

Elevation and Bathymetric survey measurements around Burden Lake.

by Larry McKeough

in conjunction with The Burden Lake Preservation Cooperation





These photos show the location of the “PIN”, an iron bolt, that in 1863 was pounded into a hole drilled in a rock, on what is now the northeastern shore of the First Lake, set at an elevation of 629.68’. This pin was installed to protect the farmers’ fields from being overflowed by the Wynantskill Association any higher than this pin. This pin was set 8’ higher than the original 1830 pin which had been installed in another rock on the shore of Martin’s Lake on Bristol’s farm. (now somewhere 6’ under water in the Third Lake)

This pin marks the highwater mark of all three Burden Lakes and represents the extent of the property currently owned by the Burden Lake Preservation Corp., which owns the bottoms of the lakes up to the high-water mark, as well as the property around the dam system.

This “Pin” was the first thing Jim & I identified and recorded the elevation measurements. This enabled us to memorialize the other elevation measurements around Burden Lake presented in this book.

I would like to acknowledge and thank my brother Jim, without his help, none of this could have been accomplished!

The following elevation measurements were taken by Jim McKeough and myself on 2/12/2022. We took the Bathymetric measurements of Burden Lake (for the first time ever as far as we know) in June and July 2022 which will appear later in this book. My hope is that this booklet will be used as a reference in the future when questions arise.

These elevation measurements were initially taken because of the pending development of Totem Lodge on the Third Lake and the BLCA and BLPC's need to prove they owned up to the high-water mark, and owned Parcel A of the Woods Development. These measurements and research were instrumental in negotiating with American Land & Lakes, the owner of the Woods. The elevation readings were expanded to other areas of all three lakes to assist in the anticipated reconstruction of the Dam System, replacement of the culvert at Kay's, and the new pending easement for the golf course, among other things.

On 2-12-22 we used GPS technology to record the various locations around the lake including the ice surface level of all three lakes. We used sophisticated GPS equipment loaned to us by CPL Engineering: Leica Geosystems GS14 GNSS RTK Base & Rover Receiver Set w/ CS15 Field Controller, Coordinate System (Horizontal), NAD83 (North American Declination) New York State Planes, East Zone, US Foot (NY83-EF), Datum (Vertical), NAVD88 (which connected to 10 or 12 satellites) It was a clear cold day on the Lake.

Below are my observations, then a list of all the places we took elevation readings. Finally, enclosed are numerous field sketches of structures and areas around the Lake showing their elevations.

These elevation readings, maps & drawings help us to understand numerous topics that keep coming up today, like:

- Understanding that the "PIN", an iron bolt in a rock installed in 1863 on the northeastern shore of the First Lake, is the high-water marker for all three lakes. It identifies the extent of the lands under the lake now owned by the Burden Lake Preservation Corp.
- How the weir controls the lake levels.
- How they raised the lake to the high-water mark when they needed to store more water.
- Understanding the issues with the DAM under Burden Lake Road
- Understanding that the water in all 3 lakes is at the exact same elevation ¹ (Pascal's law of physics)
- The cap stones on the weir set the "normal" level of the lakes.
- Understanding that even with our current temporary repair with sandbags atop the Weir, the Dam System is still working perfectly.
- Understanding that there is no question that years ago the lake flowed out over Parcel A to the Valatie Kill.
- How the water feeds by gravity to the golf course irrigation pond.
- Understanding that the culvert pipe under Totem Lodge Road should be lowered to eliminate the ponding water.
- Understanding the difference in elevation of the two Dyke roads, more specifically the difference in the lakebed under each one. This helped us when Sand Lake replaced the culvert pipe under the 2nd Dyke Road.

The high-water mark is set at 24" above the top of the capstones on the Weir. On 2/12/2022, the high-water mark (same elevation as the iron bolt) was 22" above the level of the ice on all 3 lakes which means the water was 2" higher than the Weir when it froze, and indeed there was 2" of ice on top of the capstones on the Weir. If you were to set up a laser level 22" above the ice on that day and shoot the shore, you would see exactly where the high-water mark is on all properties around all three lakes.

¹ Providing there hasn't been a large rain fall recently. Large rainfalls can make the First & Second Lakes temporarily slightly higher or lower than the Third Lake while the lakes seek their equilibrium.

Observations:

The Weir (Sketch #1) is operating perfectly, and as designed. The top of the cap stones on the weir are set at 627.6' (+/-) above sea level. These cap stones set the "normal" level of all 3 lakes which is basically 627.8' above sea level. (.2' or 2.4" higher because there is almost always at least some water coming down the Wynantskill flowing over the top of the Weir, and this raises the water in the lake slightly) The old iron hinges used to hold & raise the boards when they wanted to completely fill the lakes top off at 629.68 feet above sea level. In the old days these boards were used to raise the lakes to the highest level possible. We call this the high-water mark, and it matches the PIN (iron bolt) in the rock on the 1st lake perfectly which is 629.68' above sea level (based on this datum.) Currently, most of the capstones have been washed off the top of the Weir and are temporarily replaced with sandbags set at the original elevation. See *The Burden Lake Dam System 1831-2024* by the same author for more details.

The Dam (Sketch #2) on Burden Lake Road - the road surface is superelevated towards the east side. The high side (lake side) is 634.6' above sea level and the low side (west side) is 633.2' above sea level. Currently, the road on the dam is closed to traffic while engineers assess the integrity of the dam and we await the status of a 2.4 million dollar FEMA Hazard Mitigation Grant applied for in 2021. See *The Burden Lake Dam System 1831-2024* by the same author for more details.

The bridge on 1st Dyke Road (Sketch #3) - The road surface is 633.77' above sea level. The lakebed under the bridge (invert elevation) is 623.35' above sea level. Right now there is a 36" clearance (freeboard) under the bridge as measured from the water up to the bridge I beam. From the I beam to the lakebed is 125".

The culvert in the 2nd Dyke Road (Sketch #4) - the road surface is 634.31' above sea level. The top of the culvert is set at 632.13 above sea level. The lakebed in the bottom of the culvert is 626.54' above sea level. The culvert is a 6' (now egg shaped) culvert and there is 67" from the gravel in the bottom of the culvert to inside top of the culvert. This culvert was replaced in 2022 with a modular concrete structure which was supposedly set to the same elevations as the culvert pipe it replaced.

In comparing the bridge on the 1st Dyke to the culvert in the 2nd Dyke you'll see that the bottom of the lake (lakebed) is 3.19' higher under the culvert as compared to the bridge. This means if the dam failed, most likely we would lose most of the water in the 1st Lake and a significant portion of the 2nd. Lake. In the short term, the lowest the 3rd lake could be is 626.54' above sea level (the bottom of the culvert pipe), or drop about 1.5'. (this is assuming the dykes are constructed to act as dams). Over the long term, the watershed around the lakes could not support the historic levels of the lakes and without the water from the Wynantskill, eventually they would continue to recede.

A major part of the runoff from Cayuga Court, the new cul-de-sac road at the Woods, (**Sketch #5**) is ponding on Parcel A. The ice there is at 624' above sea level. That's 3.8' lower than "normal level" of Burden Lake and 5.8' lower than the high water mark. There's no question that when they first filled the Lake to capacity (629.68' above sea level) in 1865 that the water was leaking out of Burden Lake thru Parcel A and flowing down the Valatie Kill Creek. The culvert pipe running under Totem Lodge Road today is set at 623.3' above sea level. I'm pretty sure if they lowered that culvert pipe 1 to 2 feet and used a backhoe to clean out in front of the pipe, it would almost eliminate the ponding water on parcel A

Sketch #6 shows the measurements (capacity) of the Spillway. Unfortunately, no elevation measurements were taken here.

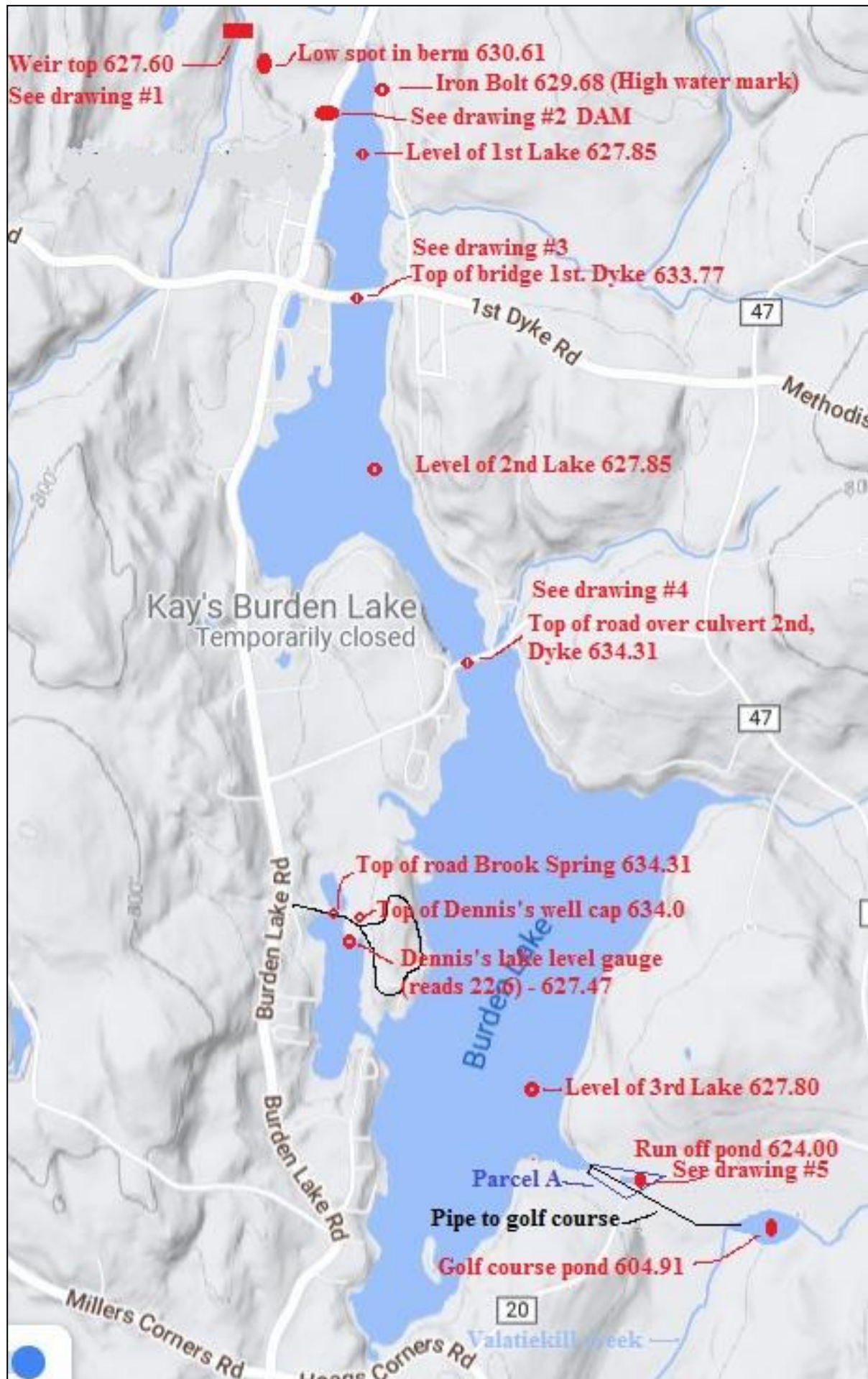
Sketch 7 & 8 show the elevations of the golf course gravity fed irrigation pipe and the inlet at the lake.

