LAKE LEVEL CONTROL PROCEDURE

FOR

LAKE LEELANAU

Revision 2, 10/03/2024

(D R A F T)

Level Control

a. The lake level shall be maintained at the lower part of the Court Order levels to provide a 'cushion' for significant rain events. The court ordered levels are specified in Attachment 2 item c.

b. The dam shall be operated in the automatic mode unless a significant weather event occurs. A significant weather event is defined as a precipitation and/or snow-melt event equivalent to more than 3.2 inches of precipitation in 24 hours.

c. The water level sensors should be checked daily, and action taken as necessary to maintain the proper water level. If there is a significant precipitation event forecasted by the National Weather Service, the water levels shall be monitored every 2 hours to assure level control is timely.

d. If a significant precipitation event, rapid ice melt or a flood advisory occurs, immediate action should be taken to lower the dam gate to increase lake storage capacity below the required lake level to prevent property and shoreline damage. If the lake levels continue rising with the gate fully open, boards on the secondary spillway should be pulled to accelerate the reduction in lake levels. It is noted that there are limitations to how quickly the lake levels can be adjusted after significant precipitation or snow-melt events. See Attachment 1 for adjustment details for the dam gate and secondary spillway.

Operational Checks

e. On a periodic basis, the dam gate shall be adjusted to the full upright position and all sensors shall be checked and compared to the visually-read staff gauges at each location. If needed the sensors shall be recalibrated to correlate with the staff gauges.

f. The dam operator shall log the water levels at the dam and the Narrows, approximately weekly, when checking lake levels and dam operations. The staff gauges and bubble gauge shall be used for these readings. The hard copy of the readings shall be kept in the dam control room.

g. The standby backup power generator shall be functionally tested semi-annually and a record logged verifying this action.

h. All questions, phone calls, and communications regarding lake level concerns, should be directed to the Facilities Manager or designee.

Attachment 1

Response to Weather Conditions

Climate Condition	***Events***	***Response***
Normal	< 1" rain in 24 hrs	Operate Auto
Rain event/snow melt (minor)	1-3.2" per 24hrs	Operate Auto Increased monitoring
Rain event/snow melt/ flood warning (major)	3.2 -4.5" per 24hrs	Manual Operation
Large Rain Event (historic)	4.5" ++ per 24hrs	Manual Operation and Pull boards if Necessary

Attachment 2

Historical Information and Basis

a. On February 14, 1978, the Board of Commissioners adopted a resolution requesting the proper level of the waters of Lake Leelanau. In their resolution they deemed it to do this "...for the purpose of maintaining and promoting the public health, welfare and safety, the conservation of the natural resources of said county and state, and to preserve property values around Lake Leelanau."

b. Circuit Court order October 1978 established a lake level, and also established a special assessment district.

c. The Court ordered "...that a level of 589.21 feet 'Mean Sea Level Datum', with a maximum fluctuation of plus 0 inches and minus 2 inches, shall be maintained from April 15 of each year or at ice break-up on said lake, whichever occurs later, until November 15 of each year; on November 15 of each year said lake level shall be reduced to 588.21 feet 'Mean Sea Level Datum' until the following April 15 or ice break-up, whichever occurs later at which time it shall be increased to the previous above stated level until further Order of this Court. These levels shall be maintained at the site of the dam located in the Village of Leland, County of Leelanau, and State of Michigan."

d. On December 11, 1997 the Department of Environmental Quality issued a letter stating that the design discharge for the dam is for a 200 yr. flood with a discharge of 1200 cubic feet per second. *(This was in a letter to Otwell Mawby engineer consultant hired by the County. This is the basis for the design of the dam.)*

e. *The Leland Dam Authority was created by the County Board of Commissioners per Resolution #2004-007. (The powers and duties of a dam authority are defined in Part 307 of NREPA-MCL, 324.30701).*

f. The Leland Dam Authority has the responsibility for the maintenance of the lake level and the dam.

g. After months of legal concerns about property, ownership, and easements, a new dam was constructed 2005-2006 under the auspices of the Dam Authority.

h. In letter dated 2/18/2005 from Thomas Prehoda *(the design engineer of dam)* it states that both hydraulic rams would be necessary to lift the gate during flood conditions.

i. The staff gauge mounted on the south concrete abutment was surveyed on 5/4/2017 by transit-level-loop from the US Corp. Eng. Disc on break wall, and also was surveyed by GPS the same day. The top of the gauge is 589.98' and 589.92' respectively, NGVD29. These are the levels and datum to use.

j. There are three (3) electronic water level sensors that provide readouts...at the dam, the narrows, and at Birch Point. They were purchased by the Lake Association and given to the County in 2016. These sensors are used as a tool to help provide real-time information, and can be accessed on-line. *(The graph readouts have full historical information since installation).*

k. Due to questions about the northern part of the lake, a stake was set and surveyed at Suelzer Park on the north end of the lake. Readings were taken over the course of several months and compared to the Narrows and Birch Point. It turns out that the lake waters are essentially level within an inch or so at any time during calm, normal, conditions.

   A measurable hydraulic gradient can occur between the south lake, Narrows, north lake and the dam due to frictional forces in the Leland River and when water flow over the dam is increased in response to high water levels.

l. The cross section at the M-204 bridge, and the Narrows itself, is several times the cross section at the dam, and there is less flow impediment at those locations.

The flow at the Narrows is less than 1 ft/sec and per hydraulic calculations, is considered 'flat' during normal conditions.

m. The dam gate should be in the full upright position for 45 minutes to let the river level stabilize, for an exact Court Order reading of lake water level at the dam.