

**Antrim County Operator of Dams**  
P.O. Box 217, Bellaire, MI 49615

Mr. Ed Boetcher  
Chair, Antrim County Board of Commissioners  
Bellaire, Michigan

March 6, 2019

Dear Commissioner Boetcher,

Please accept the following Annual Report of the Drain Commissioner and Operator of Dams for 2018.

**Annual Report of the Antrim County Operator of Dams for 2018**

**a) Elk Rapids Hydroelectric Facility**

The County share of electrical generation revenues in 2018 was \$19,357 (10% of total sales of \$193,357), a slight decrease from \$21,138 in 2017, due to less annual precipitation that results in a lower total volume of water flowing through the dam over the course of the year. Interestingly, the highest rate of generation at the Hydro since the Stockhausens began operating the dam in 2007 occurred in the spring of 2017. However, a couple of months later in July, the flow had dropped so dramatically that they had to shut down the generators for several days in order to maintain the court ordered lake level on Elk Lake—also the first time that happened since 2007. So, we experienced extremes of high flow and low flow in the same year—a direct result of the extremes we are currently experiencing in our weather.

Following the 2017 renovation of the interior, in early spring of 2018 the County replaced all the exterior glass of the hydro building. The project cost about \$10,000 and dramatically improved the quality of natural lighting inside the structure. Much of the old caulking was severely compromised and panes were leaking water during rainstorms, and many of the panes were actually old Plexiglas and severely discolored. Despite driving rains last summer, no water leaked through the new caulking. The glass replacement also upgraded the appearance of the building and drew praise from local residents.

After the completion of the interior renovation, the Stockhausens focused on the reorganization of the interior space and dedicated several weeks of work on clean up. During this time, they discovered tears in the roofing membrane of the building. The County subsequently hired the services of Springfield Construction to perform the repair for the amount of \$1,790. During the repair, Springfield personnel determined that the current membrane has exceeded its useful lifetime and is in need of replacement. They recommend replacement of the membrane as soon as practical. Upon request they provided an estimate of \$36,493. This work will have to be done at some point in the next couple of years, when it is, we will need to add the installation of a Bilco roof hatch to the project, since the current method of ascending to the roof by external ladder is unnecessarily dangerous during certain weather conditions.

The Stockhausens also continue to be intensively involved in an effort to lobby the Michigan Legislature and the Michigan Public Services Commission on gaining fair rates for electricity sales to Consumers Energy. Elk Rapids Hydroelectric is a member of a coalition of several renewable energy producers that includes methane capture facilities, waste incinerators, wind farms, and other small hydro producers. Bill Stockhausen reports that they have made progress and hope to finalize an agreement in the near future. If the coalition does not succeed in getting fair rates from the MPSC, their next avenue of recourse is the Circuit Court, and then to FERC.

In December, the Operator of Dams appeared at the Elk Skegemog Lake Association (ESLA) Board Meeting to discuss the hydrology study (see below). During the meeting, the grounds of the hydro dam came up in the discussion. All the members present expressed support for the replacement of the fencing around the upper raceway and a general upgrade to the grounds. It was also suggested that the County install an informational display about the dam, its history and the Elk River watershed as part of the upgrade. ESLA may be willing to contribute to such a project.

The Operator of Dams also appeared before the Elk Rapids Harbor Commission last spring. Harbor Commission members expressed similar comments as heard at the ESLA meeting. After discussion about the inherent integral relationship between the Harbor campus, Dam Beach site, and the County Dam (which sits in between), the Harbor Commission directed the Harbormaster to meet with the Operator of Dams and discuss opportunities to integrate the sites to improve the public use of the facilities. The Operator of Dams subsequently met with the Harbormaster and they shared ideas about improvements to the grounds around the dam. The Harbormaster was very enthusiastic.

A critical requirement of the County's Federal Energy Regulatory Commission (FERC) license (under which the County operates the hydro) is to continue to provide recreational, historical and cultural amenities in and around our project boundary. With the County's goodwill with the Elk Rapids community at such a highpoint, and the clear support of local partners, this is an excellent time to upgrade the dam site. The Operator of Dams also believes the local community is willing to help fund the improvements.

