

2019 PRIOR LAKE OUTLET SYSTEM ANNUAL OPERATIONS REPORT



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PRIOR LAKE-SPRING LAKE
WATERSHED DISTRICT

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INTRODUCTION

The Prior Lake Outlet Structure and Outlet Channel were constructed in 1983 under DNR permit 79-6016 to address high lake level issues on Prior Lake, which does not have a natural outlet. The Prior Lake Outlet Channel (PLOC) is utilized by the Prior Lake-Spring Lake Watershed District (District or PLSLWD) in managing lake levels on Prior Lake, as well as a trunk stormwater system for the Cities of Prior Lake and Shakopee, and the Shakopee Mdewakanton Sioux Community. The 7-mile long PLOC has been divided into eight management segments. Segment 1 is on the southern end beginning at the Prior Lake Outlet Structure, while Segment 8 is on the northern end and flows into the Minnesota River in Shakopee.

To address current needs and plan for future development in the watershed, the District finalized a Memorandum of Agreement (MOA) in 2007 with the Cities of Prior Lake and Shakopee, and the Shakopee Mdewakanton Sioux Community for the operation, maintenance and use of the Prior Lake Outlet Channel. The MOA is updated regularly and was last updated in 2019. This group of cooperators oversees the overall operation of the PLOC, while the District administers the day to day operations. In the early 2000's, the cooperators determined that the channel and outlet had worked well since their inception, but they could operate more efficiently if modified in several places, reducing long term maintenance and enhancing the environment. Acknowledging that the PLOC is used as a stormwater conveyance system and is not solely a natural conveyance, the cooperators' focus is to manage the easements of the channel and the channel itself to maintain hydrologic capacity, reduce maintenance needs, provide long-term stability and improve water quality. Secondary benefits include increased aesthetics, improved habitat and consistency with city and county plans for parks and greenways.

OUTLET STRUCTURE

HISTORY

The Prior Lake Outlet Structure was originally constructed in 1982 and has been operated since 1983. The original design of the structure required manual operation to open and close gates to regulate the flow. This design posed safety concerns for staff operating the structure during high water levels. Additionally, inefficiencies in the structure's design meant that the 36-inch outlet pipe connected to the structure did not reach its maximum flow of 65 cfs until lake levels had well surpassed the outlet elevation. Over the years, the structure had also developed wear and required minor maintenance.

Given these conditions, a replacement structure was pursued by the District and installed in 2010 (Figure 1). The new design has increased the efficiency of discharging water by allowing the outlet pipe to reach capacity sooner. It also provides safer conditions for staff during inspections and maintenance and is self-operating which reduces overall operations and maintenance costs. A schematic of the outlet structure is provided in Attachment A.



FIGURE 1 OUTLET STRUCTURE

MAINTENANCE AND OPERATION

Operation of the Prior Lake Outlet Structure is governed by the DNR-approved Prior Lake Outlet Control Structure Management Policy and Operating Procedures (Operating Procedures) dated October 2004 and approved February 2005. This plan specifies a review procedure that is to be repeated every 3 years and last occurred in 2017. Changes primarily addressed guidance for opening the low-flow gate and removed old language that referred to the old outlet structure.

Additionally, an Operation, Inspection and Maintenance Manual was drafted and adopted in September 2011 for the Prior Lake Outlet Structure. The purpose of this secondary manual is to establish guidelines and practices to provide existing and future District staff with the knowledge of how to properly operate, inspect and maintain the structural and operational components of the outlet to maximize the life and effectiveness of the structure. The manual includes a table of recommended inspection items along with the recommend frequency of inspection. These recommendations will be reviewed periodically by District staff to determine if the frequency is appropriate based on findings in the field and the manual will be updated accordingly.

The new structure requires minimal maintenance to operate. Once Prior Lake reaches 902.45', water starts spilling over the accordion shaped weir located inside the trash rack. Maintenance includes visual inspections, greasing gates, and removing debris from the trash rack. Removing vegetation and other debris from the trash rack is the most time-consuming and labor-intensive task (Figure 2). When the structure is operating (Prior Lake is greater than 902.45'), the structure will be inspected no less than once a week, and as much as twice per day, depending on the lake level and amount of vegetation getting caught on the trash rack. Inspections and debris removal are typically conducted by PLSLWD staff. During times when water is high and large amounts of vegetation are getting caught on the track rack, the City of Prior Lake staff have helped remove vegetation to ensure the Outlet Structure was not blocked.



FIGURE 2 REMOVING VEGETATION FROM OUTLET STRUCTURE

Excluding 2009, the Prior Lake Outlet Structure had flow, at least partially, every year since 1999. The year 2011 had the greatest volume of water flowing through the system since the structure's establishment in 1983. This was partially due to the more efficient design of the new Outlet Structure; however, the primary factor was the duration of continuous discharge was significantly greater than in previous years.

During 2019 operations, the Prior Lake Outlet Structure performed well throughout the 334 days that water discharged from the lake (see Attachment B). Prior Lake overtopped the outlet weir most of the year with a few exceptions: October 4-9, October 14-28, and December 19-31. The only reason the structure wasn't flowing in October was because PLSLWD staff closed the main gate while bank erosion repair was being completed downstream in the channel. Otherwise, the Outlet Structure operated all but the last 12 days of the year.

At certain lake levels, the low-flow gate allows more water through the outlet structure, resulting in the lake level lowering more quickly and creating more storage (see Attachment C). To reduce the risk of flooding, the District opened the low-flow gate on March 5 due to anticipated high lake levels. To reduce ice dams along the channel after opening the low-flow gate, the low-flow gate of the outlet structure was only opened 10 rotations of the gate. This allowed the water to melt some of the ice in the channel before fully opening the low-flow gate on March 19. The low-flow gate remained open until July 9 (see Figure 3). The low-flow gate was opened again on October 2 and wasn't closed until December 19 when the lake level neared 902.0', at which the permit requires it be closed.

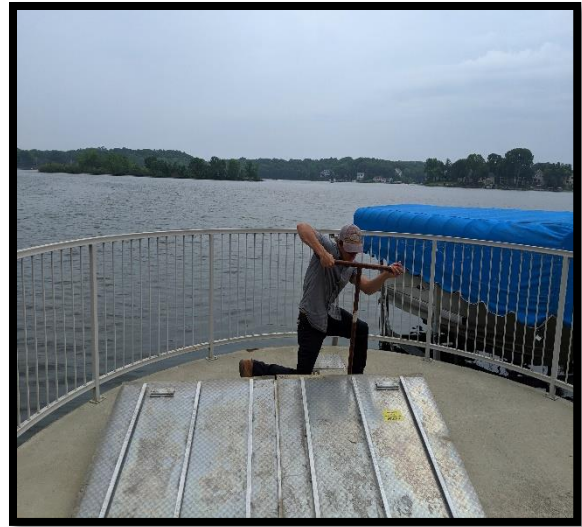


FIGURE 3 – OPENING THE LOW-FLOW GATE

In its 334 days of discharge during 2019, an estimated 10.4 feet of vertical volume was eliminated through the Prior Lake Outlet Structure (see Attachment D). Prior Lake *theoretically* could have reached 914.33' without operating the outlet structure. Attachment D is provided for comparison between years on the overall usage of the Prior Lake Outlet Structure; 2019 discharged more volume than any other recorded year. The numbers shown are calculated based on the most accurate information available. They are not exact and are intended for yearly comparisons only. Attachments E and F show daily Prior Lake elevations.

OUTLET PIPE

The Outlet Pipe leads from the Outlet Structure to the beginning, or “daylight,” of the outlet channel (Figure 4). It is buried underground for approximately 2075 feet, with 5 manholes and 7 access points (Figure 5).

MAINTENANCE

Visu-Sewer televises the entire length of the pipe every two years to look for potential damage, areas in need of repair, blockages and accumulated debris, and to assess whether the pipe is reaching full hydraulic capacity.

Chemical grouting was completed in 2018. 120 leaks were sealed, but it was originally estimated to only have 50. As the original leaks were sealed, it forced other leaks to start due to more pressure. Visu-sewer documented all the seals with video.



FIGURE 4 THE “DAYLIGHT”: BEGINNING OF THE OUTLET CHANNEL

In general, the lake outfall pipe is in good to fair condition and the pipe will be televised again in 2020.

OUTLET CHANNEL

The MOA cooperators' goals of the outlet channel include: maintain hydrologic capacity, reduce maintenance needs, provide long-term stability, improve water quality, increase aesthetics, provide improved habitat and provide consistency with city and county plans for parks and greenways. Several of these goals have been met, but the channel will always require maintenance.



FIGURE 5 MAP OF OUTLET PIPE

MAINTENANCE

While the Outlet Structure is in full operation and discharging water, the District is required to perform regular inspections (at least once per week) of the Outlet Structure and the Outlet Channel in accordance with the Operating Procedures. Inspections look for debris or any other issues along the channel or at the structure. Debris, downed trees, and other material are removed when they pose a risk, such as flooding or erosion. When debris is too difficult for PLSLWD staff to remove, the party in charge of that culvert, or land, will be contacted to address the issue.