Measurements above sea level taken at:

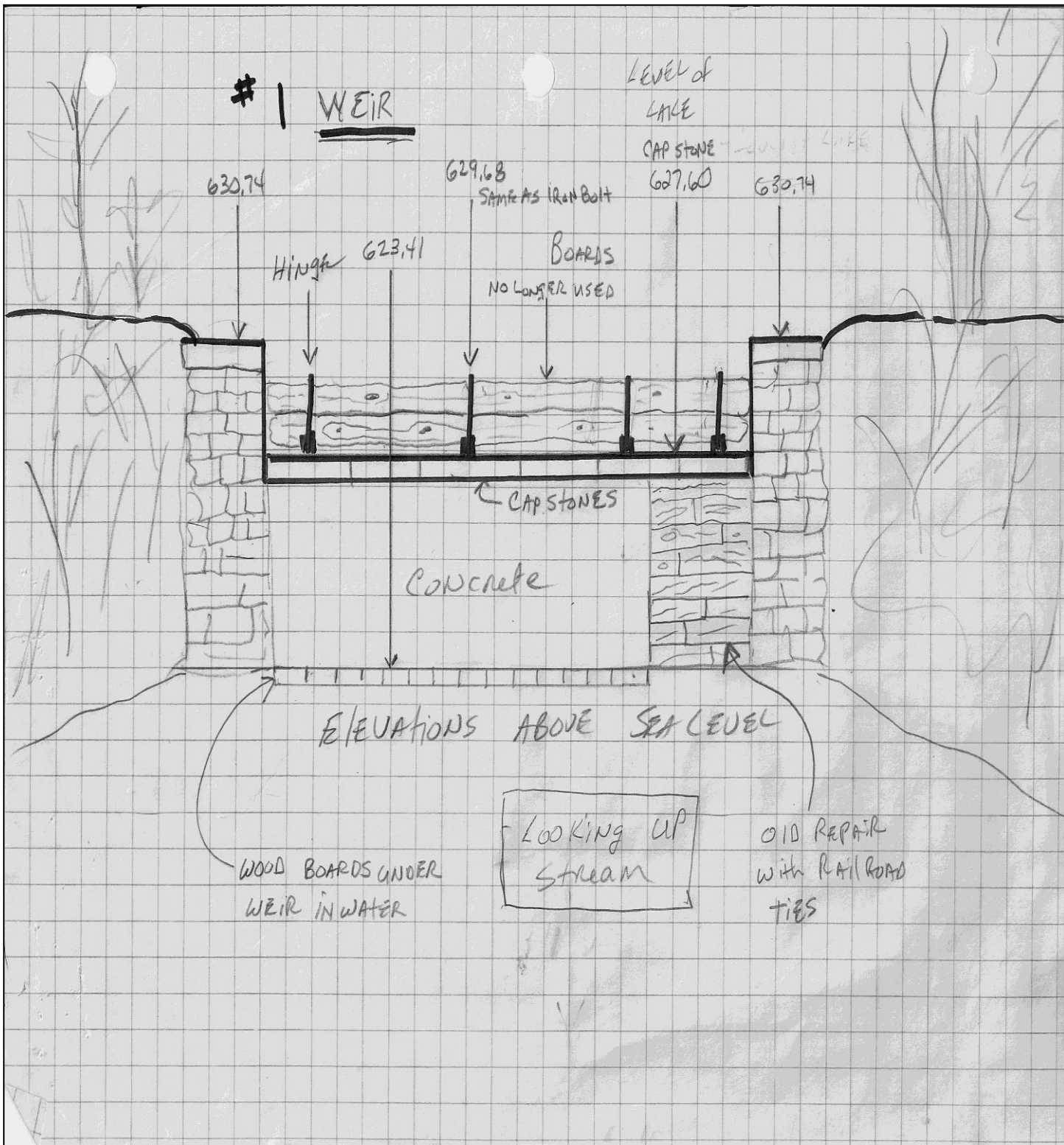
- 1- Height of ice
1st lake - 627.85
2nd lake - 627.85
3rd lake - 627.78
- 2- Heights at Weir (see sketch 1)
Original weir capstone - 627.60

Top of Iron hinge - 629.68

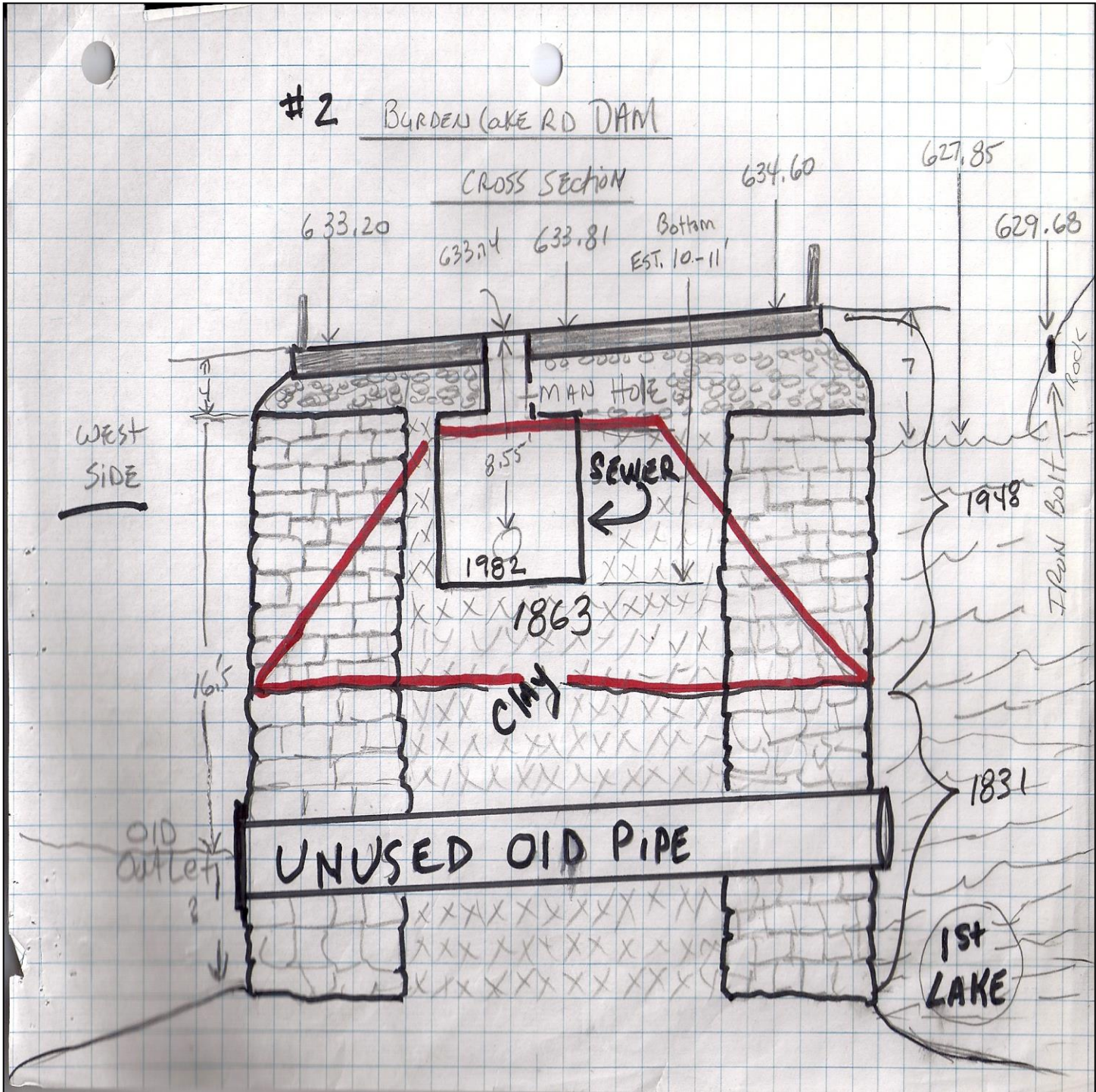
Top of side cap stones (abutments) - 630.74
- 3- Height along berm
At the low spot where it overflowed during the July 2021 storm - 630.61
- 4- Dam (see sketch 2)
Height of dam @ Burden lake Road West side 633.20 Center 633.81 East side 634.53
- 5- Iron bolt on east side of 1st Lake (the high water mark) (the bolt was 22" above the ice on 2-12-2022) The bolt is **629.68** above sea level
- 6- Top of road above bridge on 1st Dyke Rd (see sketch 3) - 633.77
- 7- Top of road above culvert on 2nd Dyke Rd (see sketch 4) - 634.31
- 8- Top of road on Brook Spring Rd- 629.75
- 9- Dennis Ryan's well head - 634.0
- 10- Level of ice in Brook Spring cove on club house side- 627.86
- 11- Level of ice in Brook Spring cove on the north, Shanley side - 627.98
- 12- Dennis Ryan's shore (at his lake level gauge which read 22.6)- 627.47
- 13- Ponding water on parcel A (runoff) next to Totem Lodge road (Valatie Kill) - 624.00
- 14- Ice on golf course irrigation pond - 604.91
- 15- Culvert under Totem Lodge Road (see sketch)



