

# 2012 Annual Aquifer Monitoring Report

## Evergreen Spring

### Fryeburg, Maine

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Prepared for:

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(Poland Spring)  
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Prepared by:

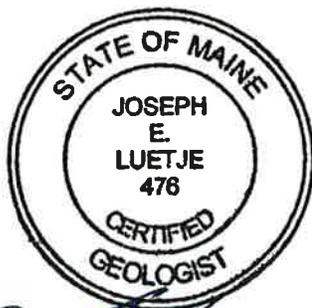
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GROUND WATER HYDROLOGISTS



March, 2013

**2012 ANNUAL AQUIFER MONITORING REPORT  
EVERGREEN SPRING  
FRYEBURG, MAINE**

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## 1.0 INTRODUCTION

Nestle Waters North America Inc. (Poland Spring) has contracted with Luetje Geological Services (LGS) of Portland, Maine and McDonald Morrissey Associates, Inc. (MMA) of Concord, New Hampshire, independent hydrogeologic consulting firms, to collect and compile data from the Wards Brook Aquifer. Poland Spring is not required to submit these data to the Town of Fryeburg but started to do so voluntarily with the December 2008 monthly report. Annual reports are compiled after the end of each calendar year summarizing final data and drawing conclusions about hydrologic conditions in the Wards Brook Aquifer. Poland Spring purchases spring water in Fryeburg from the Fryeburg Water Company (FWC). The FWC also services other residential, commercial, industrial and public water users in Fryeburg.

Hydrogeologic data collection from locations in and around the Wards Brook Aquifer began in 2003 by Woodard & Curran for Pure Mountain Springs Company. LGS assumed responsibility for the monthly monitoring program in July, 2008 and continues to conduct monitoring of the Wards Brook Aquifer on behalf of Poland Spring. The primary role for LGS is monthly data collection and preparation of monthly and annual reports. MMA was contracted to perform data analysis, program review, and general oversight of site monitoring and reporting.

In August 2005, Emery & Garrett Groundwater, Inc. submitted a report (*Groundwater Flow Model, Wards Brook Aquifer, Fryeburg, Maine, 2005*) to the Town of Fryeburg Planning Board. This report was funded by the Fryeburg Aquifer Resource Committee (FARC). To date, this appears to be the most comprehensive investigation and report pertaining to the Wards Brook Aquifer. Emery & Garrett used groundwater and geologic data collected by several entities including:

- Pure Mountain Springs (PMS) and Woodard & Curran (W&C);
- Poland Spring;
- Fryeburg Water Company (FWC);
- WE Corporation (WE);
- SF Corporation, LLC (SF); and
- U.S. Geological Survey (USGS).

As part of its effort, Emery & Garrett created a groundwater model of the Wards Brook Aquifer. To simplify the report and present findings to the public, Emery and Garrett likened the Wards Brook Aquifer to a bank account, with income (groundwater recharge), fixed expenses (FWC needs for its customers other than Pure Mountain Springs and appropriate minimum flow through Wards Brook Drainage), and discretionary expenses (water used for other FWC customers, other water users of the aquifer, and excess flow through Wards Brook drainage). Emery & Garrett concluded that discretionary expenses (withdrawals) from the Wellhead Protection Area as delineated, after all other 'fixed expenses' were met, totaled approximately 293 million gallons per year (equivalent to 804,000 gallons per day over the course of a calendar year) during an average precipitation year. Emery & Garrett then imposed an arbitrary safety factor of 25%, arriving at a conservative 'discretionary expense' value of 220 million gallons per year (equivalent to 603,000 gallons per day over the course of a calendar year). Poland Spring purchases well below the 'discretionary expense' value. In 2012, water pumped from Borehole-1 (PBH-1) totaled approximately 93 million gallons.

## **2.0 AQUIFER MONITORING PROGRAM**

This annual report is a compilation of data for the period from January 2012 through December 2012. The entire record of water elevations measured at MW-108 is also included showing typical seasonal groundwater fluctuations in the Wards Brook Aquifer and is discussed further in Section 3.0

Data are presented for eleven monitoring wells, four surface water stations, from rain gauges at the PBH-1 load-out facility and the Fryeburg Eastern Slopes Airport (ICAO Station KIZG, Northeast Regional Climate Center), and withdrawal data from PBH-1. Locations of all data collection stations are shown in Figure 1. Table 1 summarizes data collection stations and monitoring frequency.

## **3.0 GROUNDWATER LEVELS**

Groundwater levels are measured in eleven monitoring wells at locations shown in Figure 1. These wells provide groundwater level data across and adjacent to the Wards Brook watershed. Photographs A and AA show a typical monitoring well in Fryeburg and the device used to measure the depth to water (water level indicator). Photographs appear in Appendix A.