A detailed report of this year's outlet channel inspections can be found in Attachment B. Below is a summary of maintenance projects that have been completed each year:

- 2006
 - Work completed on Segment 1 in 2006 consisted of bank stabilizations, increased native plantings and a creation of a spillway between Upper and Lower Jeffers Ponds.
- 2007
 - A basin was excavated and sinuosity was added to the channel in Segment 5c prior to entering Dean Lake during the early portion of 2007.
- 2009
 - Replacement of an undersized culvert on the northern end of Segment 8.
- 2010

- Finalization of work in several segments including reshaping banks
- Toe stabilization and weir reinforcements in Segment 7a.
- Toe stabilization, bank protections and flow realignment in Segment 3.
- Built up the channel bed and reconnected it to the floodplain in Segment 2.
- 2012
 - Site checks were made throughout 2012 to ensure stability against erosion and vegetation establishment within the areas of previous work in Segments 2, 3, and 7a.
- 2013
 - Three failing culverts were replaced between Segments 3 and 4B (Pike Lake Road, Jackson Trail, and Gonyea field crossing).
 - Vegetation along the channel was managed for herbaceous invasives by EOR and woody invasives by Applied Ecological Services. Garlic mustard was hand cut in Segments 3-8. Small populations of common burdock were cut in Segments 4A, 4B, and 8. Black locust, common buckthorn, and Tatarian honeysuckle suckers and seedlings were treated in segments 1, 3, 4A, 5C, 6, and 7A.
- 2014 – Prior Lake flooding occurred
 - Garlic mustard was hand cut with a weed cutter in segments 3-7 by EOR.
 - Wild Parsnip was hand cut with a weed cutter in segment 1 by EOR (only location wild parsnip was found).
 - A foliar spray was applied for woody invasives (black locust, common buckthorn, and honeysuckle) in segments 1, 3, 4a, 5c, 6, and 7a by AES.
- 2015
 - Garlic mustard was hand cut by EOR on May 15 in segments 3 through 8.
 - EOR released flea beetles on June 26 in Segment 7 to treat the leafy spurge in that segment.
 - Downed trees were removed from the channel by WHR.
 - Segment 4A was realigned by Sunram to protect field road from eroding (EOR design). Trees replaced by Scott Soil and Water Conservation District (SWCD).
 - The Shakopee Mdewakanton Sioux Community replaced the KiciYapi culvert in Segment 3 (Bolton and Menk design).
 - USFWS removed the field road crossing near the parking lot north of Highway 101. This crossing had experienced damage many times and was restored the area to a native flood plain instead of replacing the crossing again.
- 2016
 - EOR hand-cut garlic mustard in Segments 3-7.
 - A site visit with EOR and Minnesota Department of Agriculture determined beetle establishment in Segment 7 was successful, but too low to capture and redistribute beetles to more sites. Another assessment will be completed in 2017.
 - In Segment 1, AES spot-treated wild parsnip, locust and thistle and removed locust and silver poplar.

- AES treated a large patch of garlic mustard on the north and south side of County Road 16 (Segments 4 and 5).
- A large purple loosestrife plant was removed from Segment 4A by AES.
- All manhole benches in the outlet pipe were reconstructed (smoothed) by IBA Manhole.
- Kes Field Crossing culvert (Figure 6), Gonyea culvert, and Pike Lake Park stream crossing repaired by Nadeau Companies.
- The remaining downed trees and woody debris were removed by WHR.



FIGURE 6 KES FIELD CROSSING REPAIR IN 2016

- 2017
 - Segment 1 – Locust foliar, parsnip rosette, and thistle spot treatment
 - Segment 2 – Buckthorn foliar treatment, larger than ½” diameter cut/treated
 - Segment 4a – Buckthorn scouting/treating (foliar treat small individuals, cut/treated larger as needed); pulled loosestrife
 - Segment 4b - Buckthorn scouting/treating (foliar treat small individuals, cut/treated larger as needed); spot treat thistle northern half – especially pasture
 - CR 16 – Garlic mustard treatment; pulled loosestrife
- 2018
 - Outlet Pipe – Chemical grouting to seal 120 leaks
 - Segment 1 – Wild parsnip treatment
 - Segment 3 – Scouted for garlic mustard, but no plants were found.
 - Segment 4 – Five purple loosestrife and 11 wild parsnip plants were treated.
 - Segment 5 – Six purple loosestrife plants treated.
 - Segment 7 – Released purple loosestrife and leafy spurge beetles and weevils.
 - Ice dam on Gonyea culvert steam jetted by City of Shakopee staff due to flooding.
- 2019
 - Removed beaver dam near the inlet to Pike Lake.
 - Inspections were conducted for Quarry Lake pumping/drawdown into Outlet Channel.
 - Bank Erosion work
 - Jedlicki construction completed the FEMA bank erosion project from 2014 flood in Segments 1, 2, 3, 4, and 7 – more detail in section below
 - Additional bank erosion repair, that was *not* funded by FEMA, was completed while doing FEMA repairs in Segments 3 and 4.
 - Emergency bank stabilization in KiciYapi camp completed by SMSC.
 - Maintained opening and closing of Outlet Structure gates for bank erosion project.
 - Culvert Maintenance
 - Cleared ice jams at culverts along the channel during snowmelt.
 - Emergency culvert repair at KiciYapi culvert completed by SMSC.
 - Beaver buster grate installed at Jeffers Pass culvert.
 - Repaired crushed culvert at Kes Driveway which was likely damaged during the bank erosion repair project.

- Vegetation Maintenance
 - **Segment 1** - Three wild parsnip populations and garlic mustard were treated by AES. The City of Prior Lake staff mowed the dense patch of wild parsnip. Foliar treatments for herbaceous and woody invasive plants were conducted by AES.
 - **Segment 2** - Foliar treatments for woody invasive species were conducted by AES.
 - **Segment 3** - EOR scouted for garlic mustard in the Kici Yapi area previously managed by hand-pulling efforts, but no plants were found. Foliar treatments for woody invasive species were conducted by AES staff.
 - **Segment 4** - Foliar treatments for herbaceous and woody invasive plants were conducted by AES staff. Two large patches of garlic mustard and eight wild parsnip plants were treated by AES.
 - **Segment 5** - Foliar treatments for herbaceous invasive plants were conducted by AES. One purple loosestrife plant was found and subsequently hand removed by EOR staff.
 - **Segment 6** - Foliar treatments for herbaceous invasive plants were conducted by AES.
 - **Segment 7** - Foliar treatments for herbaceous and woody invasive plants were conducted by AES. Over 1,000 leafy spurge flea beetles were collected by EOR and PLSLWD staff from a known population west of Deans Lake and were released in four separate locations where dense patches of leafy spurge were found.



FIGURE 7 PLSLWD INTERNS PULLING INVASIVES TO PROTECT THE FOURPOINT EVENING PRIMROSE

MONITORING

Monitoring along the outlet channel in 2019 consisted of water quantity (flow), water quality (chemistry), vegetation surveys, and erosion monitoring (Figure 8). Some of this monitoring is funded by the MOA cooperators, and some is done for other programs or entities.