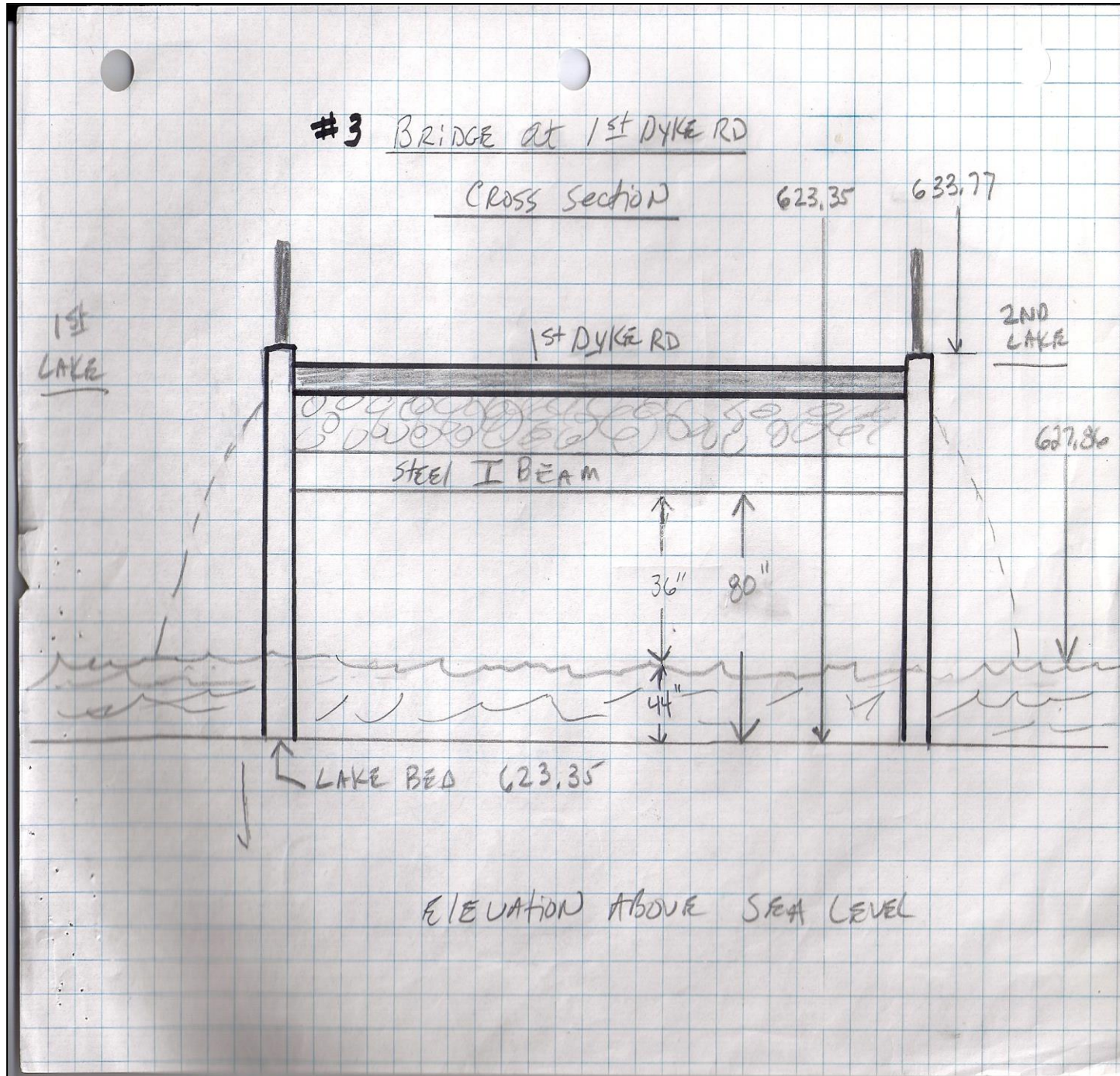
#1 the Weir Elevations



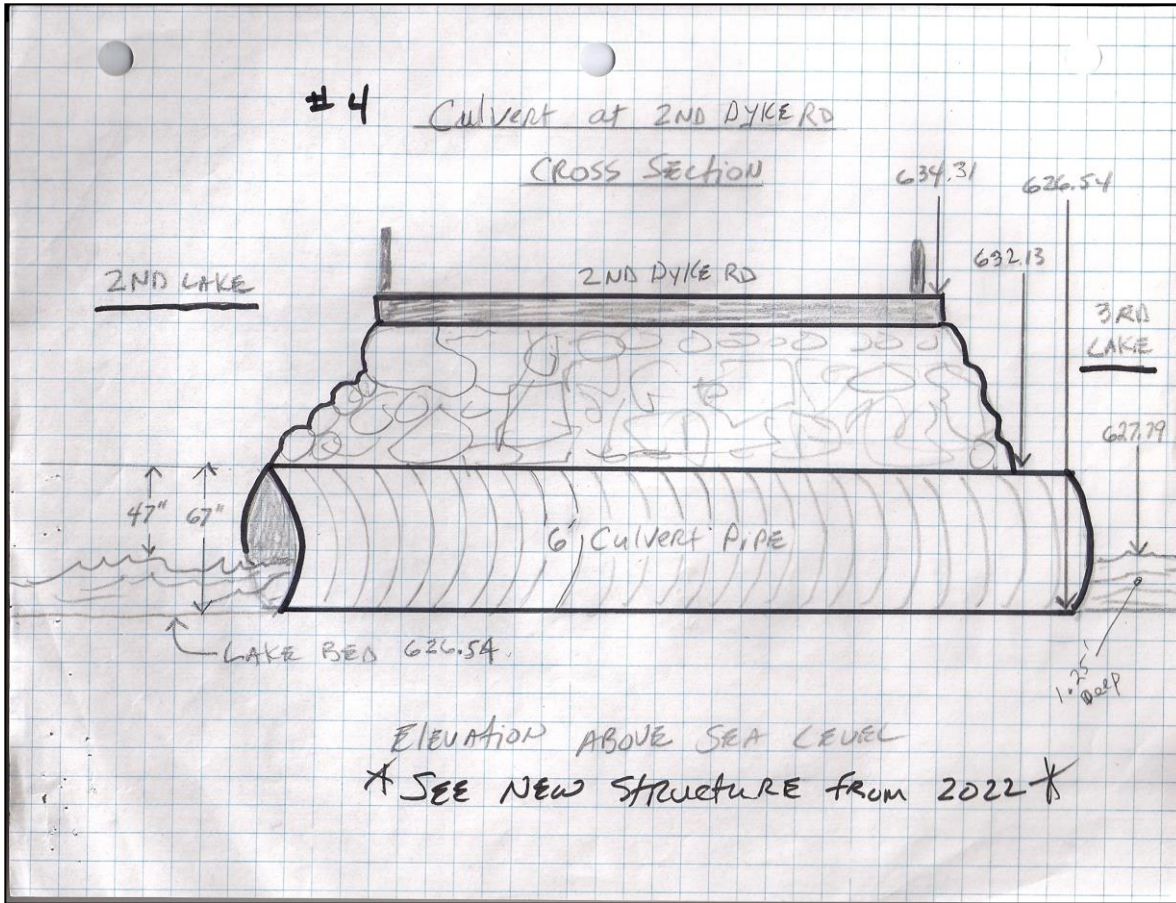
#2 - Cross section of the Dam circa 2023
Lowest portion 1831
Red section added in 1863
Top added in 1948
Sewers added in 1982



