



February 1, 2010

Ms. Janell Miersch, Area Hydrologist
Metro Region of Waters
Department of Natural Resources
1200 Warner Road
St. Paul, Minnesota 55106

2009 Prior Lake Outlet Channel Annual Operations Report

Dear Ms. Miersch:

Enclosed is the Annual Operations Report for the Prior Lake Outlet Channel for the year 2009. If you have any questions or need additional information please contact me at (952) 447-4166 or ssass@plslwd.org.

Sincerely,

Stacy Sass
Water Resources Technician

Attachment: 2009 PLOC Operations Report

CC:

PLSLWD Board Members
Ed Matthiesen, Wenck Associates
Carl Almer, EOR
Terry Schwalbe, LMRWD
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Paul Nelson, Scott County
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2009 Prior Lake Outlet Channel Operations

Introduction

The Prior Lake Outlet 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 Watershed District in managing lake levels on Prior Lake as well as a trunk storm water system for the Cities of Prior Lake and Shakopee, and the Shakopee Mdewakanton Sioux Community.

To address these needs and plan for future development in the watershed, the PLSLWD formed a Joint Powers Agreement/Memorandum of Agreement (JPA/MOA) 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. It was determined that while the channel and outlet have worked well since their inception, if modified in several places, they could operate more efficiently, reduce long term maintenance and enhance the environment. With this in mind, the cooperators have undertaken a project to restore and enhance the PLOC. The PLOC has been divided into 8 planning and management areas referred to as Segments. Segment 1 is on the southern end beginning at the Prior Lake Outlet, while Segment 8 is on the northern end and flows into the Minnesota River in Shakopee. In addition to the PLOC restoration and enhancement project, the PLSLWD is in the process of replacing the Prior Lake Outlet Structure with a more efficient and structurally sound design.

Following the historically wet years of 2000-2007, the PLSLWD and portions of the state were in a drought throughout much of 2008 and 2009. According to Scott SWCD records, the 30-year county wide average rainfall is 28.13 inches. The average for PLSLWD in 2008 was a mere 23 inches. The deficit from 2008 combined with the drought during early and mid 2009, led to elevations of Prior Lake dropping to an 18-year low. Attachments E and F show Prior Lake elevations throughout 2009 and Attachment G summarizes the rainfall within the District.

Low lake elevations in Spring Lake carried over from the 2008 drought, and the continued period of drought over the spring and summer months of 2009, attributed to the limited outflow from Spring Lake into Prior Lake. Flows through the Spring Lake outlet were first observed during snow melts in late March. Flows were estimated at a level of 6 cfs on April 1st and proceeded to drop down to an estimated 3.5 cfs by April 15th. Flows then continually tapered down over the next few weeks until the outlet was observed to be dry on June 15th.

The Prior Lake Outlet did not discharge any water during 2009; consequently, all flow within the PLOC was due to stormwater runoff. Excluding 2009, the Prior Lake Outlet has been operated, at least partially, every year since 1999 and has discharged over 43,484 acre-feet of water over that 10-year period. More information on the yearly and cumulative discharges from the Prior Lake Outlet can be seen in Attachment D.

Outlet Operations

As stated in the introduction, the Prior Lake Outlet was not operated during 2009; therefore, no Notice of Operation was issued as required by the current Prior Lake Outlet operation manual.

Before and during operations, the District is required to perform inspections of the Outlet and the Channel. Despite not operating the Outlet, the District performed a complete inspection of the outlet system during late March and again in early April. It was determined that the PLOC was in acceptable condition to handle the stormwater discharges and surface flows anticipated from downstream of the Prior Lake Outlet. Partial inspections were also made during monitoring visits throughout the spring and into the summer.

