

# SHALDA CREEK BEAVER DAM STUDY SUPPLEMENT



11/30/2015

Little Traverse Lake Property Owners  
Association

Prepared by: Gosling Czubak Engineering Sciences, Inc  
1280 Business Park Dr.  
Traverse City, MI 49686  
231-946-9191

# Shalda Creek Beaver Dam Study Supplement

LITTLE TRAVERSE LAKE PROPERTY OWNERS ASSOCIATION

## PURPOSE

The purpose of this study is to determine how the Shalda Creek system responds to modifications to beaver dam restrictions present in the system. Observations will be made to the water levels at various locations in the system and lake levels will be observed and compared to reported levels where property damage has been reported. This report is a supplement to the report dated May 13, 2015, and updated August 26, 2015.

## INVESTIGATION

In a July 10, 2015 meeting with Gosling Czubak & NPS, LTLPOA officials reported that beaver dam #1, approximately 300 feet upstream from beaver dam #2, had been rebuilt. Little Traverse Lake levels had been steady (not declining) all spring and early summer, despite a period of low rainfall.

LTLPOA requested that a study be undertaken to observe the impact on Little Traverse Lake water level after opening dam #1. The specific purpose was to observe any changes to the lake level during a low flow period since it provided the best opportunity to observe if a cause and effect relationship existed.

Agreement was reached in the meeting and water level gauges were installed upstream and downstream of dam #1 on July 11, 2015. The gauges were surveyed and correlated to the NAVD 88 vertical elevation datum. Reported elevations in this report are given in that datum. A photo of dam #1 with the water level gauge installed is shown to the right.

Water levels on the upstream side of dam #1 were 1.66 feet higher than downstream level. Prior to modifying dam #1, water levels were observed from July 11 to July 20 to document that the levels were stable. Dam #1 was initially opened on 7/20/2015. The water level surface was recorded to observe any changes in Shalda Creek or Little Traverse Lake. Additional modifications to dam #1 were made through November, 2015 as indicated on the appended chart data.



## OBSERVATIONS

### May 1, 2015 through November 30, 2015

1. Rainfall Observations:	<u>Measured</u> <u>(Normal)</u>
a. May, 2015	4.37 in. (2.82 in.)
b. June, 2015	1.63 in. (3.12 in.)
c. July, 2015	1.38 in. (2.81 in.)
d. August, 2015	6.72 in. (3.58 in.)
e. Sept, 2015	5.85 in. (3.91 in.)
f. Oct, 2015	2.97 in. (3.80 in.)
g. Nov, 2015 (thru 11/23)	3.32 in. (3.26 in.)

-Rainfall as reported by LTPOA. "Normal" per NOAA Online Weather Data for Maple City, MI.  
[\(<http://www.weather.gov/climate/xmacis.php?wfo=apx>\)](http://www.weather.gov/climate/xmacis.php?wfo=apx)

2. Lake Michigan Water Level*:	<u>Monthly Avg.</u>
a. May, 2015	579.35
b. June, 2015	579.67
c. July, 2015	579.81
d. August, 2015	579.79
e. Sept, 2015	579.72
f. Oct, 2015	579.33
g. Nov, 2015	579.03

\*As reported by USACE. Note, elevations provided in IGLD datum are not the same as the study datum

3. Little Traverse Lake Water Level:	<u>Monthly Avg.</u>
a. May, 2015	595.09
b. June, 2015	595.22
c. July, 2015	595.10
d. August, 2015	594.79
e. Sept, 2015	595.24
f. Oct, 2015	594.88
g. Nov, 2015 (thru 11/29)	595.20

4. Significant water level observations prior to beaver dam #1 modifications (May-July, 2015):
- Little Traverse Lake levels were stable at 595.2
  - 669 Culvert levels were stable at 594.2
  - Dam #2 levels were declining from 592.4 to 592.0 (0.4')
  - Rain was slightly below average during the period
5. Significant water level observations after beaver dam #1 modifications:
- Dam #1 upstream had an initial drop of 1.1'.
  - Little Traverse Lake responded immediately to modifications at dam #1 and had an initial drop of 0.6' over a 12 day period.
  - Dam #2 upstream level rose 0.5'.
  - Dam #1 and dam #2 levels have equalized and move up and down together after the second dam #1 modification.
  - Lake levels rose only 0.14 feet (1.68 inches) during significant rain input in August (6.7 inches).

6. Water level at 669 recovers from rain flow very quickly:
  - a. On 8/2/2015, a 1.85" rain raised the water level 0.21'.
  - b. By 8/7/2015 (5 days), the water level had returned to within ½" of the level prior to the rain.