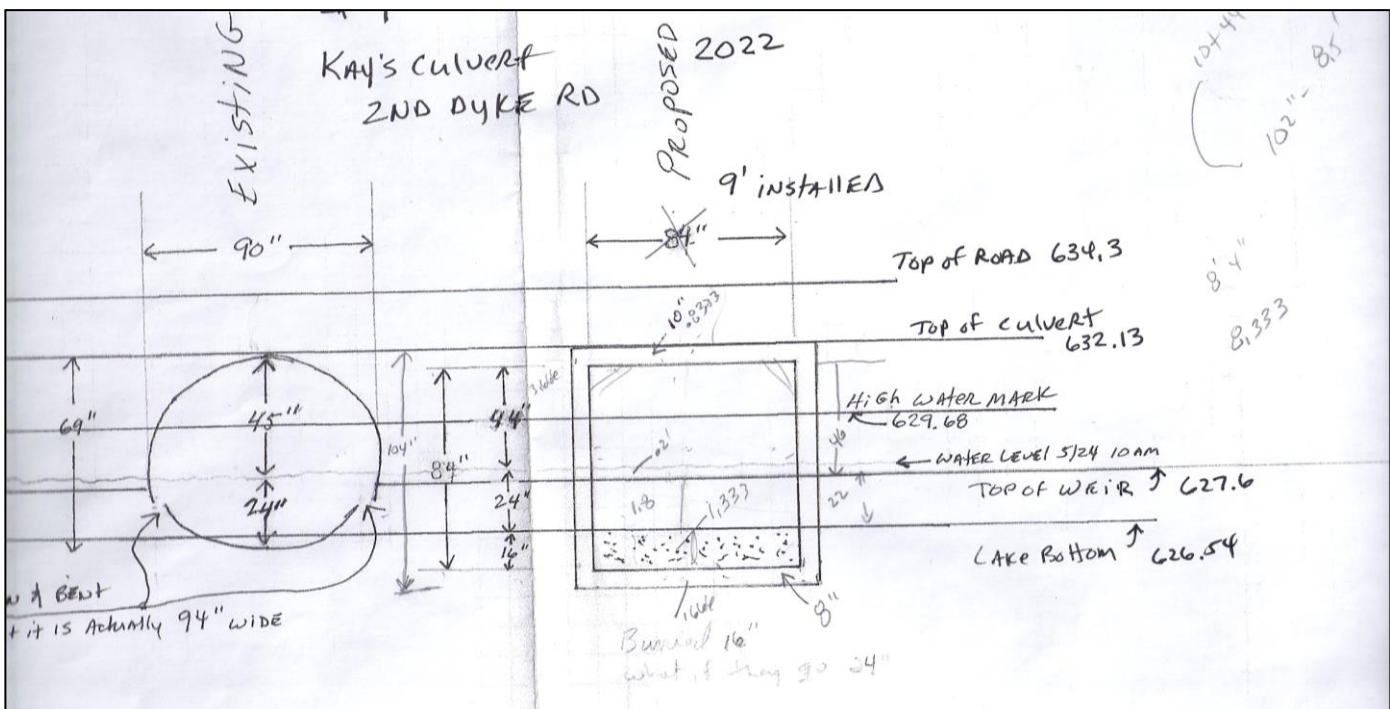
#3 - Bridge on First Dyke Road



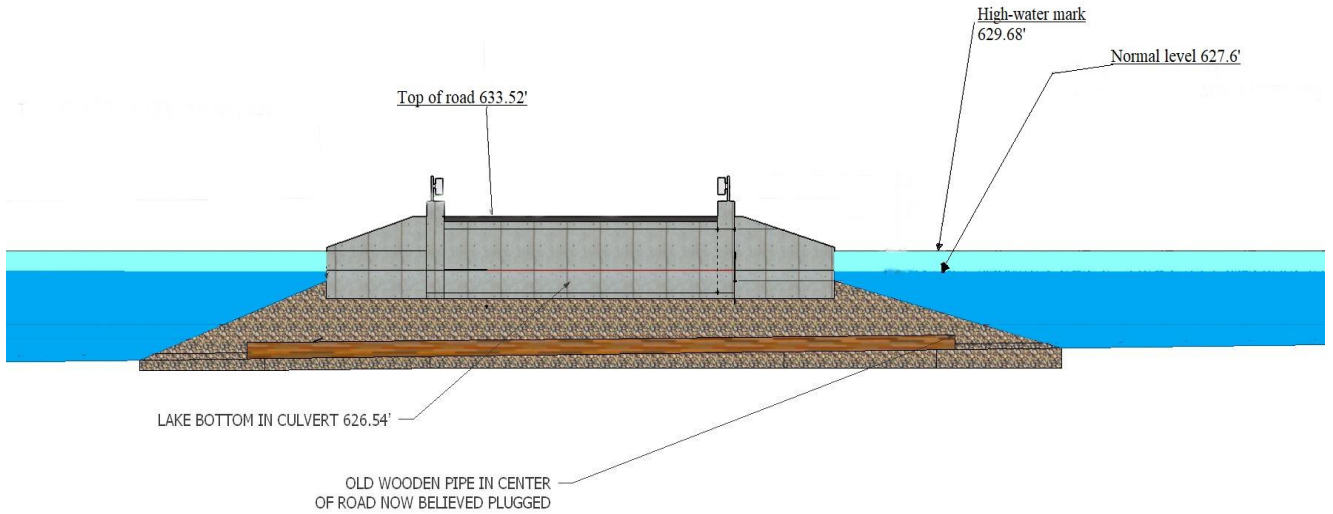
**#4 – Culvert Pipe under Second Dyke Road
circa 2021. This was replaced in 2022/23**



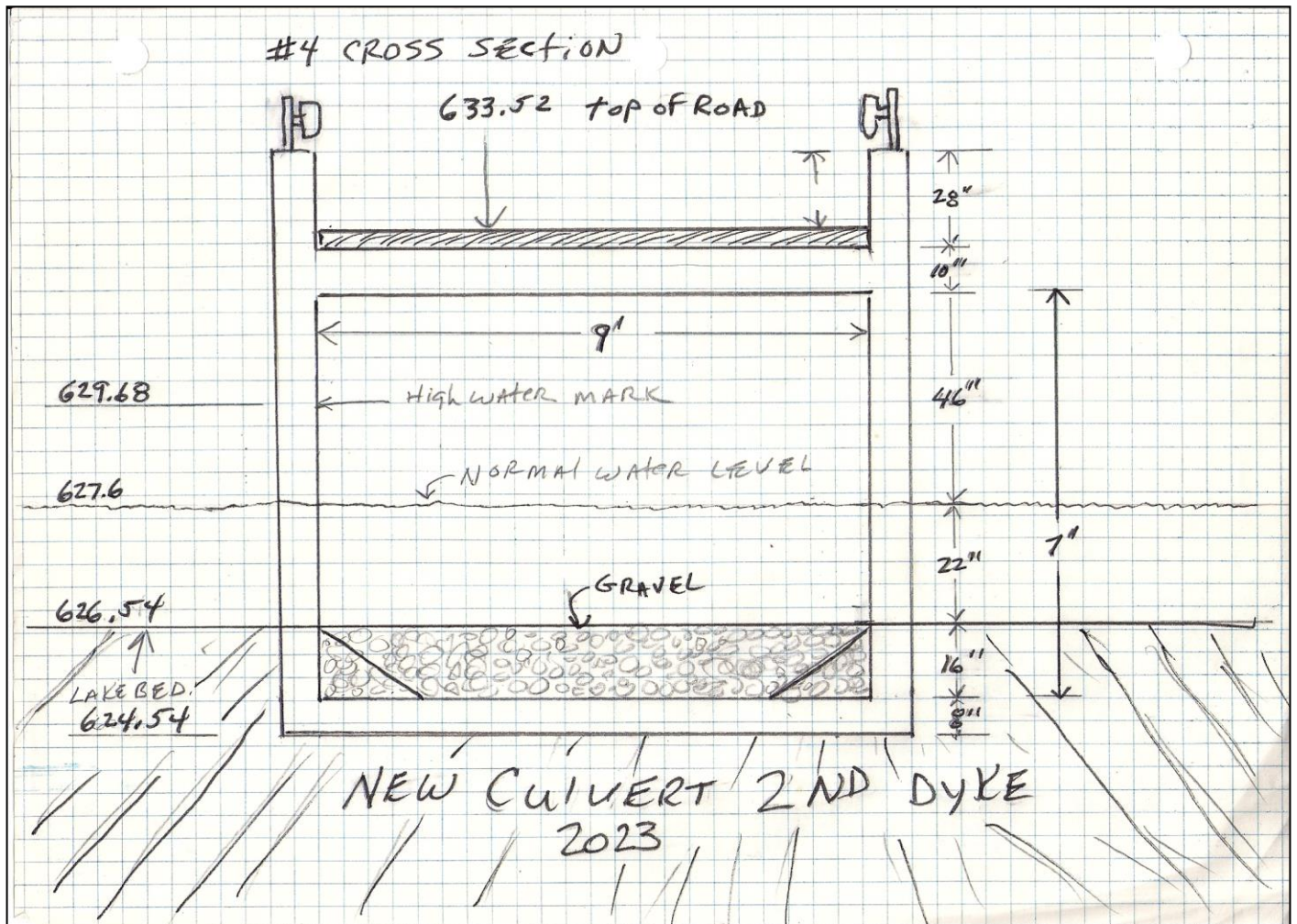
Comparing old culvert pipe with proposed replacement



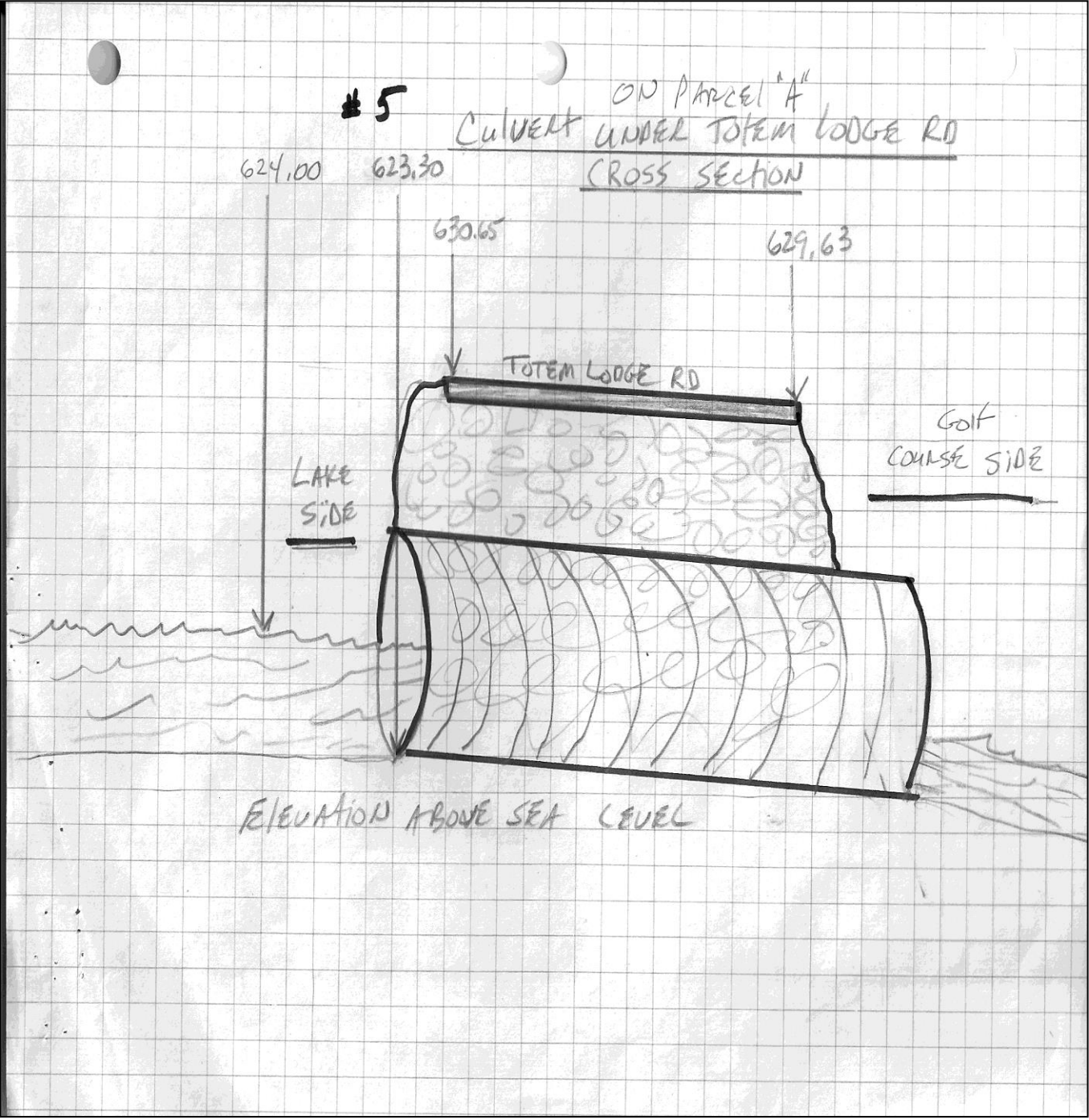
#4- Second Dyke Road
New concrete structure installed 2022/2023