The spring of 2009 marked the first season of focused monitoring on the PLOC. The primary goals for monitoring included providing a base line of water quality data by taking grab samples and utilizing multi-parameter sondes, as well as verifying the JPA/MOA modeling through obtaining flow measurements. Due to the Prior Lake Outlet not being operated, and the minimal rainfall throughout the spring and summer months, there was never continual flow throughout the length of the channel; therefore, grab samples and flow measurements were not taken. Multi-parameter sondes were used to monitor the minimal water flows that were within the channel on 16 dates over the course of the spring and early summer, with additional week long deployed monitoring done on six occasions. The sondes measured pH, temperature, DO, turbidity, and conductivity. The data will be used to identify hotspots and to guide more intensive monitoring in future years. Plans are in place for similar monitoring to take place in 2010, given that there is flow within the channel.

There were only a few minor maintenance items throughout 2009 within the PLOC. Three small manmade dams that were restricting water and diverting flow towards the banks, causing minor erosion, were removed from two locations on Segment 1 during May. Additionally, a beaver dam was observed to be blocking one of the box culverts underneath Pike Lake Road. The City of Shakopee removed this dam during August.

Permits were issued by the District for two PLOC crossings during 2009. The Riverside Bluffs development placed two concrete box culverts in Segment 5a. The culverts under Highway 101 between Segments 7 and 8 were also replaced by the Scott County Highway Department with two larger box culverts. In 2008, the Scott County Highway Department was issued a permit for their crossing of the PLOC with the extension of County Road 21 in Segment 5c. Work on this project began in 2009 and will follow into 2010. All crossings that were permitted by the District were required to be sized to accommodate full build out flows.

Outlet Structure Reconstruction

The Prior Lake Outlet structure has been in place since 1983. The design of the structure was such that it required manual operation to open and close the flow. This design has posed safety concerns for operation during high water levels. Additionally, there is inefficiency in the existing structure's design in that the 36 inch pipe connected to the structure does not reach its maximum flow of 65 cfs until lake levels well surpass the outlet elevation of 902.5 feet. A graph showing this can be seen in Attachment C. Over the years the structure has also developed wear and required minor maintenance.

Given these conditions, plans and designs for a replacement outlet structure were pursued by the District. These plans were finalized in 2009 and the project moved forward through bidding. The construction contract was awarded in November 2009 and groundbreaking for the project will begin in January 2010. The project is projected to be completed and ready for operation by June 2010. The new outlet structure will increase efficiency by allowing the outlet pipe to reach capacity immediately at the outlet elevation of 903 feet. Furthermore, the new structure will provide safer conditions for staff during inspections and maintenance, and will be self-operating, which shall reduce overall operations and maintenance costs. Schematics of both the existing and new structures are provided in Attachment A.

Outlet Channel Construction and Maintenance

Over the last few years the PLSLWD and the other JPA/MOA cooperators have undertaken a project to restore and enhance the PLOC. The purpose of the project has been to 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 portions of this project were completed in previous years. 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. 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. No construction activities were completed on the PLOC during 2008 as project direction was reevaluated by the JPA/MOA cooperators, who transferred engineering and design work to Inter-fluve.

