REITZ & JENS, INC.
CONSULTING ENGINEERS

1055 corporate square drive
st. louis, mo 63132
phone: 314.993.4132
fax: 314.993.4177
www.reitzjens.com

MEMORANDUM

To: Janet Hirsch, Clarue Martin, Rich Hirsch

From: Jeff Bertel, P.E.

Subject: Lake Tishomingo Site Visit and Slope Monitoring

Date: June 11, 2019

At your request Stacy Bonderer and I made a site visit on June 7, 2019, to observe a reported bulge in the downstream slope of the Lake Tishomingo Dam. Your mowing company noticed the change and placed flags outlining the area they believe had bulged or moved and become steeper. The flags were placed on the steeper and upper dam fill section. The flags were placed in an upper and lower line that ran from approximately the siphon and to an old slide. The upper line was a few feet downslope from the downstream shoulder, and the lower line was near the downstream slope break. The approximate area inside the flags is shaded in yellow in the aerial below.

We walked the area and did not observe signs of seepage, cracking or a defined head or toe scarp. The downstream slope was built with a somewhat uneven surface, but it appears possible that some movement may have occurred in this upper section at some point in time. We flagged two areas during our visit that are most noticeable as potential locations for head or toe scarps.

It was not possible to definitively say whether movement has occurred by visual observation only. If slope movement was occurring in the areas defined by the flagging it appears to be a relatively shallow slide mass confined to the upper steeper portion of the dam. Due to its position high on the dam and without any observed seepage, it appears that this type of failure would be driven by recent rainfall saturating the soil on the downstream slope.

Reitz & Jens used existing historical data to model the slope to see how critical this potential and assumed slope failure is to the overall stability of the dam. Based on this analysis it does not appear that further movement would immediately cause catastrophic failure; however, if a slide is identified then corrective measures should be implemented as soon as possible.

We recommend visually monitoring the downstream slope routinely and after rain events to see if additional movement is occurring. The two areas flagged during our site visit should receive particular attention. If signs of movement, cracking or seepage are observed then you should notify us immediately for further action.

Longer-term monitoring alternatives could include inclinometers or survey monuments. Long-term monitoring could be conducted monthly initially, with the frequency adjusted based on the observed movement.

Inclinometers are the preferred alternative. These are a vertical PVC casing that is used in conjunction with a probe to monitor soil movement with depth. We would recommend 2 to 4 inclinometers spaced evenly and near the center of the shaded area. We estimate the cost to install 3 inclinometers as approximately $13,500. This cost includes time to cut benches into the downstream slope for inclinometer installation and to regrade and seed the slope after installation. An additional cost of approximately $850 per trip would be required for monitoring.

Survey monuments are an additional alternative which would involve multiple metal and concrete monuments placed in and around the shaded area that are monitored with precise survey measurements over time. The monuments should be robust so that they aren't disturbed by mowers and with tip depths below the frost line (approximately 30 inches). We approximated the cost to install monuments as $5,000 to $10,000, with a recurring cost for monitoring of approximately $800. We recommend working with a local surveyor to develop a better cost estimate or bid. We can develop a monument layout at your request.

Please contact me to discuss these recommendations and to let me know how you wish to proceed.

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