## CONCLUSIONS

The water level in Little Traverse Lake is influenced both by beaver dams in Shalda Creek and culvert restrictions at Traverse Lake Road and CR 669. There is a strong relationship between dam #1 and lake levels. The prediction of an exact lake level that would result from lowering dam #1 is complicated by the large number of variables, including rain input and creek hydraulic capacity. However, the observations clearly show a cause and effect relationship of lowering dam #1 resulting in an immediate lowering in Little Traverse Lake, especially during low flow periods.

High flow events during the study period were documented to increase the lake level 3" above "naturally occurring" creek levels due to the existing culverts. However, modification to dam #1 and maintenance of the other dams demonstrates that this increase in lake level can be offset by providing a lower tailwater condition to allow a quicker return to levels prior to rain input.

Prior to dam modification, downstream changes in water level at dam #2 did not impact water level in Little Traverse Lake. The implication is that either dam#2 is either too far downstream to impact lake levels, or there is another dam obstruction upstream. The data indicate that dam #1 was creating an upstream obstruction.

Modifications and maintenance of beaver dam #1 had an immediate affect and lowered the Little Traverse Lake level by 7" during period of "normal" flow (dry weather) conditions.

The modification of dam #1 has attenuated high water level conditions. August rainfall was 6.25", yet the Little Traverse Lake water level was 5" lower than the level prior to dam #1 modification. During the period from May to November: total precipitation was 26.24 inches, 2.9 inches higher than "normal"; Lake Michigan is 0.27 feet (3.24 inches) lower; Little Traverse Lake is up 0.1 feet (1.2 inches).

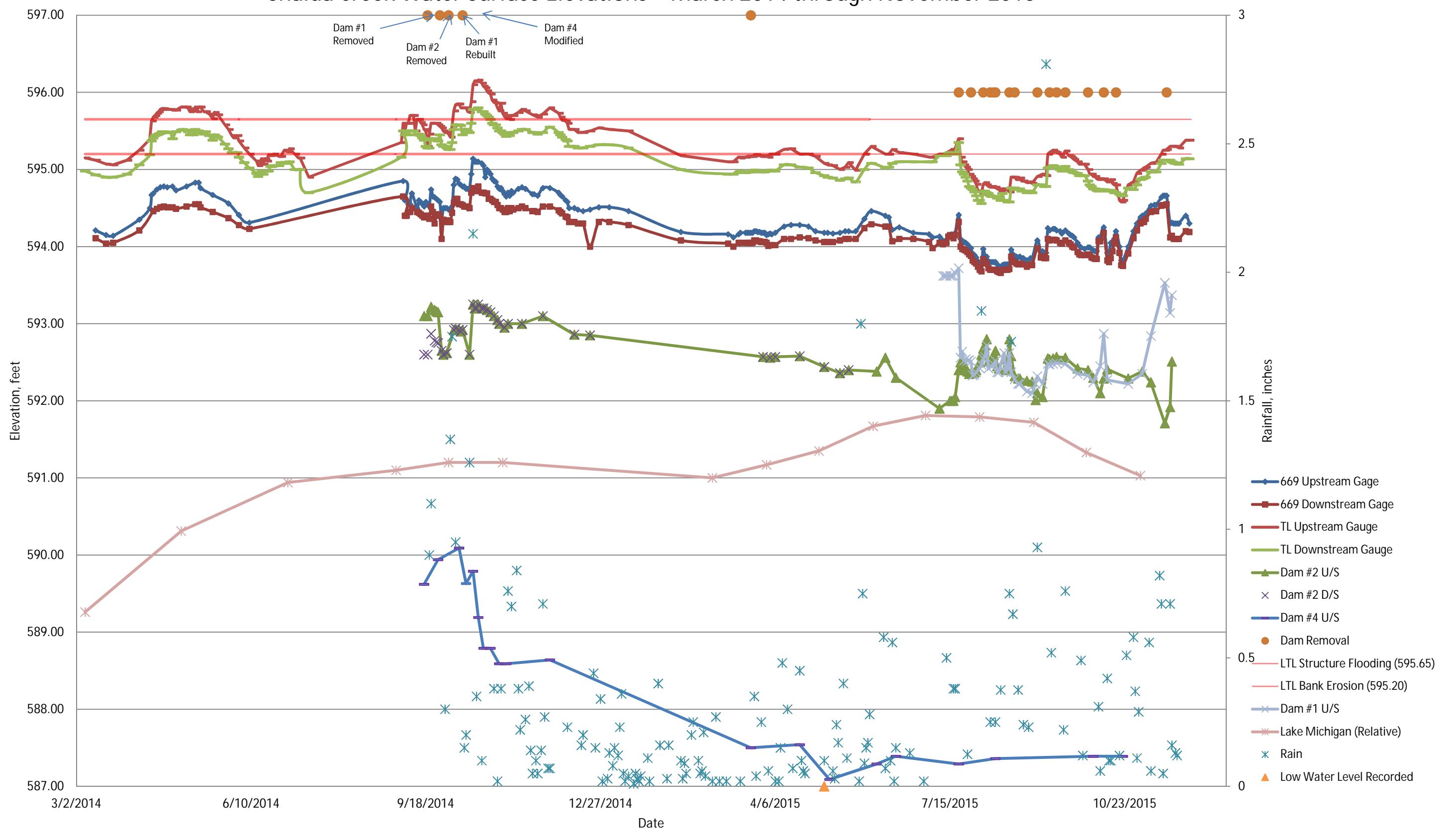
Culvert restrictions will continue to impact lake levels during high flow (rain) conditions, regardless of dam elevations. However, the duration of the lake level impact can be reduced by maintaining a lower tail water condition in the creek, at least a distance as far as dam #1.