### **b) Intermediate Lake Dam in Bellaire**

Last year Intermediate Lake reached its peak elevation of 2018 on May 6th—608.7 feet above sea level—several inches higher than the highest elevation of 2017 (608.5) in the previous November. Once again, as disturbing as the high water in Intermediate Lake was, the lakes further up the Chain, especially Ellsworth Lake, Lake St. Clair and Six Mile Lake reached flood stage, again overtopping the road crossing at Ellsworth. During this time—as is always true during threats of high water—all the gates of the Intermediate Dam were wide open.

Residents of the Upper Antrim Chain showed up at meetings, voiced their concerns, and requested action from the County. In order to clarify the extent of the County's obligations, County Commissioners sought legal advice from their civil counsel. During the summer, the Board held a closed session meeting to determine the County's legal responsibility in regard to high water levels. Subsequently, the County issued a written statement titled "Intermediate Lake Water Levels and the Operation of the Bellaire Dam—Important Facts to Know" (see attached). The statement was authored by the Operator of Dams, and edited by the County Administrator and the County's civil counsel.

During this time, the Operator of Dams was actively engaging with the concerned residents, fielding phone calls, attending meetings, and enlisting professional advice. The Dams department sponsored a special meeting with several dam and hydrology experts, along with several County commissioners and concerned residents. The meeting featured Mr. James Pawloski (DEQ Dams Division Supervisor), Mr. James Coughlin (Certified Dam Safety Engineer), and Dr. Anthony Kendall (MSU Hydrology Lab). At the meeting, the experts agreed that the flooding episodes appeared to be due to changing weather patterns in the region—high volume rainfall episodes of short duration were becoming more frequent—complicated by sedimentation. It was also agreed that a hydrological study of the Antrim Chain of Lakes would be useful to determine what, if any, remedies may be available to reduce flooding.

In response to this meeting, the newly formed Lake Level Committee of the Intermediate Lake Association took responsibility for initiating a hydrology study of the entire Antrim Chain of Lakes. The group developed a Request for Proposal (RFP), with the input of the Operator of Dams, advertising and distributing the RFP among professional groups. By the deadline for submissions in January of 2019, the committee had received four proposals, which are now under review. Responding to a request by the Lake Level Committee, the BOC voted to authorize the Operator of Dams to work directly with the Lake Level Committee and participate as a co-investigator in the planned study.

Since the RFP was distributed, the Operator of Dams has been in contact with the U.S. Army Corps of Engineers about a couple of different programs the Corps operates for flood prevention planning. These programs offer great potential and the initial impression is that the County is well positioned to be accepted into the program. In order to be successfully admitted into the program, the County may need to act quickly at certain stages in the process and it would improve the County's chances if the BOC had a preliminary discussion with the Operator of Dams as soon as possible.

After the closed session meeting in early August, the Intermediate Lake Association (ILA) held a general meeting of the membership for the sole purpose of hearing a presentation by

the Operator of Dams and follow up Q and A. By all accounts the participants found the meeting productive and informative.

The Operator of Dams took the opportunity of the ILA meeting to announce a change in protocol at the Bellaire Dam: in order to improve the holding capacity of Intermediate Lake in the case of heavy rains during the fall months and reduce the peak level of any possible flood conditions, all the gates at the Bellaire Dam would be opened by October 1 in hopes that the level of Intermediate Lake would reach the winter level of 606.54 by November 1. This was a decision taken only after wide consultation and the approval of the Buildings, Lands, and Infrastructure Committee, and within the discretionary guidelines of the circuit court order for the Intermediate Lake level.

The DEQ requires safety inspections of all dams in Michigan every three years. In 2018, the County hired Mr. James Coughlin, a certified dam safety engineer, to perform the customary inspection. (The report was submitted to the BOC last month.) The report praises Antrim County's upkeep and operation of the dam. Nevertheless, elements of the dam are in need of repair. Notably, gate seals need replacing and some older concrete surfaces need repair. The Operator of Dams anticipates that the work should amount in the \$5000 to \$7000 range, and recommends the work be completed in 2019.

### **c) Recommended Action Items for 2019**

- Authorize the BOC Chair to sign a letter of interest to the US Corps of Engineers in order to begin the process of applying for a Corps program to undertake a hydrology study on the Antrim Chain of Lakes. In addition, while we are actively searching for grants and outside funding for the hydrology study, the County should have a discussion about how much funding it is willing to apply to the project. This is important due to the fact that the timing for the project could accelerate soon.