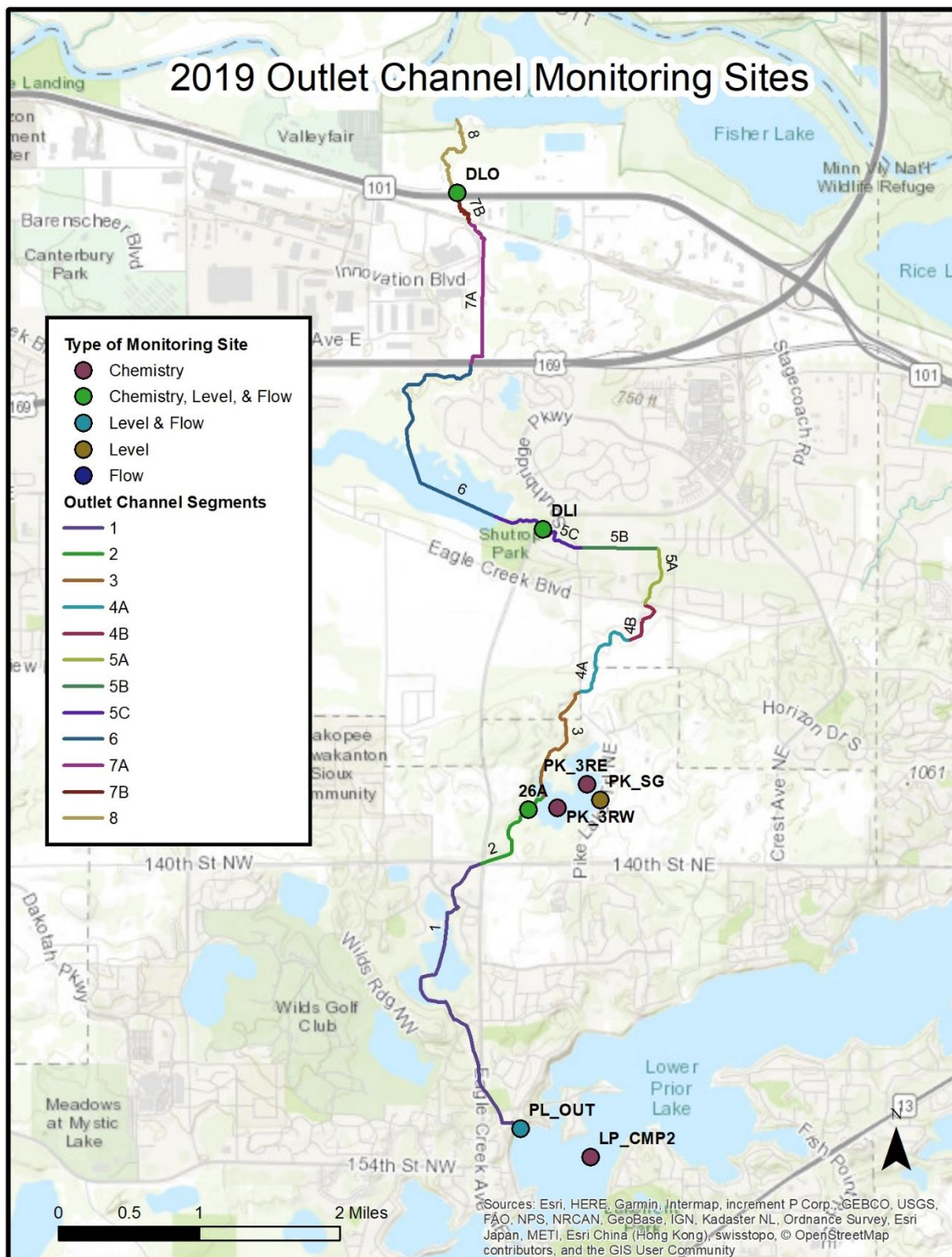


FIGURE 8 – PLOC MONITORING LOCATIONS

MONITORING SITES

From the beginning of the channel to the end, water quality, water level, and flow are collected by a collaboration of several organizations (Table 1).

LP_CMP2: Water quality samples at this site are taken every two weeks by a Citizen-Assisted Monitoring Program volunteer. This water quality data represents the water quality at the very beginning of the channel. Samples are taken every 2 weeks for chlorophyll-A, total kjeldahl nitrogen, total phosphorus, secchi depth and some physical observations.

PL_OUT: This site is located at the Prior Lake Outlet Structure. An automated level logger is connected to the structure and records water levels every 15 minutes. The data is then sent remotely to the PLSLWD website every hour to update the hydrograph and discharge graph. Flow measurements are taken at the end of the outlet pipe, so by comparing flows to lake levels, we can calculate a relationship of lake level and flow. See Attachment F for the annual hydrograph and discharge graph.

26A, DLI, and DLO: These three sites are spaced evenly along the outlet channel. Scott SWCD collected biweekly water quality samples at 26A, DLI, and DLO. Samples include temperature, dissolved oxygen, pH, conductivity, turbidity, secchi tube, total phosphorus, orthophosphorus, nitrite + nitrate, total kjeldahl nitrogen, total suspended solids, total volatile suspended solids, and chloride data. DLI sampling was paid for by Lower Minnesota River Watershed District. 26A and DLO were paid for by PLSLWD, not the PLOC Cooperators.

PK_3RW and PK_3RE: Three Rivers Park District monitored lake water quality at two sites on Pike Lake, PK_3RW (west bay of Pike Lake) and PK_3RE (east bay of Pike Lake). Samples are collected bimonthly and analyzed at Three Rivers Park District's laboratory. Parameters that are sampled include temperature, dissolved oxygen, pH, conductivity, secchi, Chlorophyll-a, total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorides. Results for these sites can be found on the PLSLWD website.

PK_SG: This site is located on the very east side of Pike Lake. An automated level logger was connected to a DNR-surveyed staff gauge. The level logger records water levels every 15 minutes and then sends the data remotely to the PLSLWD website every hour to update the hydrograph. Flow measurements are not taken at this site. See Attachment F for the annual hydrograph.

TABLE 1 DESCRIPTION OF MONITORING SITES

Site	Waterbody Type	Location	Monitored By	Type of Monitoring
LP_CMP2	Lake	SW end of Lower Prior Lake in deep spot	Citizen Assisted Monitoring Program (CAMP) Volunteer – Steve Reinders	Lake Water Quality
PL_OUT	Lake	Prior Lake Outlet Structure	PLSLWD Staff	Lake level and flow
26A	Stream	Prior Lake Outlet Channel in Pike Lake Park	PLSLWD and SWCD Staff	Stream chemistry, water level, and flow
PK_3RW	Lake	West bay of Pike Lake	Three Rivers Park District	Lake Water Quality
PK_3RE	Lake	East bay of Pike Lake	Three Rivers Park District	Lake Water Quality
PK_SG	Lake	Pike Lake Staff Gauge on east side of lake	PLSLWD	Lake Level

Site	Waterbody Type	Location	Monitored By	Type of Monitoring
DLI	Stream	Prior Lake Outlet Channel at Hwy 21 before entering Dean Lake	Scott SWCD	Stream chemistry, water level, and flow
DLO	Stream	Prior Lake Outlet Channel at Hwy 101 near end of channel	PLSLWD and Scott SWCD	Stream chemistry, water level, and flow

MONITORING DATA

Water level is recorded every 15 minutes at four points along the channel. Flow is shown to increase as water travels downstream from the Outlet Structure to the end of the PLOC. In 2019, the maximum flow leaving the Outlet Structure was calculated as 57 cubic feet per second (cfs) and 85 cfs near the end of the channel. This increase is due in part to runoff in the PLOC watershed, but also influences from groundwater seeps mostly starting downstream of CR16.

Water chemistry samples are taken every two weeks at each of the four above-mentioned water level sites. The following table shows the average of each site in 2019. Most parameters are very similar. The most notable changes are increases in TP and sediment at site DLI, which then drop again by the time it reaches DLO. In general, the water quality is very good along the channel, but it is clearest and best at the end.

TABLE 2 – 2019 AVERAGES OF STREAM SITES

Site	CL mg/L	COND uS/cm	DO mg/L	PH units	Nitrates mg/L	Temp C	TP mg/L	Turbidity NTRU	TSS mg/L	T TUBE cm	VSS mg/L
26A	57	442	9.4	8.1	0.20	16.7	0.037	5	10	83	2.8
DLI	51	454	8.8	7.9	0.22	16.1	0.057	8	17	72	4.0
DLO	53	436	8.3	7.8	0.20	16.5	0.036	2	4	>100	2.0

PRECIPITATION

Precipitation can highly affect water quality and water levels. Precipitation was recorded at the PLSLWD office using a manual rain gauge provided by the State Climatologist. 2019 was above average by exactly 9" with 39.95" of rainfall at the District rain gauge, and even more in other areas of the watershed and county. 2019 was declared the wettest year in recorded history. Luckily, the rain was spread-out over the year and the lake only surpassed the Ordinary High-Water level of 903.9' for four days during ice-free conditions, which enacted the no-wake policy on Prior Lake from April 22-29. The precipitation data is summarized in Attachment G.

VEGETATION AND EROSION MONITORING

The Prior Lake Outlet Channel has been routinely inspected twice annually to document the channel condition, survey debris and log jams, and inspect culverts and road crossings for obstructions of flow. Starting in the fall of 2017, a vegetation assessment was conducted concurrently with the channel condition inspection to assess previously managed areas for invasive plant species and document any satellite populations of invasive species growing within the PLOC easements. Following the assessment, recommendations have been provided to address certain populations of invasive species growing along the channel.

The PLOC was assessed on foot from Segment 1 to Segment 7 on May 16, July 12, and September 24, 2019. Segment 8, which is under management by the United States Fish & Wildlife Service, was not assessed. For the spring and fall assessments, a series of photographs were taken in each segment to characterize the condition of the outlet channel, assess any new areas of bank erosion, and document any obstructions to flow such as fallen trees, debris piles, or culvert blockages.

These reports can be found on the PLSLWD website with a summary of recommendations for continued channel and vegetation management in 2020.



**FIGURE 9 DEBRIS IN SEGMENT 8 ON
SEPTEMBER 24, 2019**

PERMITS

In 2019, the District had two open permits along the PLOC:

- Permit #10.02 *Jeffers Waterfront*: The District will complete the final inspection and close the permit in 2020.
- Permit #11.03 *Jeffers Pointe*: The District and the City of Prior Lake are coordinating to ensure proper establishment of the raingarden, at which time this permit will be closed.

EASEMENTS

The District holds drainage easements along most of the Outlet Channel. An easement allows the District to access and maintain the channel and the land within the easement area. For example, because of damage in the channel by the 2014 flood, bank repair was needed along much of the channel. During the preparatory review process for this work, it had come to light that some of the easements are inaccurate and need to be amended. This could be because the channel has shifted over time, or due to errors in the legal description when it was originally established. Although the existing easements may be erroneous, the District retains prescriptive rights along the channel.

No easements were amended in 2019. There are still many locations along the channel that need easements or alignment amendments, but the Cooperators have generally accepted that we won't pursue easement purchases or amendments until the landowner changes hands or development occurs. A spreadsheet exists in the PLSLWD files that describes each potential easement purchase or amendment.