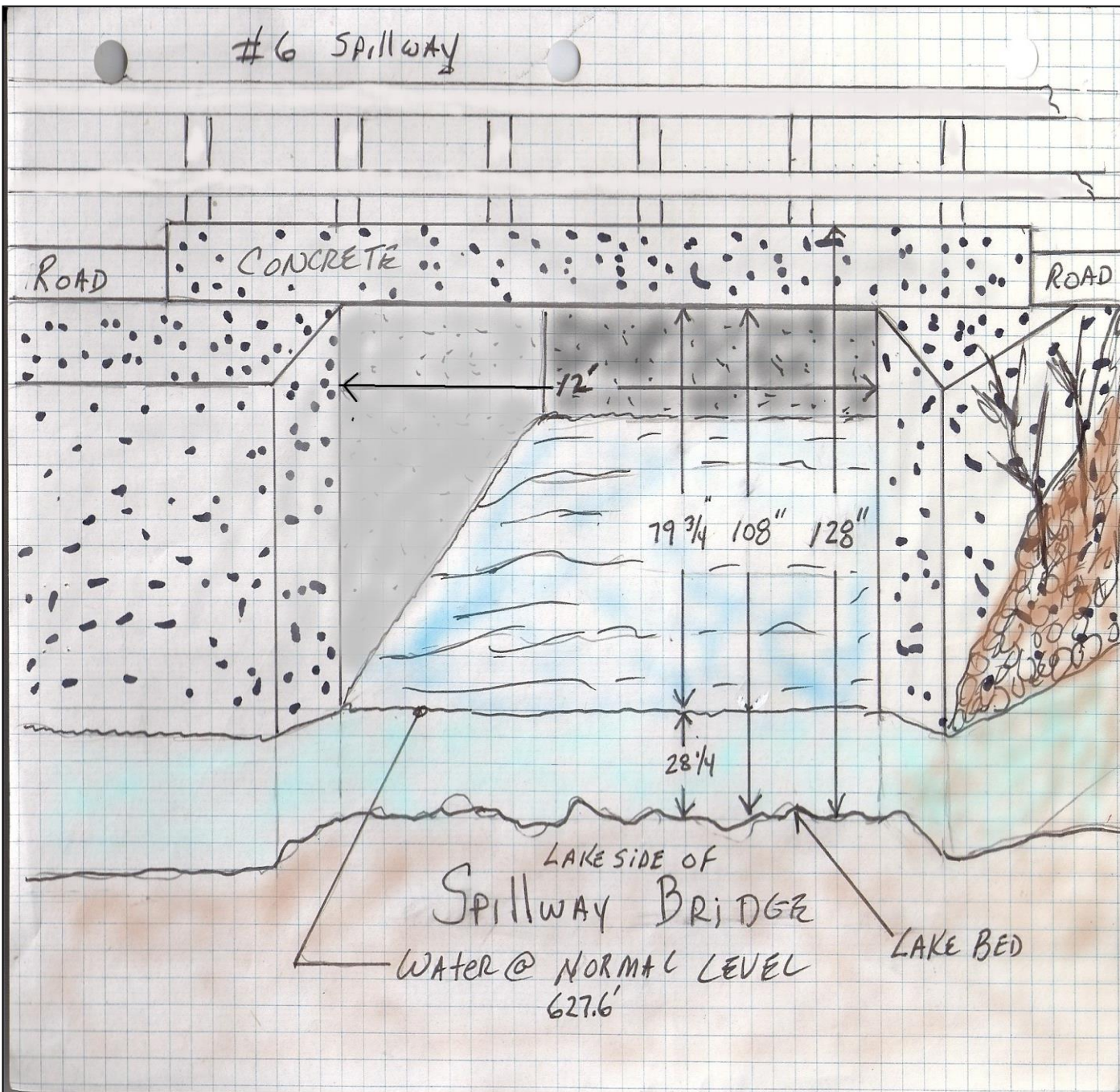
Cross section of new culvert at 2nd. Dyke installed 2022-2023



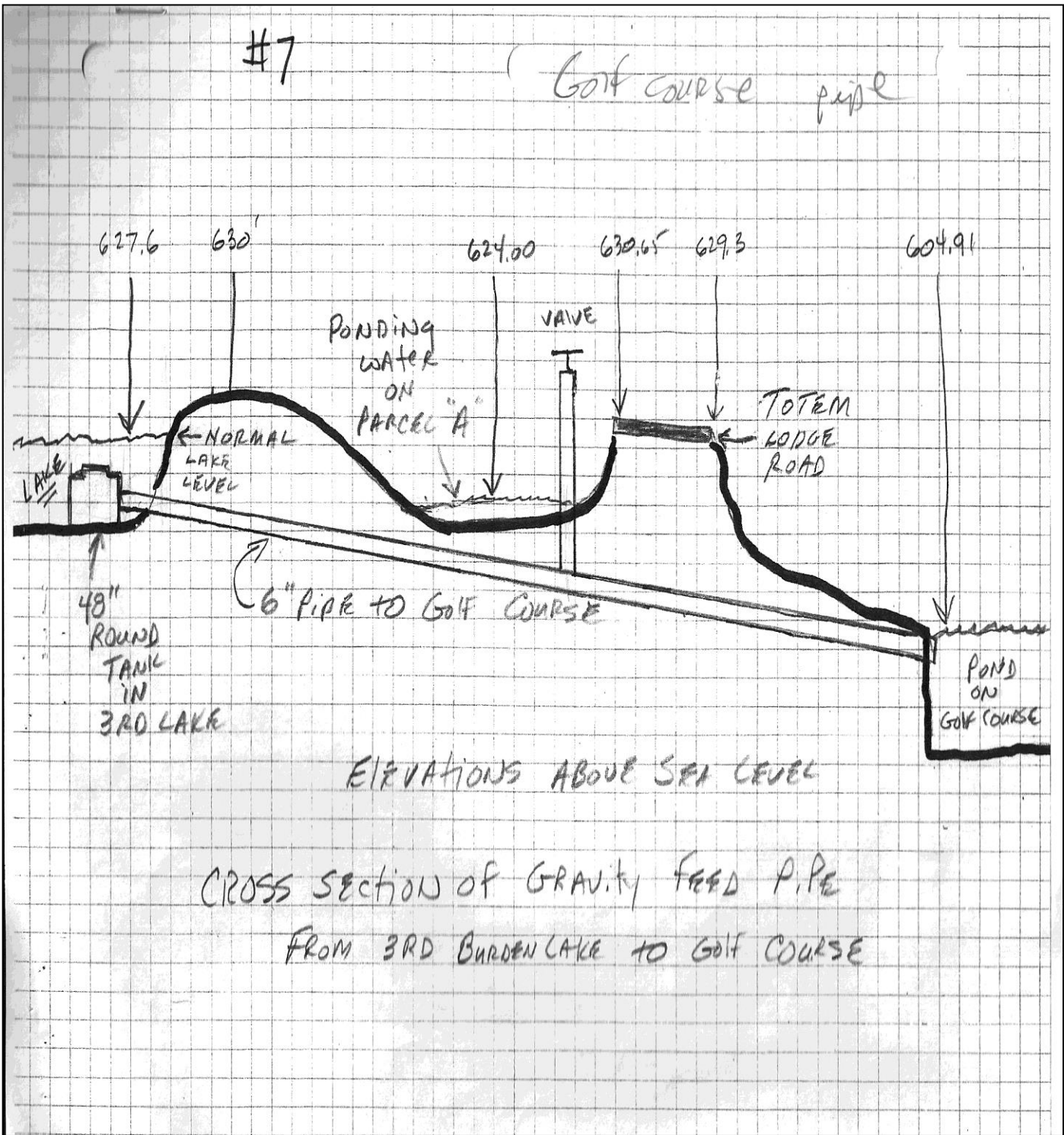
#5 Culvert under Totem Lodge Road at Parcel A



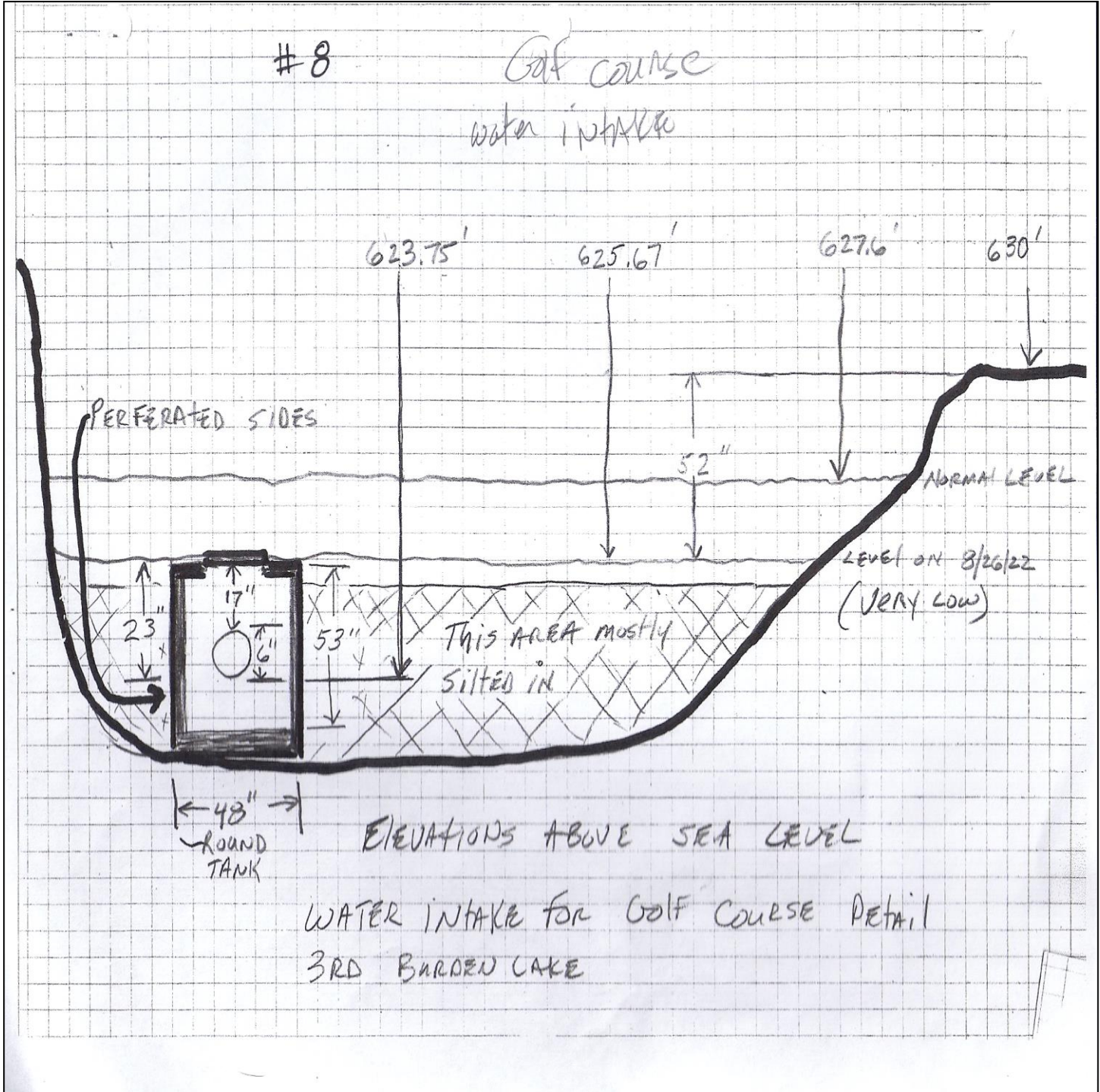
#6 Spillway Bridge & Abutments at the north end of the First Lake on/under Burden Lake Road



#7- Golf course pipe, gravity feed to the golf course pond.