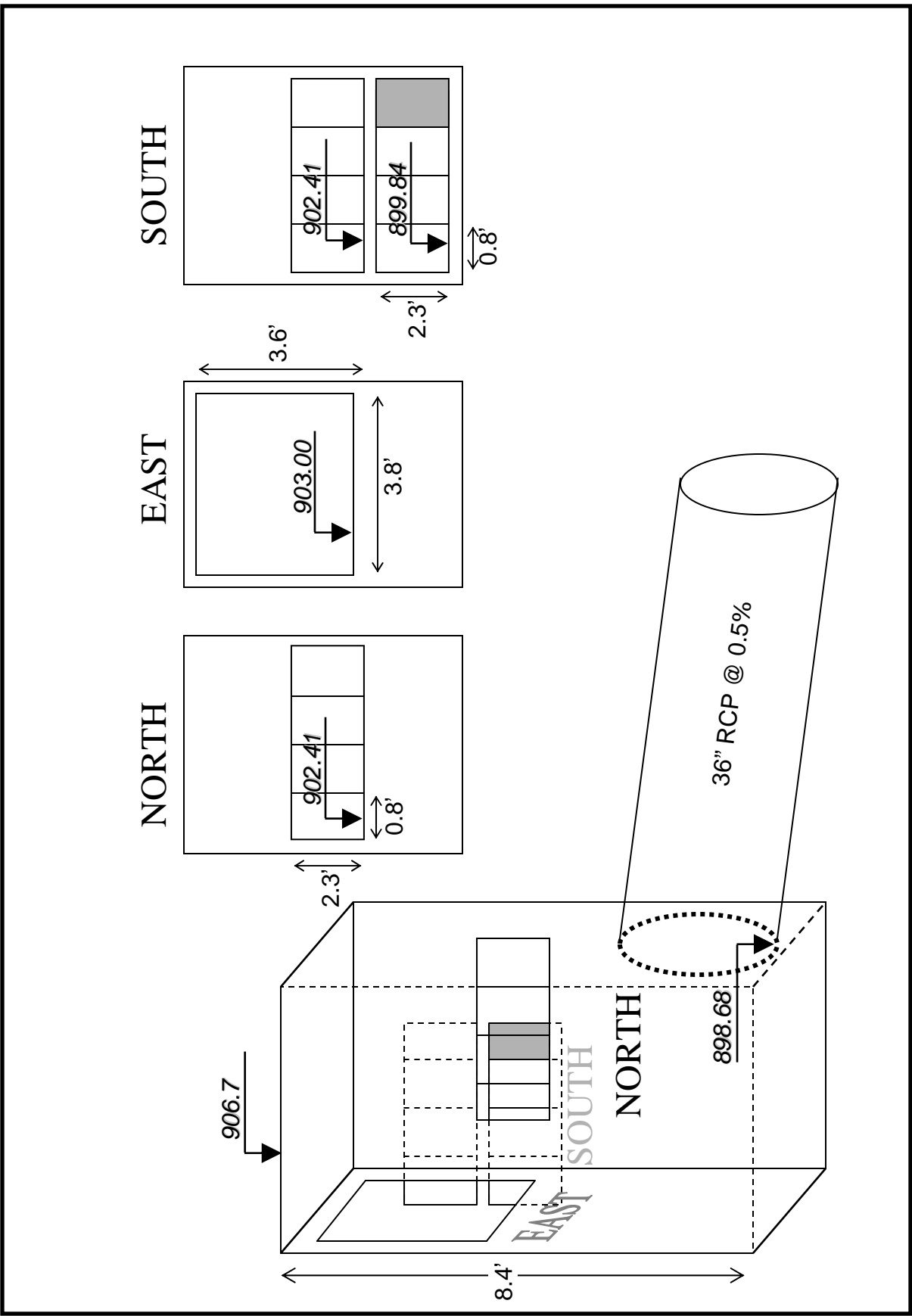
Early 2009 began with the replacement of an undersized culvert on the northern end of Segment 8; however, the majority of the work that was completed in 2009 occurred in the late fall. Banks were reshaped, in addition to toe stabilization and weir reinforcements put in place on Segment 7a. Toe stabilization, bank protections and flow realignment were completed in Segment 3. Work to build up the channel bed in Segment 2 had begun but was halted due to frozen conditions. The work on Segment 2 will be completed in the spring of 2010. Project work on Segments 3 and 7 will also be completed in the spring with vegetation plantings and final site stabilizations.

Designs are underway for construction work in Segments 4 and 7b for the year 2010. Segment 4 will include bank stabilizations, grade controls, cattle exclusion fencing and vegetation plantings within the bank and riparian area. Segment 7b is planned to have toe stabilizations and bank protection installed.