OTHER ACTIVITIES

2014 FLOOD DAMAGE REPAIRS

The Prior Lake Outlet Channel incurred substantial damage during the 2014 flood, including downed trees, accumulated woody debris, sediment accumulation, culvert damage and over 2.8 miles of bank erosion. In 2015, most of the tree and woody debris removal work was completed and one of the culverts (KiciYapi) was repaired by the Shakopee Mdewakanton Sioux Community. Removal of the remaining trees and woody debris, culvert repairs (Gonyea and Kes Field Crossing), and Pike Lake Park stream crossing repair work was completed in 2016. The sediment delta was excavated in spring of 2018.

Due to permit and engineering design delays, the Bank Erosion project didn't begin until 2019, however, the flood damage repair was fully complete in the fall of 2019. The Federal Emergency Management Administration (FEMA) has approved federal funding to cover 75% of the costs of the 2014 flood damage to the PLOC. The State of Minnesota will pay the remaining 25%.



FIGURE 10 INSTALLING ROOT WAD FOR BANK EROSION REPAIR IN SEGMENT 4



FIGURE 11 ROCK RIPRAP BANK REPAIR IN SEGMENT 2

Some bank erosion repair was completed at the same time the FEMA project was being done. Segment 3 and Segment 4 both had some construction work done in fall of 2019 while another contractor was doing the flood damage repair. This work was not paid for by FEMA because it was not caused by the flood. See Figure 11 for project in segment 4 that was completed with “non-FEMA” money.



FIGURE 12 “BEFORE” AND “AFTER” PICTURES OF NON-FEMA FUNDED BANK EROSION REPAIR THAT WAS COMPLETED IN FALL OF 2019

MASTER PLAN

A master plan was created and last updated by EOR on 12/26/2019. The purpose of the master plan was to provide a history of maintenance and repairs in the channel and assess the current conditions of the Prior Lake Outlet Channel (PLOC) from a channel capacity, bank stability, easement alignment with physical conditions, and invasive species management standpoint. The cooperators requested this master plan be developed to have all Outlet Channel repairs and maintenance in one place and further guide PLOC MOA activities to get the channel in a state of completion. Once all the repairs are complete, the cooperators may consider taking over their own segments and maintaining them without the guidance of the PLOC cooperators.

QUARRY LAKE DRAWDOWN

Quarry Lake is located along the east side of the Outlet Channel in Segment 7. It has experienced rising water levels over the years, especially in 2019, which caused erosion along the banks. Pumps were installed in Quarry Lake, which pulled the water out and through a filter which then flowed to the Outlet Channel. See Figure 13 for drawdown plan and Figure 12 for pictures of pumping procedure.

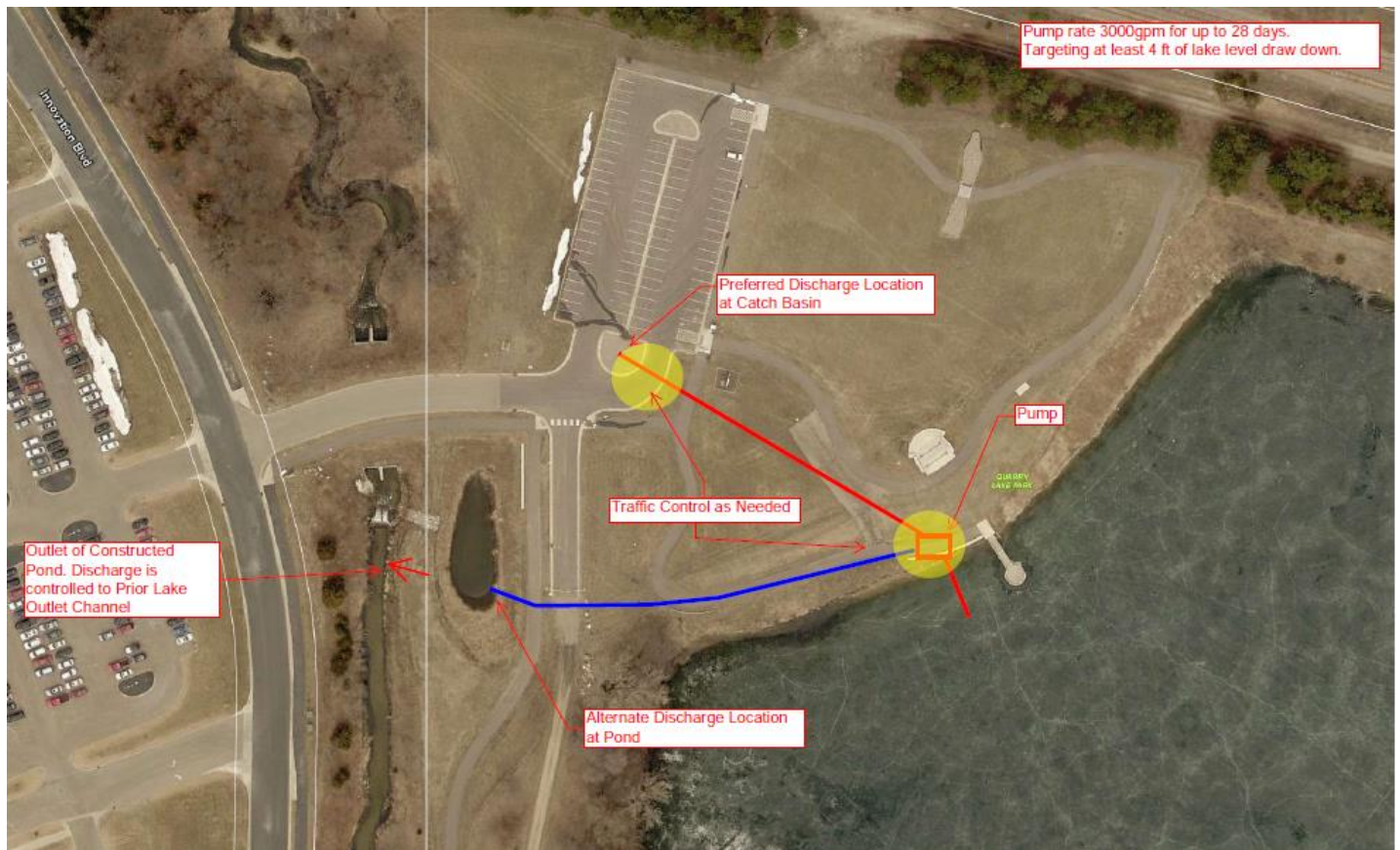
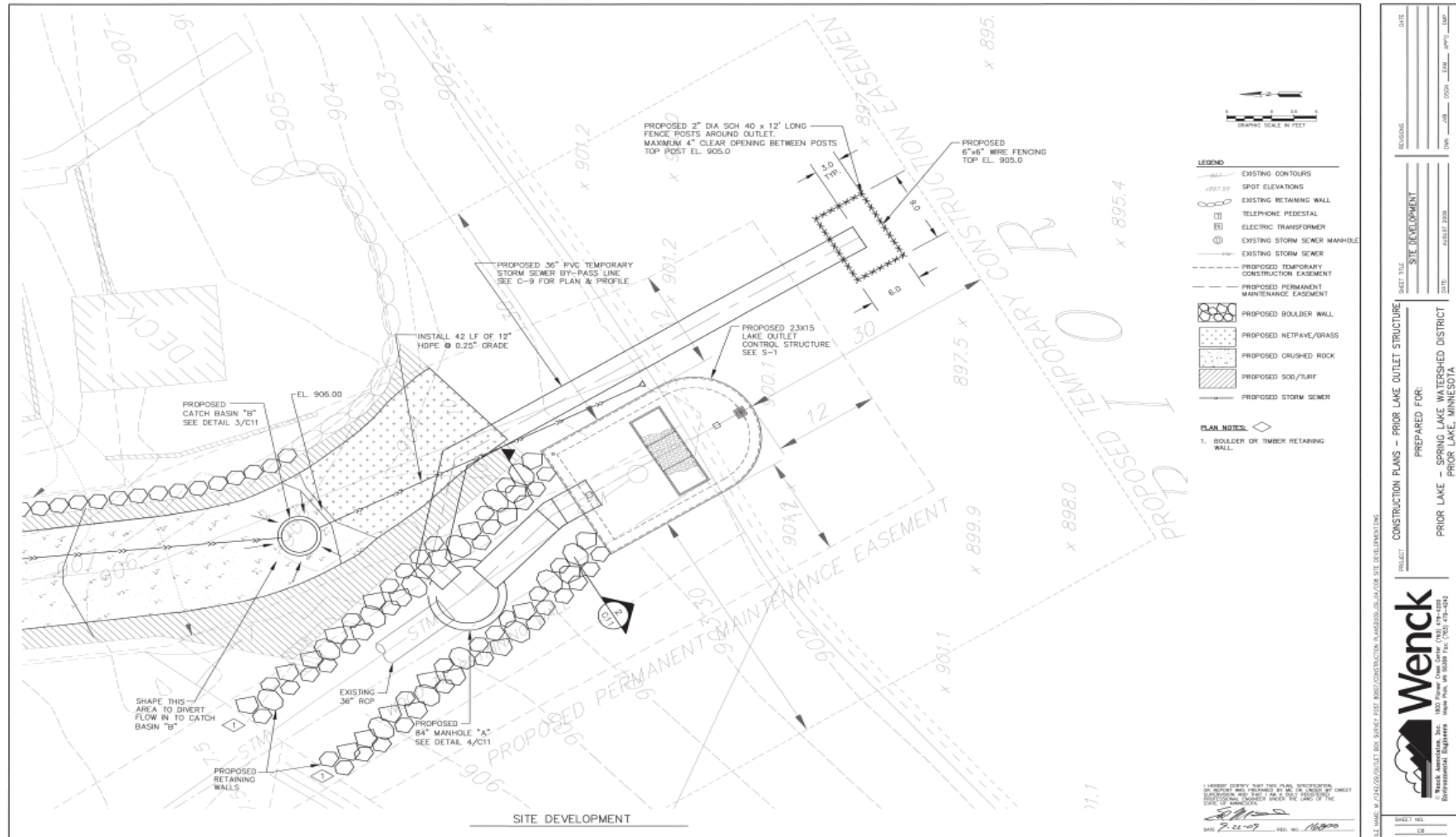


