Nancy Johnson Dent".

Nancy Johnson Dent, P.E.  
Vice President

**Question 1:** *How low could Round Lake go if The Carlson Dam is officially abandoned and the floor and sill are removed and the culverts are fixed at County Road NN, with 4-48" RCP and flow of at least 150 cfs at elevation 72?*

**Response:** The water levels in Round Lake are impacted by both natural fluctuations in precipitation and the configuration of the outlet structure. Historical data indicates the lake was as low as about elevation 71 (adjusted local datum) in 1935, prior to construction of the existing Carlson Dam. The two sills of the Carlson Dam are currently at about elevation 75.7 (adjusted local datum). The response assumes that the channel width at the dam stays the same as under current conditions with the existing Carlson Dam.

If the existing floor and sill of the Carlson Dam were removed, the "outlet" for Round Lake would be the channel bottom at the location of the removed Carlson Dam. The water levels in Round Lake could be lowered if this outlet channel were to erode.

Based on site observations and probing of the channel bottom downstream of the dam conducted in 2004, the channel bottom is composed of sand and gravel and is very soft in the top 2 feet. Probes were easily pushed through the material in the bottom of the channel. The existing high point in the channel appears to be about 200 feet downstream of the dam, with elevations about 0.5 feet above the sill of the dam.

Erosion of channels occurs when the velocities are at or above 4 feet per second, with severity dependent on the vegetation, soil type and gradation. Preliminary hydraulic modeling results indicate that velocities will range from 3 to 5 feet per second in the channel downstream of Little Round Lake when flows are at 150 cfs with 4 culverts under County Highway NN at elevation 72. Further geotechnical drilling and soil analyses would be required to confirm the depth of likely erosion of the bottom of the channel.

Assuming similar channel bottom and loose soil conditions exist at the location of the Carlson Dam after it is removed; the outlet could erode, especially during high flows. The erosion could lower the channel bottom by about 2 feet, depending on further soil analysis. Mitigation measures such as riprap protection may be required to minimize the erosive potential should the sill and floor of the Carlson Dam be removed.

The water level in Round Lake is highly dependent on the elevation of the Carlson Dam sill or the outlet once the sill and floor are removed. When the water level is above the dam sill or outlet, water will continue to flow out of the lake. Once the water level drops to the level of the outlet, evaporation will continue to lower the lake level unless precipitation occurs to replenish the water. If the channel outlet erodes down 2 feet below the existing sill of the Carlson Dam, the water level in Round Lake would be lower than existing conditions and the low levels would last for longer periods of time. Groundwater also affects the low water levels; however investigations have not been conducted to define the groundwater levels, the inflows and outflows, and the resulting fluctuations.

**Question 2:** *How high could the lake go if after the Carlson Dam abandonment the artificial channel downstream got obstructed at least temporarily with debris and/or beaver activity?*

**Response:** Beaver dams or debris can temporarily block portions of the channel between Little Round Lake and Osprey Lake, raising the Round Lake water levels. Beaver dams were observed in the channel between the Carlson Dam and Osprey Lake during site visits (2003 to 2005), and within the channels in the dam structure. Therefore, this scenario seems likely if routine maintenance of the channel is not conducted, resulting in an increase water level in Round Lake. For example, it was noted in 2003 that beaver dams downstream of Osprey Lake had increased the water level on Osprey Creek by about 2 feet.

The maximum increase in water level as a result of beaver activity is not easily defined, but would likely be based on the number and height of beaver dams between Little Round Lake and Osprey Lake. Based on historic beaver dam activity in the downstream Osprey Creek, it is reasonable to assume that a 2 foot increase in Round Lake water levels could be observed at a beaver dam. Although some low flows may continue through or around the beaver dam, the beaver dam would essentially raise the elevation of the Little Round Lake outlet, increasing both the normal lake level and the flood levels until the beaver dams were removed or potentially washed out during high flows.

**Question 3:** *Could the Regional flood elevation for Osprey Lake be changed if the inflow to Osprey Lake from Little Round is the same as the outflow at the NN culverts (e.g. 150 cfs at both locations or even 125 cfs). This would assume that the beaver dams are removed upstream of County Road NN and the culverts at NN are fixed with 4-48" RCP at elevation 72.*

**Response:** This is a complex question, and responses could focus on several different issues. The issue that will be addressed is whether a modification to the Carlson Dam would impact downstream flood levels if the capacity of the County Highway NN culverts were increased so that it had the same capacity as the Carlson Dam.

Wisconsin State law does not allow any increase in the flood level of downstream water bodies, defined as an increase of 0.01 feet or more. The impact to downstream water bodies would need to be defined through detailed analysis of all downstream reaches potentially impacted, likely to the Chippewa River. This analysis was not conducted as part of previous studies. The applicability of this law to structures that do not comply with state-designated levels is outside of my area of expertise - you would need to talk to a lawyer about those issues.

There are 2 things that would have to be considered if the outlet from Round Lake were enlarged and the new structure were required to meet the WI state law of no downstream flood increases (defined as 0.01 feet):

- 1) The outlet from Osprey Lake is comprised of a long section of Osprey Creek and the culverts at NN. Increasing the capacity of the culverts at NN would help relieve any increased flows from Round Lake, but the Osprey Creek capacity may also have to be enlarged, since it also may control the Osprey Lake flood level. The control of the Osprey Lake level will likely be Osprey Creek once the new culverts are installed.
- 2) The downstream channel to the Chippewa River would also have to be analyzed with a hydrologic and hydraulic analysis to determine if there is any increase in the downstream river as a result of the larger outlets from Round Lake and Highway NN.

Further analysis would have to be done to determine whether or not an increase of 0.01 feet would occur. As you can imagine, it does not take much flow to result in an 0.01 foot increase in flood level. Therefore, it would only be speculation as to whether or not a larger outlet from Round Lake would or would not result in an 0.01 foot increase in any of the downstream flood levels.

**Question 4:** *What is the projected 100-year flood level with a new 40' wide dam, 40' channel, elevations to be established and dredged, Beaver dam removal up stream of NN, 4-48" culverts at NN to handle 150 cfs at elevation 72?*

**Response:** For this response, the 100-year flood level (Regional Flood Elevation) flows are assumed to be 150 cfs (as stated in the question). The hydraulics model indicates an existing flood level for Round Lake at elevation 79.3 (adjusted local datum) during outflows of 150 cfs.

For the configuration proposed in the question, the flood level during 150 cfs outflow would drop about 3 foot below the flood level under existing outlet conditions to elevation 76.75 (adjusted local datum, the maximum water level specified in PSC Order).