Attachments:

- A. Prior Lake Outlet Structure- Existing and New**
- B. 2009 Outlet Operations**
- C. Stage-Discharge Relationship- Existing Structure**
- D. Volumes Discharged from Prior Lake**
- E. Prior Lake Elevation Recordings with Precipitation**
- F. Prior Lake Elevations Graph**
- G. Summary of Precipitation within PLSLWD**

Attachment A:
Prior Lake Outlet Structure

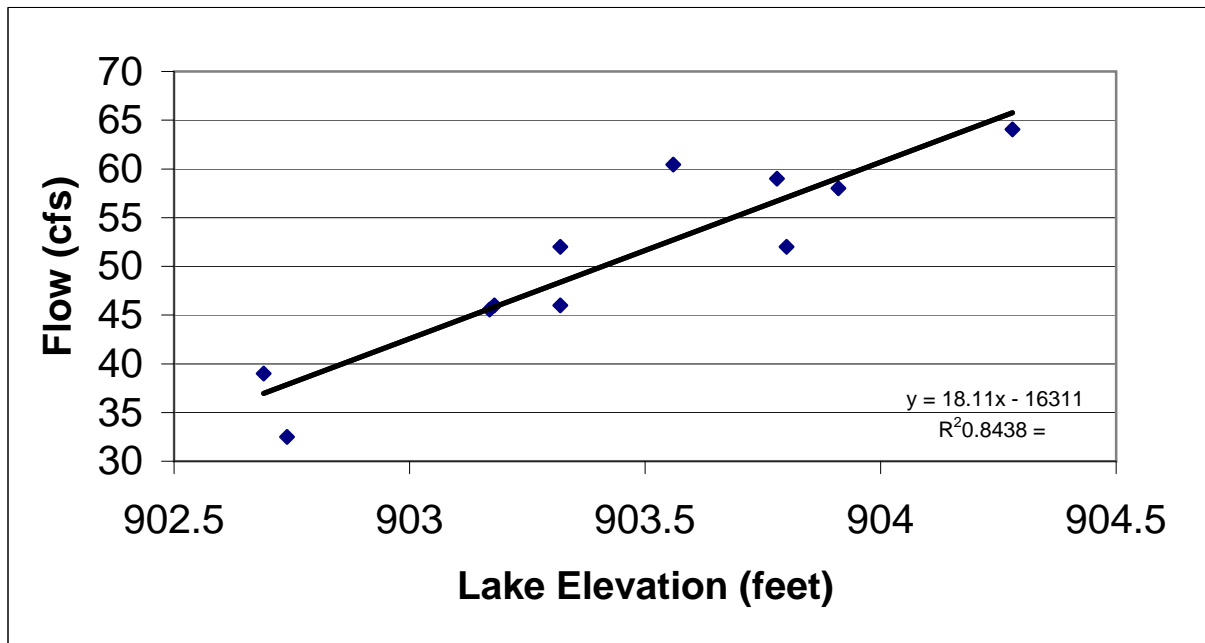


Existing Outlet Structure

Attachment B:
2009 Outlet Operations

Date	Elevation	Outlet Activity	Channel Activity
12/31/2008	900.28	Closed	Status
3/18/2009	900.08	Closed	Inspection
3/19/2009	900.07	Closed	Partial Inspection- Synoptic monitoring
3/25/2009	900.26	Closed	Partial Inspection- Synoptic monitoring
4/1/2009	900.32	Closed	Partial Inspection- Synoptic monitoring
4/7/2009	900.41	Closed	Inspection with City of Shakopee- Seg 5-8
4/8/2009	900.41	Closed	Inspection- Seg 1-4
4/9/2009	900.41	Closed	Partial Inspection- Synoptic monitoring
4/15/2009	900.40	Closed	Partial Inspection- Synoptic monitoring
4/22/2009	900.38	Closed	Partial Inspection- Synoptic monitoring
4/29/2009	900.44	Closed	Partial Inspection- Synoptic monitoring
5/6/2009	900.42	Closed	Partial Inspection- Synoptic monitoring
5/13/2009	900.39	Closed	Partial Inspection- Synoptic monitoring
5/20/2009	900.28	Closed	Partial Inspection- Synoptic monitoring
5/27/2009	900.16	Closed	Partial Inspection- Synoptic monitoring
6/8/2009	900.00	Closed	Partial Inspection- Synoptic monitoring
8/10/2009	899.60	Closed	Partial Inspection- Synoptic monitoring; Beaver dam removed on Seg 5c
8/20/2009	899.54	Closed	Inspection Seg 1
10/16/2009	899.22	Closed	Partial Inspection
10/22/2009	899.22	Closed	Partial Inspection- Synoptic monitoring
*Construction oversight and inspection dates are not included in this table.			