FIGURE 13 QUARRY LAKE DRAWDOWN PLAN



FIGURE 14 QUARRY LAKE PUMP (LEFT) AND FILTRATION AREA (RIGHT)

Attachment A. Prior Lake Outlet Structure Diagram

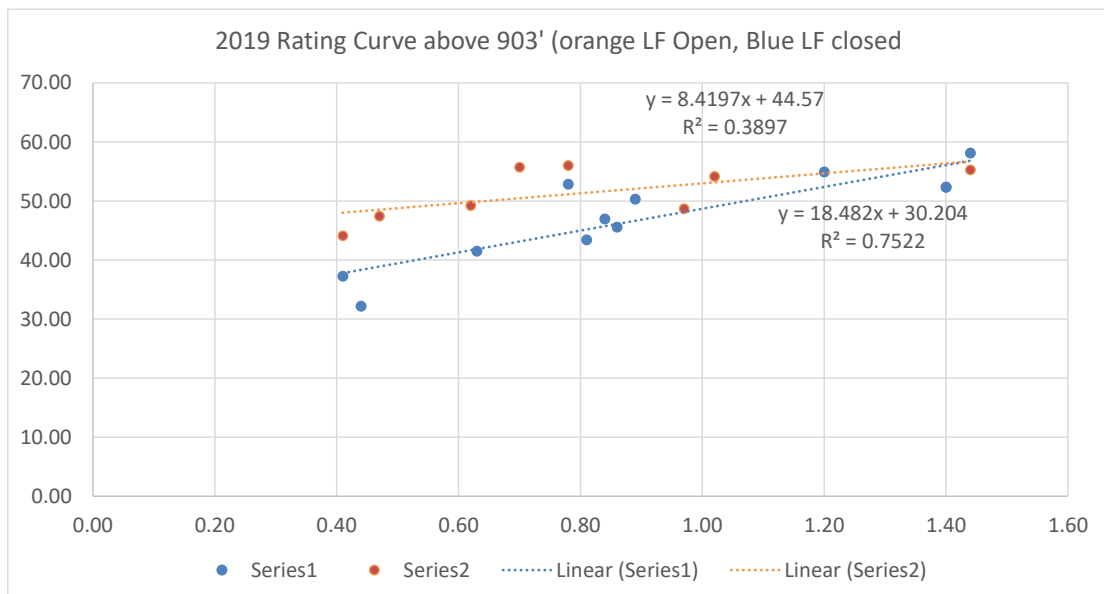
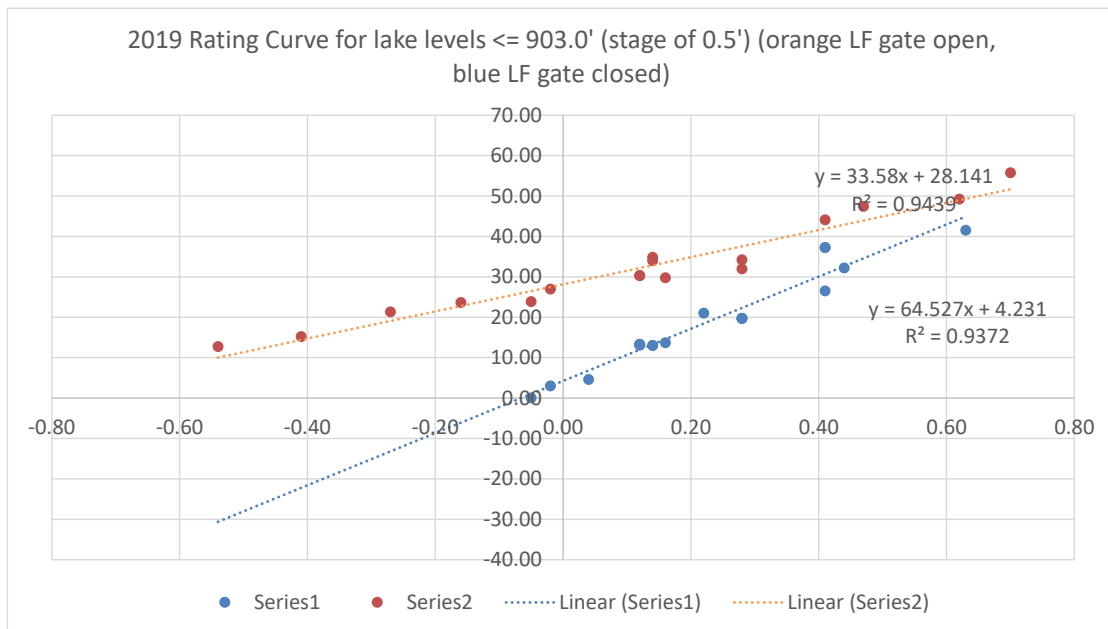


Attachment B. Annual Outlet Channel Operations Summary

Date	Elevation	Outlet Activity	Inspections/Channel Activity
1/8/2019	902.52	Inspection	Vegetation on jeffers grate, ~8-10" blockage, open water. Beaver activity at Pike Lake Park. Removed Ott Logger from Pike Lake.
2/5/2019	902.60	Inspection	Took measurements of the lake elevation for Ott adjustment. Some debris on Jeffers pass.
3/5/2019	902.60	Inspection/Interview	Channel 5 interviewed us about the low-flow gate and went to structure with us.
3/5/2019	902.60	Gate adjustment	Opened Low-Flow Gate @ 15:30. Only 10 full rotations because we were worried about ice jams in the channel.
3/7/2019	902.56	Inspection	LF gate still 10 full turns open. Some veg on beaver buster at jeffers. Ice/slush/water pooling at kes field crossing and pike lake park. Flow had not reached strauss driveway yet. Potential for flooding at jackson trail.
3/15/2019	902.80	Inspection	City PL removed vegetation from jeffers pass beaver buster. Water going over top of beaver buster. Bank erosion construction in the stream. Lots of mud. Biologs not staked in. Talked to Nate and Cole (foreman)... they were installing biologs. Nate doesn't know if they'll be mulching. They don't normally mulch - usually blanket. Could stake biologs when it warms up, but aren't now. Construction in stream causing very turbid water. They are removing trees and added rock to the banks. Strauss Driveway under water - no vortex. CR16 clear, but silt curtain broke and Jedlicki doing work in Meuhlenhardt property. Ponds just north of CR16 are about even with the channel and erosion from the ponds into the stream. Channel is flooded over banks in Noecker property.
3/15/2019	902.80	Monitoring	6.26' Pike Lake staff gauge - actual water level.
3/19/2019	903.10	Gate adjustment	Opened LF gate 100% at 13:00. 28 turns to open in the rest of the way. Took lots of video.
3/19/2019	903.10	Inspection	Water ~2' above new beaver buster. Talked to city pl. Water above banks at CR42 - lots of grass on grates. Called county to make aware. Water above culvert at Kes Driveway, still flowing, very turbid from all the bank stabilization work. Road is a mess - 2-8" of muck. Water above culvert at strauss creating vortex, some debris at culvert top of water, talked with Jim Strauss, yellow lab is Cricket, st bernard is Nancy or Patty.
3/19/2019	903.10	Monitoring	Installed Ott Logger at 15:40. DNR staff gauge at 5.96' - 1" top ice/~1' water/solid ice to bottom? Zip tied level logger up above bottom ice.
3/25/2019	903.63	Inspection	Water spilling over structure at Jeffers Beaver Buster, way down from last week. Lots of debris at CR42, removed top half of debris from grate, water in flood plain. Water at top of culvert at Kes driveway and field crossing. Cleared debris at Strauss, vortex.
3/25/2019	903.63	Monitoring	Installed level logger at Pike Lake Park. Pike Lake Staff Gauge at 5.70.
4/3/2019	903.90	Inspection	Water going through top of beaver buster at jeffers. Pike Lake ice-free. KiciYapi culvert "blown out". Met Steve Fisher on site with SMSC. Water short cutting around culvert. Temp fix soon. Strauss culvert water above culvert with lots of debris, cattails, logs, tire but did not remove.
4/17/2019	903.70	Inspection	Water going through top of beaver buster. Lots of grass at CR42 culvert - called county, high water. Water above culvert at kes culvert, cleared logs, sticks, large log still jammed in culvert. Water above both Kinney culverts. Water above culvert at strauss, lots of floating debris.
4/17/2019	903.70	Monitoring	Staff gauge straightened out and surveyed by DNR recently.
4/30/2019	903.80	Inspection	Water at top of beaver buster, appears pond is going down. Water above culvert top at Kes, large log still in water. Lots of floating debris at Strauss, unable to see upstream culvert, flowing well.
5/7/2019	903.70	Inspection	Cleared debris at structure. Culvert at Kes Driveway has been damaged, upstream smashed in reducing flow. Silt fence still in channel near pike lake park. Water level still at top of culverts at Kinney.
5/28/2019	903.65	Inspection	Water spilling into top of beaver buster, emailed pete. Kes driveway culvert submerged by a few inches. Suckers or carp on upstream side of Kinney driveway. Pike staff gauge under water. Lots of debris at Strauss, emailed Lillehaug.
6/4/2019	903.73	Inspection	Veg on outlet structure affecting water level by about 1/2", boards, clp, coontail, willow branches. Water ~1/2" above beaver buster cment pad. 2 logs crossed upstream at RR culvert. Water above culvert at Kes Driveway. Water over both culverts at Kinney. Lots of floating debris at Strauss.
6/11/2019	903.60	Inspection	Mowed weeds at outlet structure and removed minnow traps. Water atop beaver buster, carp near bb. Water at top of Kes culvert, some erosion next to culvert. Silt fence causing flow disruption at Pike Lake Park. Water above culverts at Kinney. Floating debris at strauss and can't see culvert. Large tree across channel in Pike Lake Park but not effecting flow. Cleared log from Jackson Trl.