**#8- Water intake for golf course in
Third Lake in front of parcel 8**



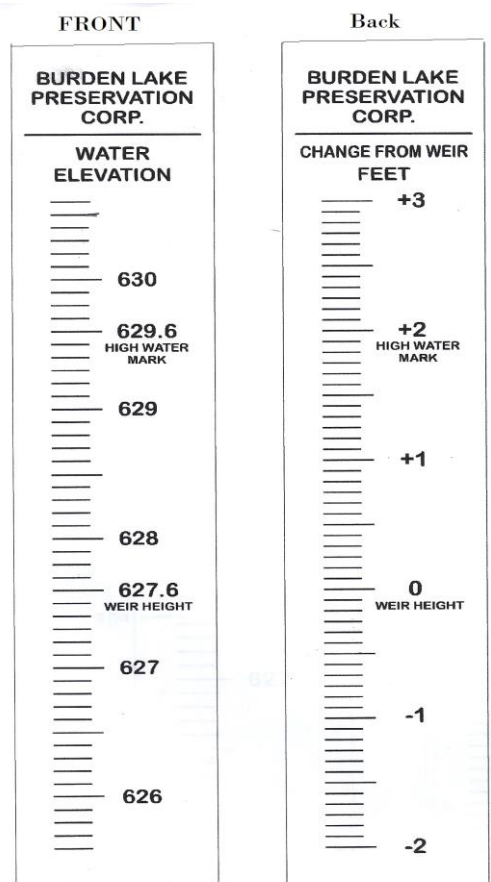
Lake Gauges

In the summer of 2023, the BLPC installed 3 lake level gauges in the Third Lake for the BLCA with a generous donation by Steve Quillinan and installation help from Dennis Ryan. There is one in Brook Spring Cove, one in the South Cove on the south side of the big island, and one on the east side of the Lake near lot 14 of the Woods Development.

These gauges have elevation markings (in feet, and 10ths of feet on one side, and in feet & inches above or below the Weir on the other.) They were set in the Lake at the correct elevations when installed.

Three more of these gauges were installed for the BLA in the First & Second Lakes. There is one on the northwest wall of the culvert at Kays, one on the northwest abutment of the bridge on the First Dyke Road and one on the lake side of the northeast abutment of the Spillway where the water enters or leaves the lake.

We have been tracking the change in water elevation in the lake relative to the rain fall for 6 months now. It's already become very apparent that the watershed from the rainfall on Taborton Mountain has a huge impact on Burden Lake via the Wynantskill Creek which starts as the outflow from Glass Lake. Burden Lake acts like a huge bladder relieving pressure and potential downstream flooding on the Wynantskill Creek. After a rain event, a great deal of the excess water coming down the Creek enters Burden Lake through the canal when it hits the Weir. Later, as the Creek volume lowers, the water from Burden Lake is slowly released back into the Creek via the Canal and Weir.



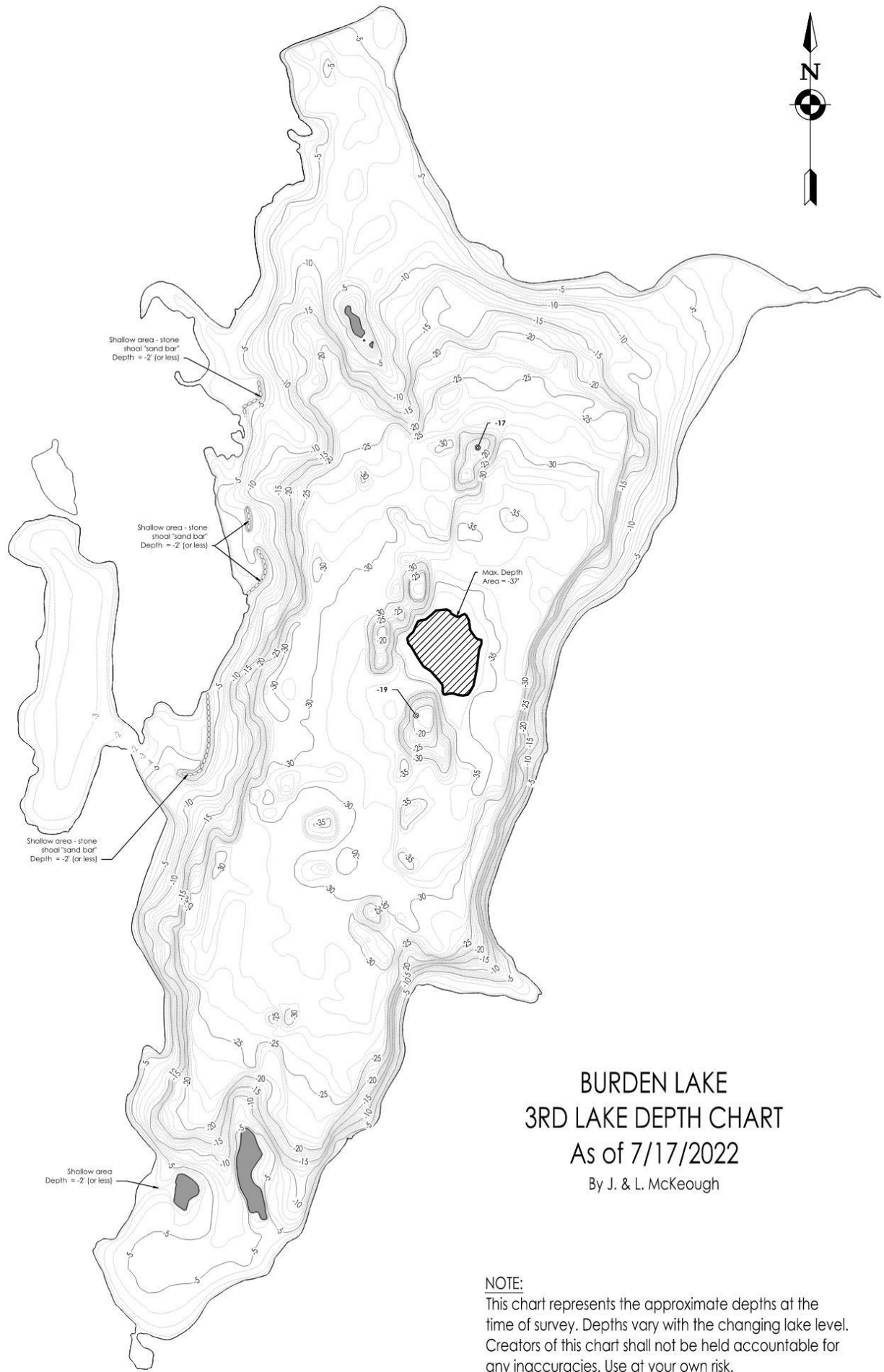
Bathymetric Measurements

There are depth maps of Burden Lake you can find online from DEC and other fishing sites but unfortunately, they are totally made up and not close to the actual depths around the lake.

Jim McKeough & I decided to take Bathymetric measurements of Burden Lake (for the first time ever that we know of) in June and July 2022. We used a Garmin Striker transducer mounted to boats and it took several weekends in a pontoon boat and then in an aluminum row boat with small outboard to get as close to shore as possible. The Lake was at its “normal” level or within 2” of the weir so 627.80’. Once the fieldwork was done, it took Jim many hours to import all the information into a software program to make the map.

At this point we have the Third Lake done and hope to do the First & Second Lakes in 2024.

The third lake is shown on the next page but might be difficult to read. A large-scale version of this map is on the wall in the Club House now. We may be able to provide digital copies if required.



**BURDEN LAKE
3RD LAKE DEPTH CHART
As of 7/17/2022**
By J. & L. McKeough

NOTE:
This chart represents the approximate depths at the time of survey. Depths vary with the changing lake level. Creators of this chart shall not be held accountable for any inaccuracies. Use at your own risk.

Where does the water in Burden Lake come from?

Refer to the maps that follow.