Attachment C:
Stage-Discharge Relationship- Existing Structure



Attachment D:
Volumes Discharged from Prior Lake

Volumes Discharged from Prior Lake and Associated Elevations

Year	Volume Discharged (ac*ft)	Depth Eliminated from Lake (ft)	Min Elevation for the Year	Date of Min Elev	Max Elevation for the Year	Date of Max Elev	Max Elevation without the Outlet	Average Rainfall
2009	0	0.00	898.98	9/30/2009	900.44	4/29/2009	900.44	27.41
2008	4,993	4.28	900.28	12/29/2008	902.90	5/8/2008	907.18	23.88
2007	1,395	1.20	900.55	8/10/2007	902.78	4/23/2007	903.98	28.59
2006	4,331	3.71	900.50	12/14/2006	903.27	4/7/2006	906.98	27.77
2005	2,299	1.97	900.71	1/18/2005	903.10	10/18/2005	905.07	38.02
2004	13	0.01	900.50	4/15/2004	902.79	7/12/2004	902.80	32.96
2003	5,921	5.07	900.62	12/30/2003	903.17	5/23/2003	908.24	23.00
2002	9,520	8.16	900.70	3/4/2002	903.60	9/10/2002	911.76	41.96
2001	8,692	7.45	901.04	12/28/2001	904.28	5/7/2001	911.73	28.52
2000	80	0.07	901.52	2/20/2000	903.00	7/11/2000	903.07	26.09
1999	6,240	5.35	902.00	11/25/1999	904.78	5/27/1999	910.13	33.29
1998			902.05	1/1/1998	903.90	4/13/1998		35.00*
1997	4,150	3.56	901.20	2/28/1997	902.90	4/21/1997	906.46	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+		901.90	9/7/1994	903.05	10/24/1994	903.05	35.28*
1993	10,000+		902.00	3/9/1993	904.49	7/14/1993	904.49	36.40*
1992	8,331	7.14	899.95	2/19/1992	903.16	10/12/1992	910.30	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		
Averages	3731	3.20	900.36		902.69		906.77	31.61

Unless otherwise noted, data is taken from annual outlet operations reports

* Rainfall data is from MN Climatology office for 115N, 22W, 15 Prior Lake; all other rainfall as recorded at PLSLWD office