Date	Elevation	Outlet Activity	Inspections/Channel Activity
6/18/2019	903.20	Inspection	Cleared veg from outlet structure. City summer staff recently cleared veg from Beaver Buster (BB), carp present near BB. Water at top of Kes culvert, erosion on east side of upstream side of culvert. Silt curtain at stream in Pike Lake Park still in place and diverting flow. Lots of debris at Strauss. Talked with guy at Jackson Trail, said eh was unhappy with erosion and water going through his property.
7/3/2019	902.90	Inspection	Cleared veg from structure on 7/1, 7/2, 7/3. Weed whipped 7/1. Cleared veg and carp from BB grate. Erosion at CR42 getting worse. Took pics of kes culvert damage. Silt fence still in channel at pike lake park. Water level down at strauss, still lots of large logs and debris, water above culvert.
7/9/2019	902.82	Gate adjustment	Closed Low-Flow gate.
7/9/2019	902.82	Inspection	Cleared veg from outlet strucutre and BB. Silt curtain at entrance to Pike Lake. Debris piling on shore at strauss.
8/6/2019		Inspection	Interns did inspection - not sure they were where they thought they were.
8/15/2019		Inspection	Interns did inspections - "good water flow"
8/20/2019	902.78	Inspection	cleared outlet structure yesterday. Biologs still in place at Pike Lake Park from FEMA work.
8/27/2019		Inspection	cleared lots of veg from outlet structure. Smells like dead turtles at BB. Biologs still at Pike Lake Park and down tree doesn't appear to be causing issues.
9/3/2019	902.56	Inspection	Cleared Outlet Structure (OS) and weed whipped. Rip rap rocks touching BB grate. Tree in Pike Lake Park was removed. Carp in channel near gonyea.
9/16/2019	902.86	Inspection	Lots of veg and BG algae at OS, removed veg. BB plugged w/veg. Some debris at CR42. Kes culvert needs to be fixed, talked to Nick Monserud.
9/19/2019	902.86	Monitoring	Pike Lake staff gauge 4.52 @ 11:40
10/1/2019	902.71	Inspection	cleared veg at OS. Grass on CR42 grates. Pumping from Quarry Lake still occuring to settling pond which then goes into channel.
10/2/2019	902.75	Gate adjustment	Opened low flow gate ahead of bank erosion project to create storage in lake in addition to forecasted rain. Article written for website.
10/4/2019	902.67	Gate adjustment	Closed main gate to prevent negative impacts during stream bank construction activities. Low-Flow gate open, but not operating because main gate is closed.
10/9/2019	902.92	Gate adjustment	Opened main gate to allow high lake levels to drop. Low-Flow gate open.
10/14/2019	902.79	Gate adjustment	Closed main gate to prevent negative impacts during stream bank construction activities. Low-Flow gate open, but not operating because main gate is closed.
10/28/2019	903.21	Gate adjustment	Opened main gate to allow high lake levels to drop. Bank erosion construction complete. Low-flow gate open.
11/5/2019	902.89	Inspection	Cleared lots of leaves from OS. Water down at BB, not submerged. No signs of recent beaver activity at fountain hills. Lots of debris at strauss. Plastic erosion netting in segment 8.
11/5/2019	902.89	Monitoring	Pike Lake staff gauge 5.46 (wavy) and DLO staff gauge 1.26'.
11/13/2019	902.54	Inspection	LF gate open, water barely over wier. Cleared logs, sticks, leaves from CR42 grate. New No Trespassing sign at Kinney Driveway. Large 8x8 timber and large log blocking strauss culvert - removed some smaller stuff.
11/19/2019	902.40	Inspection	Cleared leaves from OS. Evidence of aspen trees downed by beaver near fountain hills. Water level down at strauss, 6x6 log removed.
12/4/2019	902.24	Inspection	Removed a few leaves at OS.
12/19/2019	902.04	Gate adjustment	Close low-flow gate. Main gate open.

Attachment C. Stage-Discharge Relationship



Attachment D. Volumes Discharged from Prior Lake

Volumes Discharged from the Prior Lake Outlet and Associated Elevations								
Year	Volume Discharged (ac*ft)	Depth Eliminated from Lake (ft)	Min Elevation for the Year	Date of Min Elevation	Max Elevation for the Year	Date of Max Elevation	Max Elevation <i>without</i> Outlet	Annual Rainfall
2019	21468	10.40	902.02	12/19/2019	903.93	3/30/2019	914.33	39.95
2018	11785	5.98	902.00	9/16/2018	903.32	6/26/2018	909.30	34.52
2017	11942	6.00	902.35	8/13/2017	903.56	5/29/2017	909.56	32.4
2016	9351	4.80	902.02	8/9/2016	903.93	12/1/2016	908.73	36.74
2015	3043	1.60	901.09	3/20/2015	902.91	12/21/2015	904.51	35.74
2014	12028	6.10	900.1	3/28/2014	906.16	6/30/2014	912.26	36.44
2013	7609	3.93	900.25	3/28/2013	903.95	7/22/2013	907.88	33.25
2012	5751	3.00	900.48	12/6/2012	903.59	6/25/2012	906.59	30.57
2011	20314	9.93	900.87	12/28/2011	903.95	4/5/2011	913.88	26.07
2010	1110	0.59	899.38	1/14/2010	902.78	12/23/2010	903.37	37.23
2009	0	0.00	898.98	9/30/2009	900.44	4/29/2009	900.44	27.41
2008	4993	2.61	900.28	12/29/2008	902.90	5/8/2008	905.51	23.88
2007	1395	0.74	900.55	8/10/2007	902.78	4/23/2007	903.52	28.59
2006	4331	2.27	900.50	12/14/2006	903.27	4/7/2006	905.54	27.77
2005	2299	1.21	900.71	1/18/2005	903.10	10/18/2005	904.31	38.02
2004	13	0.01	900.50	4/15/2004	902.79	7/12/2004	902.80	32.96
2003	5921	3.08	900.62	12/30/2003	903.17	5/23/2003	906.25	23.00
2002	9520	4.88	900.70	3/4/2002	903.60	9/10/2002	908.48	41.96
2001	8692	4.47	901.04	12/28/2001	904.28	5/7/2001	908.75	28.52
2000	80	0.04	901.52	2/20/2000	903.00	7/11/2000	903.04	26.09
1999	6240	3.24	902.00	11/25/1999	904.78	5/27/1999	908.02	33.29
1998			902.05	1/1/1998	903.90	4/13/1998		35.00
1997	4150	2.18	901.20	2/28/1997	902.90	4/21/1997	905.08	32.36
1996			900.77	11/4/1996	902.98	4/10/1996		26.52
1995			902.26	9/26/1995	903.25	3/30/1995		30.62
1994	1760	0.93	901.90	9/7/1994	903.05	10/24/1994	903.98	35.28
1993	10000	5.12	902.00	3/9/1993	904.49	7/14/1993	909.61	36.40
1992	8331	4.29	899.95	2/19/1992	903.16	10/12/1992	907.45	35.86
1991			898.11	4/1/1991	900.92	6/13/1991		
1990			895.46	4/24/1990	899.38	8/10/1990		
1989			895.49	11/27/1989	897.15	4/3/1989		
1988			896.90	11/11/1988	899.63	1/1/1988		
1987			899.63	12/31/1987	901.54	3/6/1987		
1986			901.22	2/14/1986	903.96	5/15/1986		
1985			902.23	9/12/1985	903.93	4/25/1985		
1984			901.75	10/9/1984	903.60	6/24/1984		
1983	Outlet Installed		901.76	1/17/1983	905.68	7/20/1983		
1982			900.06	3/24/1982	902.56	5/21/1982		
1981			898.91	7/31/1981	899.88	9/17/1981		
1980			899.92	12/29/1980	902.60	4/18/1980		
Average	6312 (when operated)	3.23 (when operated)	900.41		902.88		906.50	32.00
Unless otherwise noted, data is taken from annual Prior Lake Outlet operations reports								
Italicized rainfall data is from MN Climatology office for 115N, 22W, 15 Prior Lake; all other rainfall as recorded at PLSLWD Office								
Italicized lake level data is from PLSLWD Historic Volunteer Collected Lake Level Data								

Attachment E. Prior Lake Elevations and Precipitation

Elevation		Precipitation	
Average	902.92	Yearly Total	39.95
Minimum	902.02	Max 1 Day	2.26
Maximum	903.93		

Automated Logger is an Ott Ecolog 500 located on the outside of the trash barrier on the Outlet Structure. Values are averaged daily.