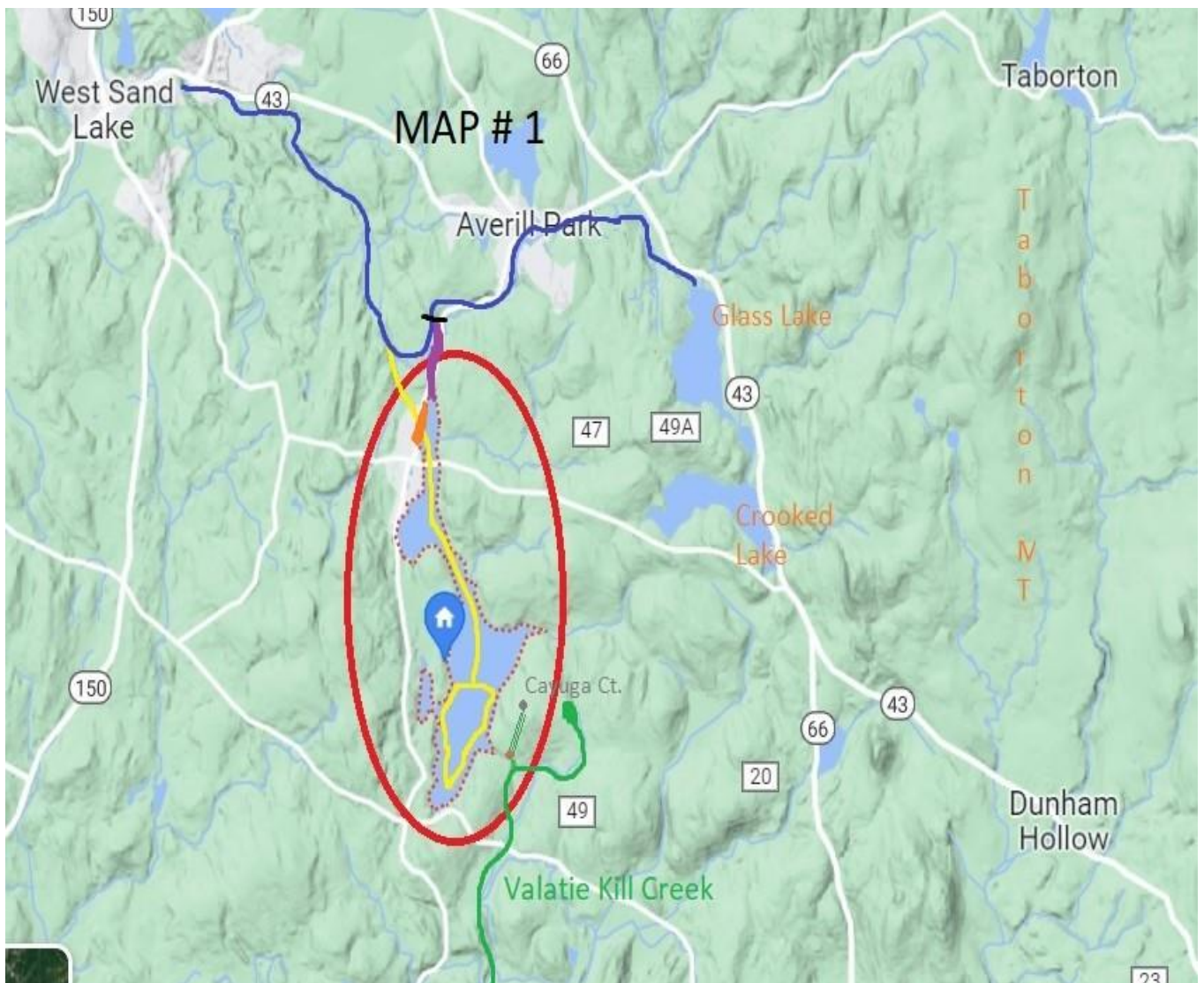
Map #1 shows the red oval around what is now Burden Lake. That oval approximates the natural existing watershed we have to fill Burden Lake.

The yellow is a representation of the original Martins Lake and its outlet stream which met up with the Wynantskill Creek near Gardner Road.

Unfortunately, the water shed within the red oval only created enough water to fill the original (yellow) Martins Lake. It would never have gotten any larger if left on its own.

The dark blue line shows the Wynantskill Creek starting at Glass Lake and flowing down the Wynantskill and from there it went down through West Sand Lake & Troy and finally to the Hudson River.

Also note on map #1 The Valatie Kill Creek which starts near Burden Lake at a small pond just past the golf course. This water shed flows towards the south and makes its way to Nassau Lake and then Kinderhook Lake and continues south from there. You'll also see green lines on either side of Cayuga Court which empty into a brown pond on Parcel A. That brown pond flows under Totem Lodge Road and enters the Valatie Kill.

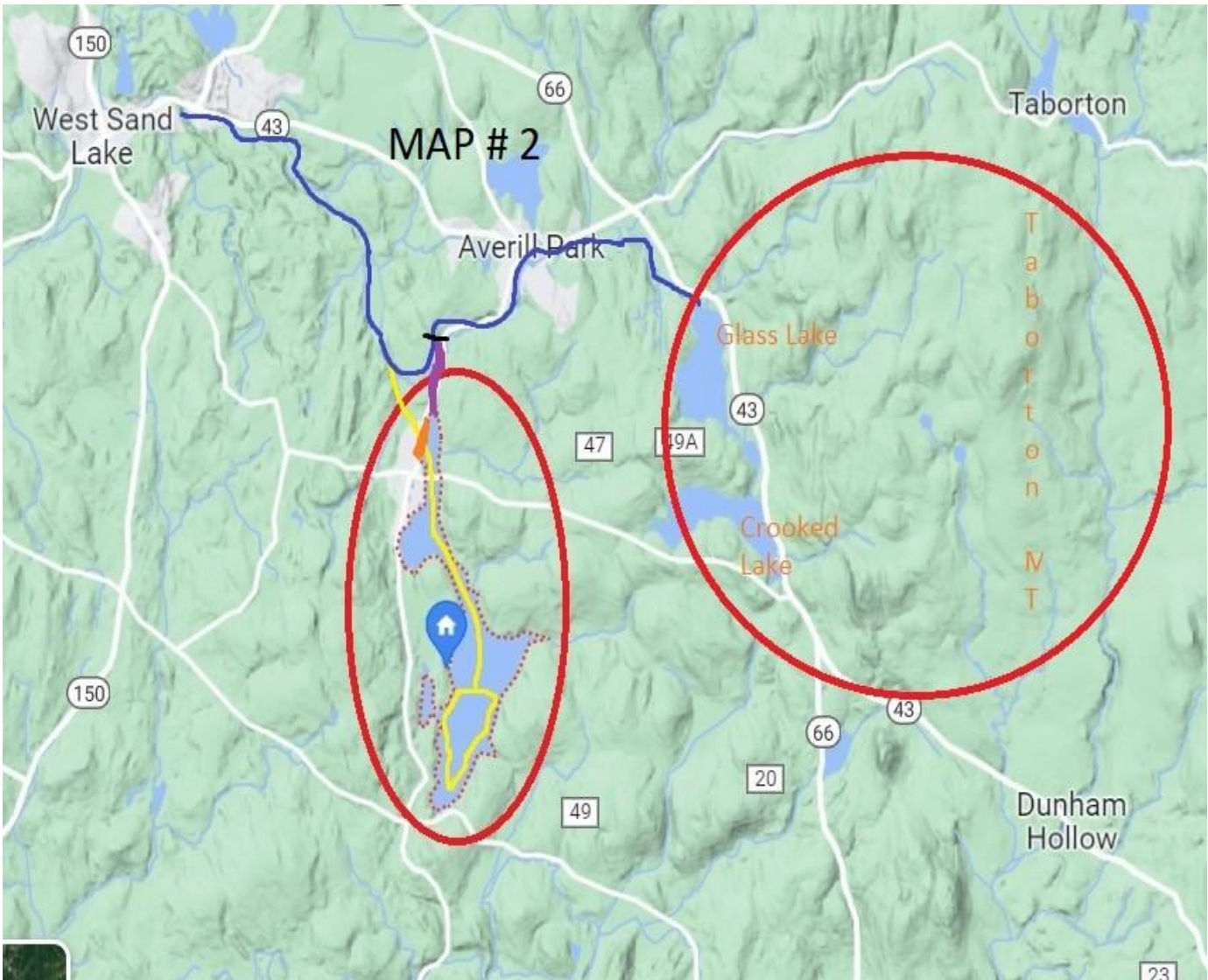


Map #2

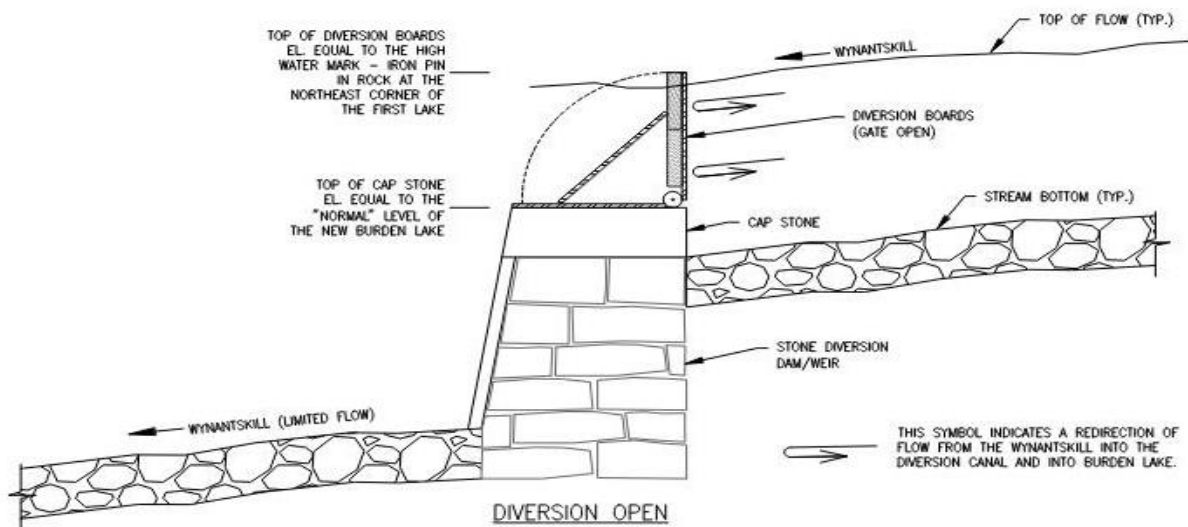
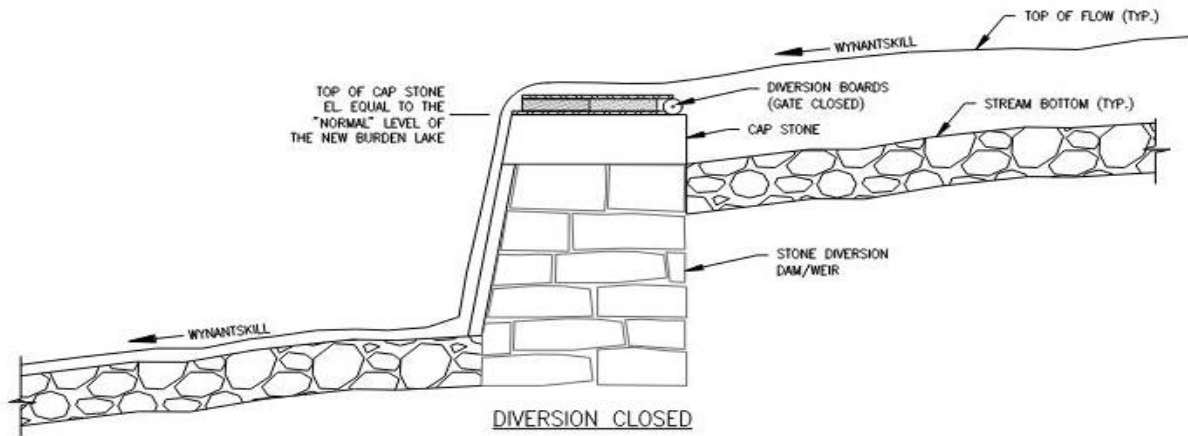
Now the map shows an additional large round red circle. That is the Taborton Mountain water shed. Taborton Mountain is 1,020' higher than Glass and Crooked Lakes. It is a huge water shed compared to the oval around Martins Lake.