- Authorize up to \$7,000 for repairs to the Bellaire Dam in 2019 per the recommendations of the Bellaire Dam Inspection Report of 2018.

- Place the roof replacement and grounds improvement of the hydroelectric dam on the Capital Projects list for 2020.

### **Annual Report of the Antrim County Drain Commissioner for 2017**

The sole County Drain under the Drain Commissioner's authority is the outlet from Birch Lake in Elk Rapids Township that drains into Grand Traverse Bay. Contacts with the Birch Lake Association have expressed their satisfaction with the Timberlake Dr. outlet culvert replaced in 2016.

Respectively submitted,



Mark Stone  
Antrim County Operator of Dams  
Antrim County Drain Commissioner

# INTERMEDIATE LAKE WATER LEVELS and the OPERATION OF THE BELLAIRE DAM

## Important Facts to Know

- In 1974, Antrim County acquired the Bellaire Dam for \$1 from the City of Charlevoix. The old hydroelectric plant located at Bridge Street in Bellaire was condemned and demolished in 1973, however the overflow structure was preserved and new gates added to increase capacity. The former overflow structure became the new Bellaire Dam.
- In 1990, after 17 years of litigation and debate, the Circuit Court issued a final ruling that the level of Intermediate Lake be maintained at 606.54 from November 1<sup>st</sup> to spring ice break up, but no later than May 15<sup>th</sup>—what we refer to as winter level. A level of 607.15 feet above sea level is to be maintained at all other times, what we refer to as summer level.
- As the owner of the Bellaire Dam, Antrim County is obligated to maintain the lake level in accordance with the court order. Since 2012, the Operator of Dams is the County official assigned the job to operate and maintain the Bellaire Dam on behalf of Antrim County. (The County Drain Commissioner position does not include any duties related to the dam. However, the current Operator of Dams, Mark Stone, also happens to hold the position of Drain Commissioner, which may cause some confusion about these two distinct jobs.)
- The court order establishing the lake levels applies only to Intermediate Lake. It is not applicable to any other body of water.
- It is physically impossible to lower or raise the water level by 7.3 inches from one day to the next in order to remain in compliance with the court order. However, in its Order, the Court recognized and acknowledged the limitations placed upon the Dam Operator to control the lake levels through operation of the Bellaire Dam due to the inability to control the rate of flow through the Upper Chain of Lakes, caused by rainfall and/or snow melt.
- Ordinarily, we don't have to take any action in the spring to raise the lake level to summer level, because nature does it for us in the form of melting snow and early spring rains. Typically, all the gates are open for the entire winter, the spring runoff drives up the water level while the gates remain open, and when the spring runoff has made its way out of the system and the level falls, we start closing gates in late spring. This spring we closed our first gate on May 29<sup>th</sup>, 2018.
- In the fall, we have ordinarily begun to draw the water down in mid-October and try to reach winter level by mid-November, so the middle of the drawdown corresponds to

November 1<sup>st</sup>. However, high water events in the fall in recent years have caused us to start the drawdown process earlier, and we now begin to open gates in the first week of October.

