Safety concern at Milliken Dam

John Stephens and Chris Malan, Napa Valley Register, 11-28-09

Letter to the editor

While researching the possibility of restoring stream flows and fish habitats on Milliken Creek, we found a serious safety issue for people who are living downstream of Milliken Dam. We found that the 110-foot high Milliken Dam, which was built in 1924, should be reassessed for seismic safety.

The Green Valley Fault runs just one mile from the dam site and is capable of producing a 6.5 earthquake. The state of California Division of Dams and Safety found that Milliken Dam at full capacity "would be overstressed by seismic loads associated with the maximum credible earthquake." Stress fractures and cracks in the face of the dam have become problematic. If an earthquake magnitude of 6.5 occurs, dam failure could occur.

The California Division of Dams and Safety ordered the city to lower the level in May of 2001. The city submitted a detailed analysis showing that "acceptable dam stresses" could be achieved with a lowered reservoir storage elevation at 907 feet, 16 feet below the crest, and still hold 1,390 acre-feet of water. After four years of engineering studies and no public reviews, four 18-inch holes and one 24-inch hole were drilled at elevation 907 to maintain the mandated level of water at the dam face.

Our concern is that the level is not constant, especially in winter. The engineers said the holes could not keep up with the inflows 6.3 percent of the time (over the entire year) and sometimes the reservoir will even top the dam.

Let's get real. It only rains in the winter, about four months of the year. So if it is 6.3 percent over a 12-month period that the holes cannot keep up with the watershed flows, then realistically this 6.3 percent becomes a whopping 19 percent part of the time, exceeding the holes' capability to reduce water surface elevations at the dam face. Almost 20 percent of the time during the wettest months of the year the dam is subject to failure should an earthquake occur on the nearby fault.

It is under these conditions that the dam is most at risk. The holes create a perforation line where a "zone of failure" is likely to occur in the event of an earthquake. It's like tearing a piece of paper off a tablet along the perforated line. It is easy because of the row of holes. The engineers did not look at this as a new area of weakness in the dam. They also did not consider if the water were shooting out of the holes, dropping onto its base and weakening it during an earthquake.

The concrete's compressive strength was tested in 1969 and found to be an acceptable 3,290 psi. Numerous "horizontal through structure cracks" developed in 1924 and some spalling can be observed on the face of the dam. The cracks have created seven loose blocks sitting on top of each other. Several of the upper blocks above the horizontal cracks have been offset (pushed out by the force of the water). In September 1990 the Static Structural Stability Evaluation Report for the Division of Dams and Safety said, "In all cases, the upper concrete block is further downstream than the lower concrete block ... the upstream edges of the open joints were filled with silt." Napa city engineers concluded that the structure will not collapse because of the load and the arch shape of the dam.

It is the upper part of the structure that we are most concerned about because of the inherent design fault brought about by drilling the holes.

During winter the Napa City Water Department plans to manually open the 36-inch outlet drain to attempt to keep the water level below elevation 907. However, we were told by a city engineer that the intake tower will collapse in a 6.5 earthquake. If the outlet drain is opened up at the bottom of the reservoir after an earthquake, rubble concrete and rocks from the collapsed intake tower will inevitably plug up the 36-inch outlet drain, rendering it useless.

We need an analysis of the dam in a worst-case winter time earthquake scenario, including a peer review for possible design flaws, rather than mere engineering computations of dead and dynamic load and assumptions of acceptable risk. This has gone beyond fish restoration and is a human safety issue.

This is not the Napa city engineer's call. It is the Napa citizens' call whether this is an acceptable risk to life and property. It is not worth proving once again Murphy's Law that what can go wrong, will go wrong.