Italics data from PLSLWD Historic Lake Level Volunteer Collected Data

Attachment E:
Prior Lake elevations with precipitation

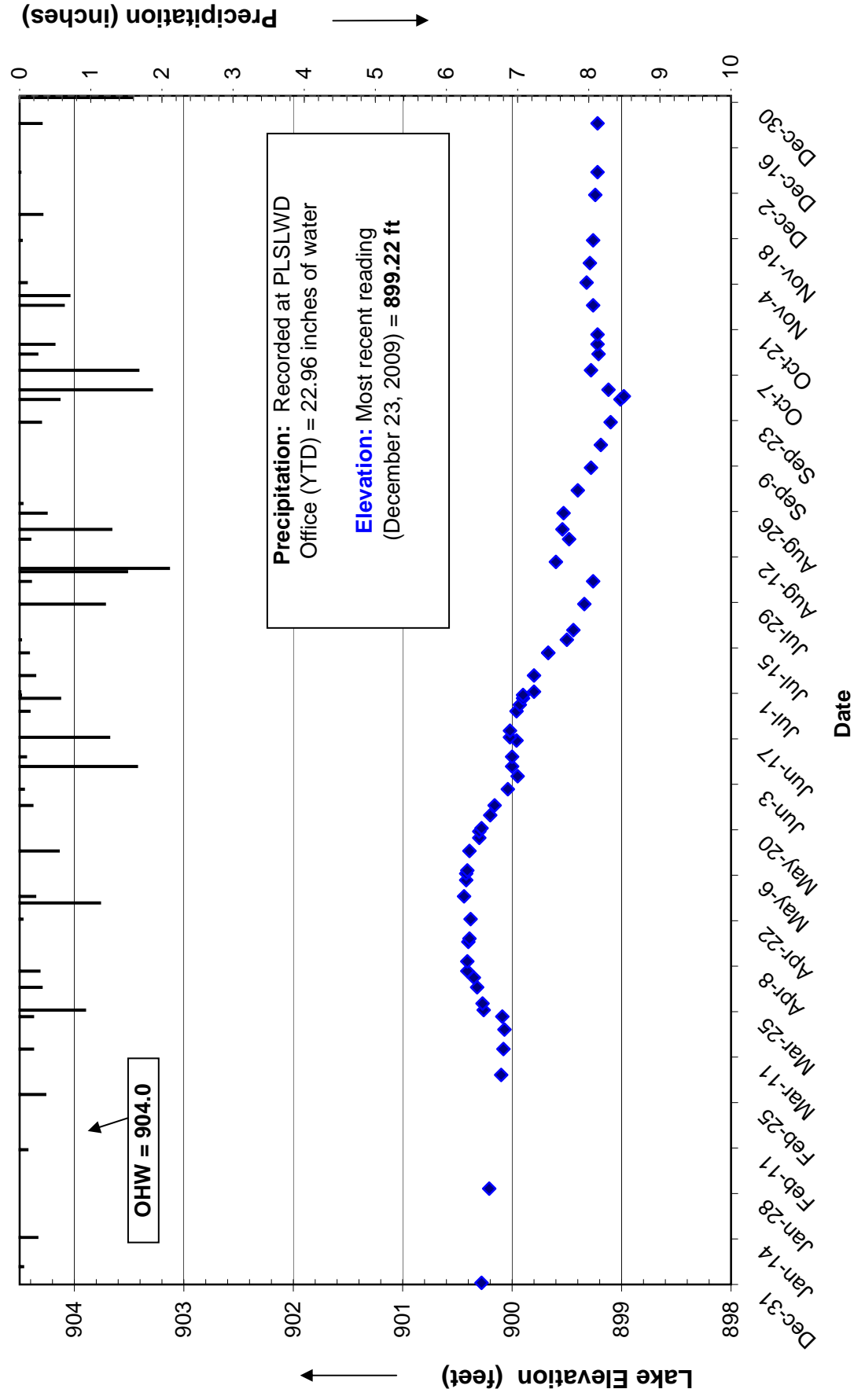
Date	Prior Lake Elevation	Precipitation b/w readings (office only)	Monthly Total
12/29/08 8:00	900.28		
12/31/08 0:00	900.28		
1/5/09 8:00		0.05	
1/14/09 8:00		0.25	
1/29/09 12:00	900.21		0.30
2/10/09 8:00		0.11	
2/27/09 8:00		0.36	0.47
3/5/09 7:45	900.10		
3/13/09 8:00	900.08	0.19	
3/19/09 7:45	900.07		
3/23/09 9:00	900.09	0.19	
3/25/09 11:20	900.26	0.92	
3/27/09 12:00	900.27		1.3
4/1/09 12:00	900.32	0.31	
4/4/09 0:00	900.35		
4/6/09 8:00	900.41	0.28	
4/9/09 11:00	900.41		
4/15/09 10:20	900.40		
4/16/09 0:00	900.39		
4/22/09 10:15	900.38	0.04	
4/27/09 9:00		1.13	
4/29/09 14:00	900.44	0.22	1.98
5/4/09 8:00	900.42		
5/6/09 10:20	900.42		
5/7/09 0:00	900.41		
5/13/09 10:30	900.39	0.55	
5/17/09 0:00	900.30		
5/19/09 16:00	900.30		
5/20/09 10:20	900.28		
5/24/09 0:00	900.20		
5/27/09 11:00	900.16	0.18	0.73
6/1/09 8:00	900.04	0.06	
6/5/09 7:00	899.95		
6/8/09 7:00	900.00	1.65	
6/11/09 7:50	900.00	0.09	
6/16/09 8:30	899.96		
6/17/09 6:50	900.02	1.26	
6/19/09 6:45	900.02	0.00	
6/25/09 7:30	899.96	0.14	
6/27/09 0:00	899.93		
6/29/09 6:50	899.90	0.57	
6/30/09 12:30	899.90	0.02	3.79