- In its summary of testimony and evidence, the 1990 court order acknowledges that the location of the Bellaire Dam—over a mile downstream from Intermediate Lake and below the confluence with the Cedar River—makes it difficult, if not impossible for the dam operator to quickly lower the water level at Intermediate Lake in response to rain events. So, during the summer months, it is common for Intermediate Lake to rise abruptly after rain, and then it may take several days or even weeks for the water to drop back down to summer level.
- On the flip side, it is possible to keep a minimum lake level on Intermediate Lake by operation of the dam. So, in the summer months, the Intermediate Lake level rarely falls much below the court ordered level of 607.15.
- The court order also acknowledges the natural flood potential in the lake basin. Steep terrain around Intermediate Lake combined with a heavy rainstorm will result in the quick accumulation of storm water in the lake, especially when the ground is already wet. Depending on how much snow has accumulated over the winter, melting snow in the early spring can cause the same problem, and is often combined with rain, which makes matters worse.
- Since 1997, when the current dam operator began in the position, the gates at the Bellaire Dam have been wide open whenever the level of Intermediate Lake was 5 or more inches above the summer level of 607.15—regardless of the time of year.
- During a flood event, with all the gates open, the Bellaire Dam does not restrict the flow or volume of the Intermediate River. The limiting factor of the rate of drainage of water from Intermediate Lake is the length, shape, depth and change in elevation of the Intermediate River above the Bellaire Dam.
- The elevation of the 100-year flood plain on Intermediate Lake is 609.1 feet above sea level (about 2 feet above summer level). The highest recorded level on Intermediate Lake occurred in 1963 and it rose to 609.55—5 inches above the 100-year flood plain.
- In the period of 2013 to present (the last five years), the lake level of Intermediate Lake has exceeded 608.5 feet above sea level during five different flooding events. In November of 2013, the lake elevation reached 608.82, and the following spring reached 608.9 on April 17, 2014—just a couple inches shy of the 100-year flood plain. In the fall of 2014 and again in the fall of 2017, the level reached over 608.5. Just this last spring, Intermediate Lake reached above 608.7 on May 6<sup>th</sup>, 2018. During all these events, flooding was widespread in the Antrim Chain of Lakes and the Northwest Michigan region.

- The widespread flooding of recent years in Northwest Michigan is due to an increase in extreme rainfall events. According to the National Climate Assessment (NCA), the amount of rain falling in heavy downpours—rainstorms at the top 1 percent of intensity—has increased by 37 percent in the Midwest region. (A 1 percent rainstorm is roughly the amount of rain that would cause a 100-year flood—about 5–6 inches of rain in a 24 hour period for our region, and somewhat less for certain lakes in the Antrim Chain.) The NCA study is based on data from the period of 1958–2012, but the majority of the increase has happened since 1991. Note that our flooding patterns in the Antrim Chain are increasing in frequency since 2012 (after the data period in the NCA study), so the increase in heavy downpours appears to be escalating. Our local climate is changing.
- The historical data suggests that the current 100-year floodplain may have to be revised. In the opinion of the Dam Operator, it is advisable that, if possible, homeowners should site the elevation of any new building well above the 100-year floodplain—even as much as an entire foot or two above the 100-year floodplain.
- Below is a list of 100-year flood plain elevations for the Antrim Chain as determined by the Michigan Department of Environmental Quality (MDEQ):

Scotts Lake.....	624
Six Mile Lake.....	612
St. Clair Lake .....	612
Ellsworth Lake .....	611.0
Wilson Lake .....	611.0
Benway Lake .....	610.4
Hanley Lake .....	609.7
Intermediate Lake .....	609.1
Lake Bellaire .....	593.0
Clam Lake.....	591.5
Torch Lake .....	590.6
Lake Skegemog.....	589.88
Elk Lake .....	589.88
Lake Michigan .....	584.6

Note that this list is a simple way to determine the relative elevations of the lakes in the Antrim Chain.

- Fluctuating water levels are a natural part of the Antrim Chain of Lakes ecosystem and the remaining natural shoreline of Intermediate Lake is the only type of shoreline that showed virtually no damage as a result of flooding events. This is true for all the lakes of the Antrim Chain. Lake shorelines are, by definition, one of the most dynamic ecosystems in nature. Structures which are built or installed adjacent to the shore of the lake, or within the 100-year floodplain, such as docks, decks, seawalls, lawns, landscaping, etc., are, by definition, temporary—the dynamic forces of the shoreline will eventually damage and break them down.

- Based on field observations and consultation with engineers at the DEQ Dam Safety Division and our consulting engineer retained by the County, the Operator of Dams believes that sediment buildup in the Intermediate River partially obstructs the flow of the river and therefore reduces the capability of the river to lower Intermediate Lake. The remedy of dredging to clear the sediment is too expensive to be a cost effective solution to the problem. As a result, the Dams Department continues to explore alternatives such as the large woody debris technique currently being tested and evaluated in the Grass River.
- It is important to note that the sediment blockage is only a problem during normal water levels. When flooding occurs, the Intermediate River rises as the lake rises, and the area in the river blocked by the sediment becomes a tiny fraction of the capacity of the river's flow. So, dredging will not solve the flooding problem.

~ Prepared by Mark Stone, Antrim County Operator of Dams, September, 2018

Revised January, 2019