Staff Gage is located under Highway 21 Wagon Bridge on pillar. The automated logger is calibrated to the staff gauge readings.

Precipitation from the MN Climatology Working Group- BYRG at T114N, 22W, 4

Logger malfunctioned after November 19 and no viable data was recorded for the rest of the year.

Date	Auto Logger	Staff Gage	Precipitation
1/1	902.65		0.04
1/2	902.59		0.00
1/3	902.59		0.00
1/4	902.59		0.00
1/5	902.63		0.00
1/6	902.60		0.00
1/7	902.60		0.00
1/8	902.64		0.00
1/9	902.63		0.00
1/10	902.57		0.00
1/11	902.56		0.00
1/12	902.60		0.00
1/13	902.57		0.00
1/14	902.53	902.52	0.00
1/15	902.53		0.00
1/16	902.54		0.00
1/17	902.52		0.00
1/18	902.56		0.00
1/19	902.56		0.18
1/20	902.57		0.00
1/21	902.50		0.00
1/22	902.50		0.04
1/23	902.49		0.00
1/24	N/A		0.00
1/25	N/A		0.00
1/26	N/A		0.00
1/27	N/A		0.03
1/28	N/A		0.45
1/29	N/A		0.00
1/30	N/A		0.00
1/31	N/A		0.00
2/1	N/A		0.00
2/2	N/A		0.00
2/3	N/A		0.00
2/4	N/A		0.07
2/5	N/A		0.00
2/6	N/A		0.28
2/7	902.62		0.04
2/8	902.61		0.25

Date	Auto Logger	Staff Gage	Precipitation
2/9	902.60		0.00
2/10	902.61		0.01
2/11	N/A		0.22
2/12	902.63		0.27
2/13	902.62		0.04
2/14	902.62		0.00
2/15	902.61		0.02
2/16	902.61		0.00
2/17	902.61		0.00
2/18	902.60		0.07
2/19	902.60		0.00
2/20	902.62		0.14
2/21	902.63		0.42
2/22	902.62		0.00
2/23	902.62		0.11
2/24	902.63		0.19
2/25	902.62		0.00
2/26	902.61		0.00
2/27	N/A		0.04
2/28	N/A		0.00
3/1	902.61		0.00
3/2	902.61		0.21
3/3	902.60		0.00
3/4	902.60		0.00
3/5	902.59	902.59	0.00
3/6	902.58		0.00
3/7	902.56		0.00
3/8	902.55		0.00
3/9	902.55		0.00
3/10	902.59		0.93
3/11	902.58		0.00
3/12	902.58		0.00
3/13	902.62		0.28
3/14	902.76		0.49
3/15	902.86		0.48
3/16	902.90		0.00
3/17	902.96		0.00
3/18	903.03		0.00
3/19	903.12	903.12	0.00
3/20	903.22		0.00
3/21	903.32		0.00
3/22	903.41		0.00
3/23	903.49		0.00
3/24	903.59		0.00
3/25	903.68		0.00
3/26	903.75		0.00
3/27	903.82		0.00
3/28	903.87		0.00
3/29	903.90		0.00
3/30	903.92		0.00
3/31	903.92		0.00

Date	Auto Logger	Staff Gage	Precipitation
4/1	903.92		0.00
4/2	903.91		0.00
4/3	903.89		0.00
4/4	903.86		0.00
4/5	903.84		0.02
4/6	903.85		0.50
4/7	903.84		0.00
4/8	903.82		0.02
4/9	903.79		0.00
4/10	903.77		0.00
4/11	903.81		0.00
4/12	903.80		0.00
4/13	903.76		0.00
4/14	903.73		0.00
4/15	903.69		1.45
4/16	903.66		0.00
4/17	903.71		0.00
4/18	903.79		1.25
4/19	903.82		0.00
4/20	903.84		0.00
4/21	903.87		0.00
4/22	903.90	903.94	0.05
4/23	903.92		0.34
4/24	903.92		0.00
4/25	903.91		0.00
4/26	903.89		0.00
4/27	903.86		0.00
4/28	903.83		0.00
4/29	903.79		0.00
4/30	903.76		0.00
5/1	903.75		0.46
5/2	903.72		0.00
5/3	903.68		0.00
5/4	903.64		0.06
5/5	903.60		0.00
5/6	903.54	903.52	0.00
5/7	903.48		0.00
5/8	903.49		0.00
5/9	903.57		1.96
5/10	903.54		0.00
5/11	903.52		0.00
5/12	903.50		0.03
5/13	903.46		0.00
5/14	903.43		0.00
5/15	903.45		0.18
5/16	903.43		0.07
5/17	903.39		0.00
5/18	903.37		0.37
5/19	903.42		0.56
5/20	903.41		0.56
5/21	903.39		0.00

Date	Auto Logger	Staff Gage	Precipitation
5/22	903.46		0.67
5/23	903.48	903.47	0.37
5/24	903.47		0.05
5/25	903.46		0.04
5/26	903.44		0.00
5/27	903.52		0.04
5/28	903.64		2.07
5/29	903.68		0.00
5/30	903.71		0.00
5/31	903.74		0.00
6/1	903.76		0.11
6/2	903.76		0.00
6/3	903.74		0.00
6/4	903.75		0.00
6/5	903.80		0.74
6/6	903.78		0.00
6/7	903.74		0.00
6/8	903.70		0.00
6/9	903.65		0.00
6/10	903.59		0.00
6/11	903.55		0.00
6/12	903.51		0.42
6/13	903.45		0.00
6/14	903.38		0.00
6/15	903.33		0.05
6/16	903.27		0.03
6/17	903.22		0.00
6/18	903.15		0.00
6/19	903.09		0.00
6/20	903.04		0.00
6/21	903.01		0.47
6/22	902.95		0.00
6/23	902.91		0.05
6/24	902.92		0.39
6/25	902.87		0.03
6/26	902.82		0.00
6/27	902.80		0.00
6/28	902.77		0.43
6/29	902.71		0.00
6/30	902.69		0.00
7/1	902.94		2.26
7/2	902.95		0.15
7/3	902.93		0.00
7/4	902.91		0.07
7/5	902.91		0.00
7/6	902.91		0.28
7/7	902.88		0.00
7/8	902.84		0.00
7/9	902.82	902.80	0.00
7/10	902.83		0.51
7/11	902.81		0.17