Date	Prior Lake Elevation	Precipitation b/w readings (office only)	Monthly Total
7/1/09 7:00	899.80	0.01	
7/6/09 7:00	899.80	0.22	
7/13/09 6:50	899.67	0.13	
7/13/09 21:00	899.67		
7/17/09 7:00	899.50	0.02	
7/20/09 11:45	899.44		
7/28/09 8:00	899.34	1.20	1.58
8/4/09 7:00	899.26	0.16	
8/7/09 7:00		1.51	
8/8/09 7:00		2.10	
8/10/09 7:30	899.60		
8/17/09 7:00	899.48	0.15	
8/20/09 14:15	899.54	1.29	
8/25/09 8:00	899.53	0.38	
8/28/09 7:00		0.04	5.63
9/1/09 7:50	899.40		
9/8/09 7:45	899.28		
9/15/09 8:15	899.19		
9/22/09 7:45	899.10	0.30	
9/29/09 7:45	899.01	0.56	
9/30/09 12:00	898.98		0.86
10/2/09 7:20	899.12	1.86	
10/8/09 10:00	899.28	1.67	
10/13/09 8:00	899.21	0.25	
10/16/09 9:50	899.22	0.49	
10/19/09 7:45	899.22		
10/28/09 7:45	899.26	0.62	
10/31/09 0:00		0.70	5.59
11/4/09 7:00	899.32	0.10	
11/10/09 7:15	899.29		
11/17/09 7:20	899.26	0.03	
11/25/09 16:00		0.32	0.45
12/1/09 8:35	899.24		
12/8/09 9:30	899.22	0.01	
12/23/09 9:00	899.22	0.31	
12/31/09 7:00		1.58	1.90

Average	899.82	YTD	24.58
Minimum	898.98	Maximum 1 Day	2.10
Maximum	900.44	Maximum Month	5.63

Attachment F:
Prior Lake Elevations Graph

2009



Attachment G:
Summary of Precipitation within PLSLWD

2009 PLSLWD Precipitation
(inches of water)

	Cohen	PLSLWD Office	Mueller	Schultz
Jan	0.57	0.30	0.57	0.40
Feb	1.15	0.47	0.97	1.02
Mar	1.99	1.53	1.95	1.59
Apr	1.87	1.75	2.23	1.99
May	0.97	0.73	1.11	1.13
Jun	3.65	3.79	3.38	3.53
Jul	1.64	1.58	1.73	1.52
Aug	6.50	5.63	7.82	6.88
Sep	1.04	0.86	1.16	1.09
Oct	4.89	5.59	6.03	5.82
Nov	0.59	0.45	0.74	0.59
Dec	2.58	1.90	2.23	2.12
YTD	27.44	24.58	29.92	27.68

Average	27.41
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