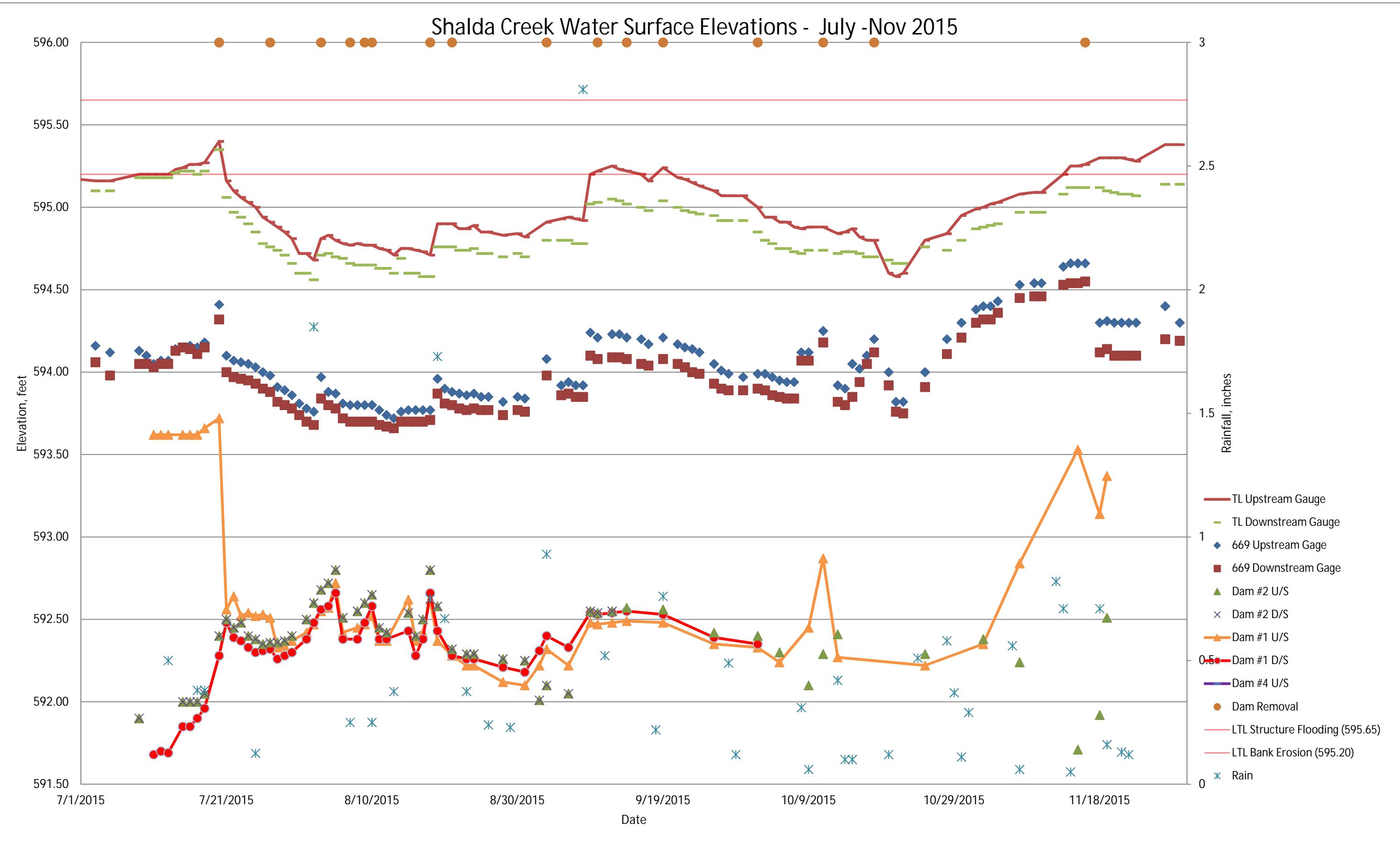
# APPENDIX

## CONTENTS

STUDY DATA & GRAPHS

## Shalda Creek Water Surface Elevations - March 2014 through November 2015





Shalda Creek Water Level Observation Record

CULVERT LOCATION	SIZE	T/CULVERT		STREAM GAGE (U/S & D/S)
		U/S	D/S	
Traverse Lake Road	64x43 Arch	596.49	595.68	597.8
CR 669	71x47 Arch	594.56	592.88	596.7