The Wynantskill Improvement Association (WIA) wanted to store more water to use for waterpower to fuel the mills along the Creek. They had already dammed up Crooked & Glass Lake as far as they could and realized that millions of gallons of water continued to flow down the Creek uncontrolled. They wanted to store more of that water. They identified a valley which led to Martin's Lake. Martins Lake was 200' lower than Glass & Crooked. They decided to install a Dam System and added the Black Line on the map (the diversion dam we now call the Weir) across the Creek, and also to dig a canal (purple) allowing the water in the Creek to flow into the valley and then put a dam across the valley (orange) to hold back the water. They installed a large pipe & valve in the orange dam right where the outlet from Martins Lake originally flowed (Yellow). That valve would allow them to release water back into the Creek as needed for mills. The Weir let the water flow into the lake when the lake was lower than the top of the Weir and to flow out of the lake when the lake water was higher than the top of the weir.

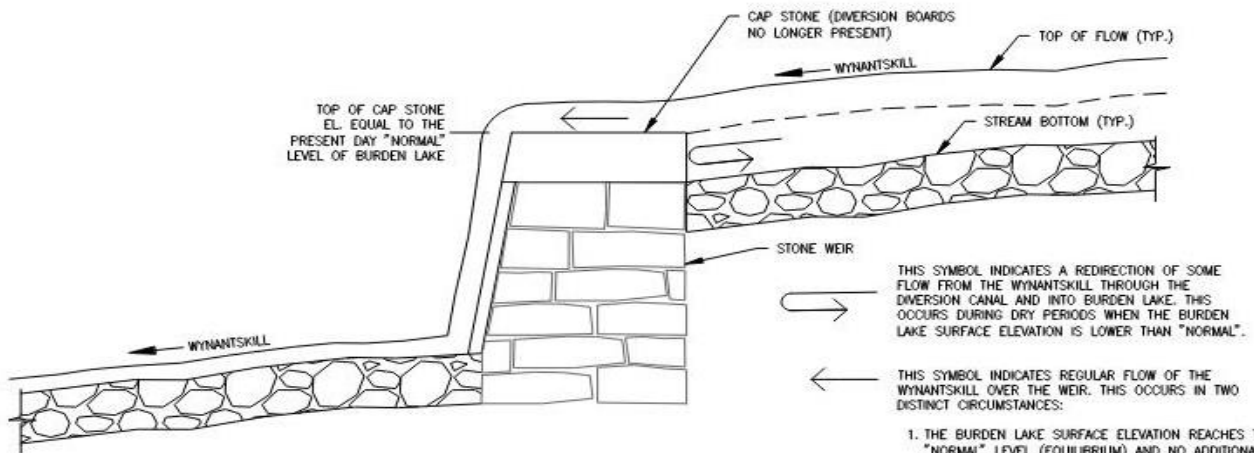
Burden Lake relies as much on the Taborton Mountain watershed today as it did 150 years ago. Without this water, Burden Lake will eventually turn back into Martins Lake.



Weir operation



HISTORIC DIVERSION DAM/WEIR OPERATION

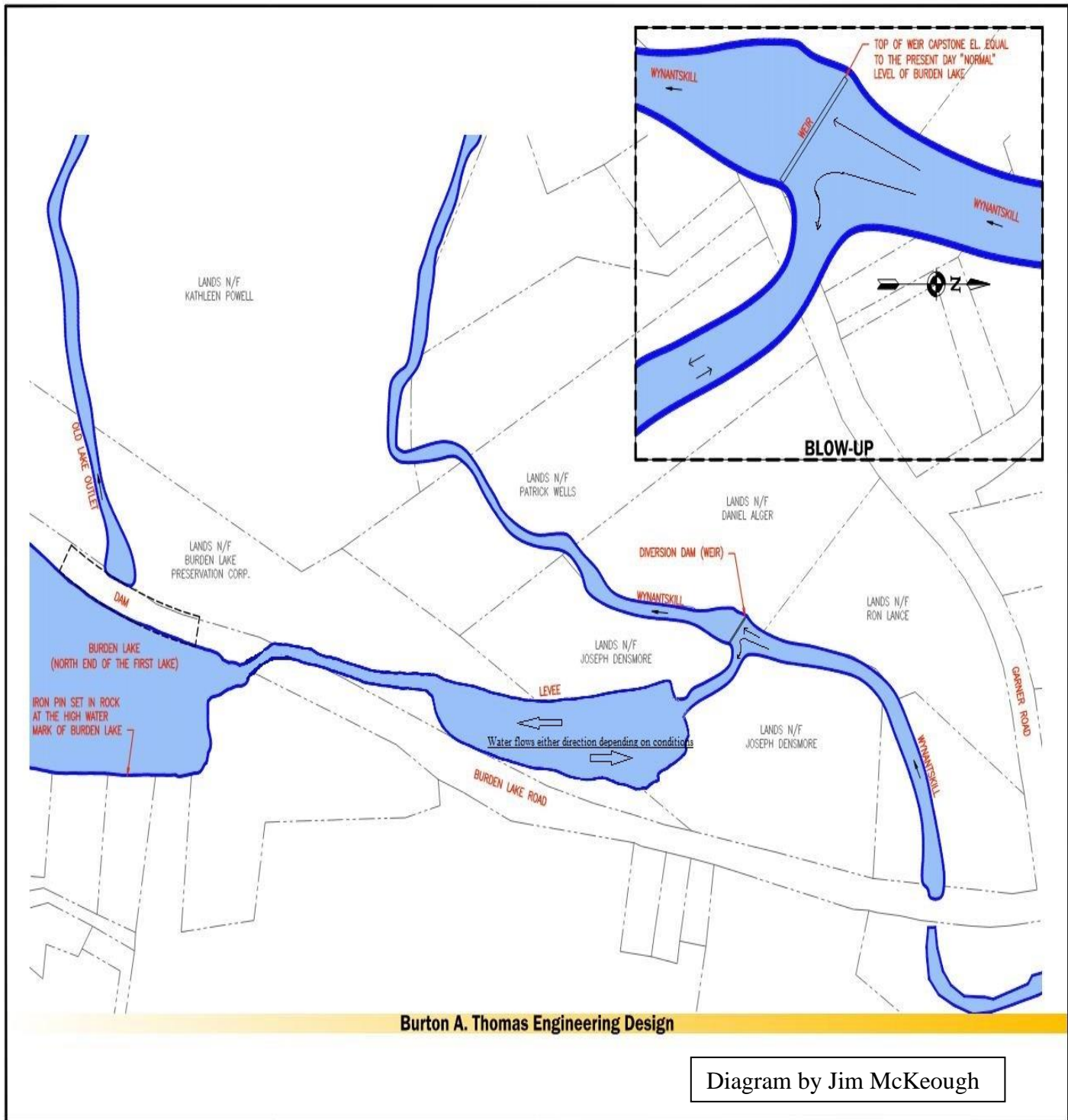


CURRENT WEIR OPERATION

- NOTES:
1. CURRENTLY THE WEIR IS SIGNIFICANTLY DAMAGED WITH TEMPORARY SAND BAGS IN PLACE TO HELP MAINTAIN THE LAKES "NORMAL" ELEVATION.

Diagram by Jim McKeough

How the Weir effects stream flow



Depending on the volume of the water flowing in the Wynantskill towards the Weir, and the current level of the water already in Burden Lake, the water coming down the Wynantskill either flows into Burden Lake or bypasses the Lake and heads down stream. In addition, when the volume in the creek is low, and the water in the Lake is high, the Lake water flows through the canal, over the Weir and heads downstream to the Hudson River.

Important Elevations of the Wynantskill Watershed

Taborton Mountain	1,850'
Crooked Lake	830'
Glass Lake	824'
Crystal Lake	770'
Burden Lake	628'
Hudson River	2'

The Water shed from Taborton Mountain summit is 1,020' above Crooked Lake and 1,026' above Glass Lake. Most of that water from Taborton flows down into these two lakes via several seasonal streams including Teals Creek which enters next to the old Glass Lake Hotel (now TBA). All that excess water flows from Crooked Lake into Glass Lake, then out of Glass Lake creating the beginning of the Wynantskill Creek. A little further north, coming down next to Taborton Road, is Horse Haven Brook which does not enter the lakes, but joins the Wynantskill near the Union Cemetery. Crystal Lake joins the Wynantskill where the Sand Lake Walking Trail is. From there, all that water flows downstream to the Weir on the Wynantskill near Burden Lake and either enters Burden Lake or passes by proceeding down the Wynantskill towards Troy.

Acknowledgements:


All of the information in this booklet was researched and prepared by the author with assistance from Dennis Ryan and James A. McKeough in 2021-2024.

Please forgive the amateurish field sketches, I only made them for a place to record the elevations.

Most of the original documents shown in this booklet plus many more reside in a locked fireproof file cabinet in the BLCA Club House.


The Burden Lake Preservation Corp.
History, Book of Deeds, and Incorporation papers

by **Larry McKeough**
in conjunction with The Burden Lake Preservation Cooperation

A blue silhouette map of Burden Lake on a yellow background. The map shows the irregular shape of the lake with several smaller inlets and peninsulas.


The Burden Lake Dam System:
1831 - 2024

by **Larry McKeough**
in conjunction with The Burden Lake Preservation Corporation

A blue silhouette map of Burden Lake on a yellow background. A red circle highlights the northernmost point of the lake, with a white arrow pointing to it from the text "Dam System location".


Elevation and Bathymetric survey measurements around Burden Lake.

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A blue silhouette map of Burden Lake on a yellow background. The map shows the irregular shape of the lake with several smaller inlets and peninsulas.

The Woods development at Totem Lodge
Burden Lake 2020 - 2023

by **Larry McKeough**
in conjunction with The Burden Lake Preservation Cooperation
and
The Burden Lake Conservation Association

A blue silhouette map of Burden Lake on a yellow background. The map shows the irregular shape of the lake with several smaller inlets and peninsulas.