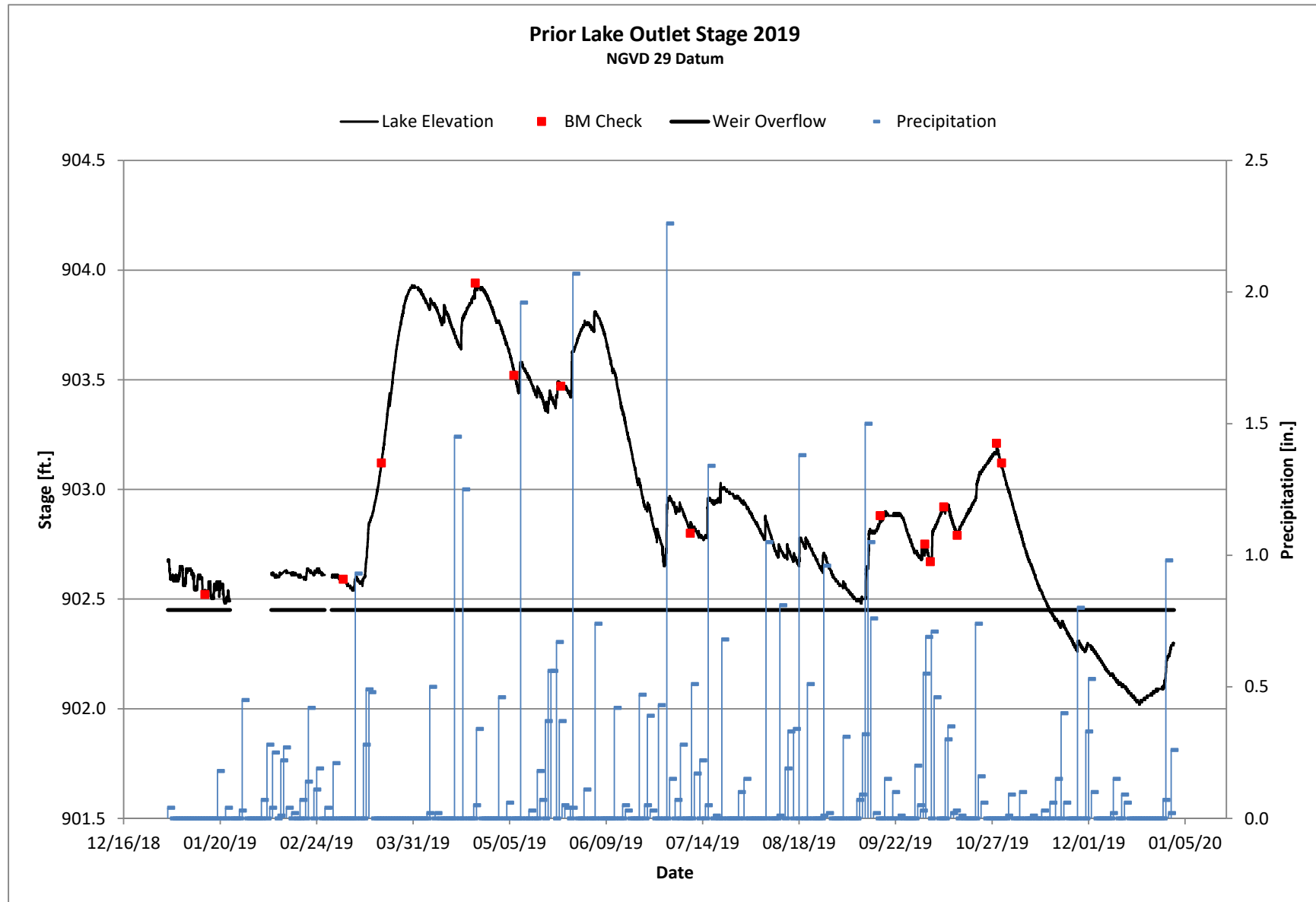
Date	Auto Logger	Staff Gage	Precipitation
7/12	902.79		0.00
7/13	902.78		0.22
7/14	902.78		0.00
7/15	902.82		0.05
7/16	902.96		1.34
7/17	902.94		0.00
7/18	902.94		0.01
7/19	902.95		0.00
7/20	902.98		0.00
7/21	903.01		0.68
7/22	903.00		0.00
7/23	902.99		0.00
7/24	902.98		0.00
7/25	902.97		0.00
7/26	902.96		0.00
7/27	902.96		0.10
7/28	902.94		0.00
7/29	902.93		0.15
7/30	902.91		0.00
7/31	902.89		0.00
8/1	902.87		0.00
8/2	902.85		0.00
8/3	902.82		0.00
8/4	902.80		0.00
8/5	902.80		0.00
8/6	902.84		1.05
8/7	902.80		0.00
8/8	902.76		0.00
8/9	902.72		0.00
8/10	902.71		0.01
8/11	902.72		0.81
8/12	902.70		0.00
8/13	902.71		0.19
8/14	902.72		0.33
8/15	902.69		0.00
8/16	902.69		0.34
8/17	902.67		0.00
8/18	902.76		1.38
8/19	902.75		0.00
8/20	902.75		0.00
8/21	902.75		0.51
8/22	902.72		0.00
8/23	902.70		0.00
8/24	902.67		0.00
8/25	902.65		0.00
8/26	902.66		0.01
8/27	902.69		0.96
8/28	902.66		0.02
8/29	902.63		0.00
8/30	902.60		0.00
8/31	902.58		0.00

Date	Auto Logger	Staff Gage	Precipitation
9/1	902.57		0.00
9/2	902.56		0.00
9/3	902.56		0.31
9/4	902.54		0.00
9/5	902.53		0.00
9/6	902.51		0.00
9/7	902.50		0.00
9/8	902.50		0.07
9/9	902.49		0.09
9/10	902.50		0.32
9/11	902.61		1.50
9/12	902.76		1.05
9/13	902.81		0.76
9/14	902.81		0.02
9/15	902.83		0.00
9/16	902.85	902.88	0.00
9/17	902.87		0.00
9/18	902.89		0.15
9/19	902.88		0.00
9/20	902.88		0.00
9/21	902.88		0.10
9/22	902.89		0.00
9/23	902.89		0.01
9/24	902.87		0.00
9/25	902.84		0.00
9/26	902.80		0.00
9/27	902.76		0.00
9/28	902.73		0.00
9/29	902.71		0.20
9/30	902.70		0.05
10/1	902.70		0.03
10/2	902.72	902.75	0.55
10/3	902.72		0.69
10/4	902.68	902.67	0.00
10/5	902.78		0.71
10/6	902.83		0.46
10/7	902.86		0.00
10/8	902.89		0.00
10/9	902.91	902.92	0.00
10/10	902.92		0.30
10/11	902.91		0.35
10/12	902.86		0.02
10/13	902.82		0.03
10/14	902.80	902.79	0.00
10/15	902.83		0.01
10/16	902.85		0.00
10/17	902.88		0.00
10/18	902.90		0.00
10/19	902.92		0.00
10/20	902.94		0.00
10/21	903.01		0.74

Date	Auto Logger	Staff Gage	Precipitation
10/22	903.07		0.16
10/23	903.09		0.06
10/24	903.11		0.00
10/25	903.12		0.00
10/26	903.14		0.00
10/27	903.16		0.00
10/28	903.18	903.21	0.00
10/29	903.16		0.00
10/30	903.11	903.12	0.00
10/31	903.06		0.00
11/1	903.01		0.01
11/2	902.97		0.09
11/3	902.93		0.00
11/4	902.88		0.00
11/5	902.84		0.00
11/6	902.80		0.10
11/7	902.75		0.00
11/8	902.71		0.00
11/9	902.67		0.00
11/10	902.64		0.01
11/11	902.61		0.00
11/12	902.57		0.00
11/13	902.54		0.00
11/14	902.52		0.03
11/15	902.49		0.00
11/16	902.46		0.00
11/17	902.44		0.06
11/18	902.42		0.00
11/19	902.40		0.15
11/20	902.38		0.00
11/21	902.39		0.40
11/22	902.37		0.06
11/23	902.34		0.00
11/24	902.32		0.00
11/25	902.30		0.00
11/26	902.28		0.00
11/27	902.30		0.80
11/28	902.28		0.00
11/29	902.26		0.00
11/30	902.28		0.33
12/1	902.29		0.53
12/2	902.27		0.10
12/3	902.26		0.00
12/4	902.24		0.00
12/5	902.22		0.00
12/6	902.20		0.00
12/7	902.18		0.00
12/8	902.16		0.00
12/9	902.15		0.02
12/10	902.14		0.15
12/11	902.12		0.00

Date	Auto Logger	Staff Gage	Precipitation
12/12	902.11		0.00
12/13	902.10		0.09
12/14	902.09		0.06
12/15	902.08		0.00
12/16	902.06		0.00
12/17	902.05		0.00
12/18	902.04		0.00
12/19	902.03		0.00
12/20	902.04		0.00
12/21	902.05		0.00
12/22	902.06		0.00
12/23	902.06		0.00
12/24	902.07		0.00
12/25	902.08		0.00
12/26	902.09		0.00
12/27	902.09		0.00
12/28	902.11		0.07
12/29	902.22		0.98
12/30	902.26		0.02
12/31	902.29		0.26

Attachment F. Prior Lake Elevations Graph



**Staff Gage is located under Highway 21 Wagon Bridge on pillar

***Elevations are recorded in NGVD29 datum

Attachment G. Summary of Precipitation within PLSLWD

Month	*2019 Rain Gauge Readings (inches)	PLSLWD 2019 YTD (in.)
Jan	0.50	0.50
Feb	1.75	2.25
Mar	2.14	4.39
Apr	2.98	7.37
May	7.31	14.68
Jun	2.82	17.50
Jul	5.82	23.32
Aug	5.22	28.54
Sep	4.28	32.82
Oct	4.09	36.91
Nov	0.78	37.69
Dec	2.26	39.95
Year Total	39.95	inches

*measurements recorded by rain gauge at Prior Lake City Hall

NOAA Scott County 30yr mo avg**	NOAA Scott County 30yr YTD avg
0.73	0.73
0.62	1.35
1.73	3.08
2.53	5.61
3.69	9.30
4.64	13.94
3.49	17.43
5.05	22.48
3.41	25.89
2.47	28.36
1.64	30.00
0.95	30.95
30.95	inches

** NOAA 30 year average is per the NWS site in Jordan for the years 1981-2010

Monthly % Deviation***	Monthly Numeric Deviation	YTD % Deviation	YTD Numeric Deviation
-31.5%	-0.23	-31.5%	-0.23
182.3%	1.13	66.7%	0.90
23.7%	0.41	42.5%	1.31
17.8%	0.45	31.4%	1.76
98.1%	3.62	57.8%	5.38
-39.2%	-1.82	25.5%	3.56
66.8%	2.33	33.8%	5.89
3.4%	0.17	27.0%	6.06
25.5%	0.87	26.8%	6.93
65.6%	1.62	30.1%	8.55
-52.4%	-0.86	25.6%	7.69
137.9%	1.31	29.1%	9.00
		29.1%	9.00

***Deviation is calculated by the difference between the current year PLSLWD average and the 30 year Scott County average