Enter Gage Readings in green cells

Date	GAGE READINGS				NAVD88 DATUM														
	W. Traverse Lake Rd.		CR 669		W. Traverse Lake Rd.	CR 669	Inlet	Outlet	Inlet	Outlet	Dam #2	Dam #4	RAIN (in)	Dam	Dam #1	U/S	D/S		
7/1/15																			
7/2/15																			
7/3/15	594.36	594.3	593.46		593.36		595.16	595.10	594.16	594.06						593.62	591.68		
7/4/15																	593.62	591.7	
7/5/15	594.36	594.3	593.42		593.28		595.16	595.10	594.12	593.98						593.62	591.69		
7/6/15																			
7/7/15																			
7/8/15																			
7/9/15	594.4	594.38	593.43		593.35		595.20	595.18	594.13	594.05	591.9	591.9				593.62	591.85		
7/10/15	594.4	594.38	593.4		593.35		595.20	595.18	594.10	594.05						593.62	591.85		
7/11/15	594.4	594.38	593.35		593.33		595.20	595.18	594.05	594.03						593.62	591.85		
7/12/15	594.4	594.38	593.37		593.35		595.20	595.18	594.07	594.05						593.62	591.85		
7/13/15	594.4	594.38	593.37		593.35		595.20	595.18	594.07	594.05						593.62	591.85		
7/14/15	594.43	594.41	593.44		593.43		595.23	595.21	594.14	594.13						593.62	591.85		
7/15/15	594.44	594.42	593.45		593.45		595.24	595.22	594.15	594.15	592	592				593.62	591.85		
7/16/15	594.46	594.42	593.46		593.44		595.26	595.22	594.16	594.14	592	592				593.62	591.85		
7/17/15	594.46	594.4	593.45		593.41		595.26	595.20	594.15	594.11	592	592				593.62	591.9		
7/18/15	594.47	594.42	593.48		593.45		595.27	595.22	594.18	594.15	592.05	592.05				593.66	591.96		
7/19/15																			
7/20/15	594.6	594.55	593.71		593.62		595.40	595.35	594.41	594.32	592.4	592.4	587.29			596	593.72	592.28	
7/21/15	594.36	594.26	593.4		593.3		595.16	595.06	594.10	594.00	592.5	592.5				592.56	592.48		
7/22/15	594.3	594.17	593.37		593.27		595.10	594.97	594.07	593.97	592.45	592.45				592.64	592.39		
7/23/15	594.26	594.14	593.36		593.26		595.06	594.94	594.06	593.96	592.48	592.48				592.52	592.37		
7/24/15	594.23	594.1	593.35		593.25		595.03	594.90	594.05	593.95	592.4	592.4				592.54	592.33		
7/25/15	594.2	594.05	593.33		593.23		595.00	594.85	594.03	593.93	592.38	592.38				592.52	592.3		
7/26/15	594.14	593.98	593.3		593.2		594.94	594.78	594.00	593.90	592.35	592.35				592.53	592.31		
7/27/15	594.11	593.96	593.28		593.18		594.91	594.76	593.98	593.88	592.36	592.36				596	592.51	592.32	
7/28/15	594.08	593.94	593.21		593.12		594.88	594.74	593.91	593.82	592.36	592.36				592.33	592.26		
7/29/15	594.05	593.91	593.19		593.1		594.85	594.71	593.89	593.80	592.37	592.37				592.34	592.28		
7/30/15	594.01	593.86	593.16		593.08		594.81	594.66	593.86	593.78	592.4	592.4				592.37	592.30		
7/31/15	593.92	593.8	593.11		593.04		594.72	594.60	593.81	593.74						596	593.72	592.38	
8/1/15	593.92	593.8	593.08		593		594.72	594.60	593.78	593.70	592.5	592.5				596	592.47	592.48	
8/2/15	593.88	593.76	593.06		592.98		594.68	594.56	593.76	593.68	592.6	592.6				596	592.55	592.56	
8/3/15	594.01	593.91	593.27		593.14		594.81	594.71	593.97	593.84	592.68	592.68				596	592.57	592.58	
8/4/15	594.03	593.92	593.18		593.1		594.83	594.72	593.88	593.80	592.72	592.72				596	592.72	592.66	
8/5/15	594	593.9	593.17		593.08		594.80	594.70	593.87	593.78	592.8	592.8				596	592.42	592.38	
8/6/15	593.98	593.89	593.11		593.02		594.78	594.69	593.81	593.72	592.51	592.51				596	592.42	592.38	
8/7/15	593.97	593.86	593.1		593		594.77	594.66	593.80	593.70						596	592.45	592.38	
8/8/15	593.98	593.85	593.1		593		594.78	594.65	593.80	593.70	592.55	592.55				596	592.47	592.48	
8/9/15	593.97	593.85	593.1		593		594.77	594.65	593.80	593.70	592.6	592.6				596	592.47	592.48	
8/10/15	593.97	593.85	593.1		593		594.77	594.65	593.80	593.70	592.65	592.65	587.36			596	592.52	592.58	
8/11/15	593.95	593.83	593.07		593.07		594.98	594.75	593.77	593.68	592.45	592.45				596	592.37	592.38	
8/12/15	593.94	593.83	593.04		592.97		594.74	594.63	593.74	593.67	592.42	592.42				596	592.37	592.38	
8/13/15	593.91	593.8	593.02		592.96		594.71	594.60	593.72	593.66						596	592.45	592.38	
8/14/15	593.95	593.89	593.06		593		594.75	594.69	593.76	593.70						596	592.47	592.48	
8/15/15	593.95	593.8	593.07		593		594.75	594.60	593.77	593.70	592.54	592.54				596	592.62	592.43	
8/16/15	593.94	593.8	593.07		593		594.74	594.60	593.77	593.70	592.4	592.4				596	592.37	592.28	
8/17/15	593.93	593.78	593.07		593		594.73	594.58	593.77	593.70	592.5	592.5				596	592.42	592.38	
8/18/15	593.91	593.78	593.07		593.01		594.71	594.58	593.77	593.71	592.8	592.8				596	592.62	592.66	
8/19/15	594.1	593.96	593.26		593.17		594.90	594.76	593.88	593.80	592.32	592.32				596	592.37	592.43	
8/20/15	594.1	593.96	593.2		593.11		594.90	594.76	593.90	593.81						596	592.37	592.43	
8/21/15	594.1	593.96	593.18		593.1		594.90	594.76	593.88	593.80	592.32	592.32				596	592.28	592.28	
8/22/15	594.07	593.94	593.17		593.08		594.87	594.74	593.87	593.78						596	592.28	592.28	
8/23/15	594.07	593.94	593.16		593.07		594.87	594.74	593.86	593.77	592.29	592.29				596	592.22	592.26	
8/24/15	594.09	593.95	593.17		593.08		594.89	594.75	593.87	593.78	592.29	592.29				596	592.22	592.26	
8/25/15	594.05	593.92	593.15		593.07		594.85	594.72	593.85	593.77						596	592.42	592.38	
8/26/15	594.05	593.92	593.15		593.07		594.85	594.72	593.85	593.77						596	592.42	592.38	
8/27/15																			
8/28/15	594.03	593.90	593.12		593.04		594.83	594.70	593.82	593.74	592.26	592.26				596	592.12	592.21	
8/29/15																			
8/30/15	594.04	593.92	593.15		593.07		594.84	594.72	593.85	593.77	592.25	592.25				596	592.1	592.18	
8/31/15	594.02	593.9	593.14		593.06		594.82	594.70	593.84	593.76	592.25	592.25							

Shalda Creek Water Level Observation Record

CULVERT LOCATION	SIZE	T/CULVERT		STREAM GAGE T/GAGE (U/S & D/S)
		U/S	D/S	
Traverse Lake Road	64x43 Arch	596.49	595.68	597.8
CR 669	71x47 Arch	594.56	592.88	596.7

Enter Gage Readings in green cells