Figure 2 shows groundwater elevations measured from the monitoring well network for the 2012 calendar year. Groundwater elevations range from approximately 380 to 430 feet NAVD88 (North American Vertical Datum 1988). Figure 3 shows the entire record of groundwater elevations for MW-108 (November 2003 – present) and demonstrates the typical general seasonal groundwater fluctuations observed across the aquifer.

Groundwater level fluctuations are primarily driven by the timing and amount of precipitation in a given region. In general, the highest groundwater levels occur in the spring in response to recharge from spring rain and snow melt after the ground thaws. Groundwater levels tend to decline through the summer months, when evapotranspiration is greatest, and lowest groundwater levels occur near the end of the summer or early fall. After the trees drop their leaves and evapotranspiration decreases, groundwater levels generally rise until the ground freezes. Another period of low groundwater levels then occurs in late winter after the ground has been frozen for several months. Data tables showing all groundwater and surface water elevation data appear in Appendix B.

Groundwater levels for 2012 show typical general seasonal variations across the site. A minor rise was observed in March caused by early snowpack melt, and then a low was observed in April due to less than average precipitation in April and lack of snow melt. Groundwater levels rebounded in June due to the precipitation recorded in May and June. Expected groundwater elevations trends were observed for the remainder of 2012.

Highest groundwater elevations for 2012 were observed primarily in the late spring and early summer (June) and the lowest groundwater elevations were recorded in the fall (September - December).

## 4.0 SURFACE WATER LEVELS

Surface water elevation is measured at four locations in and around the Wards Brook Aquifer watershed as seen in Figure 1. The surface water measuring locations are as follows:

- Saco River Monitoring Point (SRMP-1): surface water elevation is measured at the Route 113 bridge;
- Wards Pond Monitoring Point (WPMP-1): surface water elevation is measured at the Route 113 crossing;
- Lovewell Pond Staff Gauge (LPSG-1): surface water elevation is measured at the inlet from Wards Brook; and
- Wards Pond Staff Gauge (WPSG-2A): surface water elevation is measured near the center of the watershed in a bog located to the south of Wards Pond.

Appendix A includes a photograph (Photograph B) showing a typical staff gage used to measure surface water stage and a view of Lovewell Pond (Photograph BB) facing north from the boat ramp located off Route 113. The Lovewell Pond photograph is taken every month during regular monitoring if access is available. 2012 surface water elevations from surface water stations appear in Figure 4. A data table summarizing surface water elevation data appears in Appendix B.

Examination of Figure 4 shows normal seasonal surface water fluctuations near the site. In general, there is typically a rise in surface water levels during spring melt, a decline through the summer months, another rise in the fall and early winter followed by frozen conditions during winter months. Frozen conditions were observed at WPMP-1 and SRMP-1 in January and at WPSG-2A in January and February. LPSG-1 remained unfrozen due to moving water at this station.

## 5.0 PRECIPITATION

Precipitation is recorded on-site adjacent to PBH-1 using an Onset Data Logging Rain Gauge (RG). The location of the on-site rain gauge is shown in Figure 1. A photograph showing the on-site rain gauge (Photograph C) appears in Appendix A. The on-site rain gauge has a self-tipping bucket that is activated with every 0.01 inches of precipitation. The gauge is also wrapped with heat tape that melts snowfall and allows measurement of precipitation through the winter months.

Precipitation data are also recorded at the Fryeburg Eastern Slopes Airport (ICAO Station KIZG, Northeast Regional Climate Center) to compare precipitation measurements taken by the on-site rain gauge. The Fryeburg Eastern Slopes Airport is approximately two miles to the south of the on-site rain gauge. Table 2 summarizes 2012 precipitation of data available and used in the monthly reports.

Examination of Table 2 shows that there is a reasonably close correlation between precipitation data collected at both locations. For the 2012 calendar year, the on-site rain gauge recorded a total of 45.33 inches of precipitation, 6.20 inches less than was recorded in 2011. The Fryeburg Eastern Slopes Airport gauging station recorded 47.53 inches of precipitation, 8.63 inches less than was recorded in 2011.

The Fryeburg area receives an average of approximately 49 inches of precipitation per year. This average was calculated from data collected at two long term National Weather Service Cooperative stations:

- East Hiram NWS Coop Station 173794 (1967 – 2008) (the East Hiram Station was discontinued in July 2009)
- North Conway NWS Coop Station 275995 (1975 – 2010)

## **6.0 WITHDRAWALS**

In accordance with the contract with the Fryeburg Water Company, spring water volume withdrawn from PBH-1 is presented as total gallons recorded as offloaded at bottling facilities. Table 3 summarizes the 2012 monthly withdrawal volumes. Spring water withdrawals from PBH-1 totaled 93,358,622 gallons for the 2012 calendar year.

## **7.0 BIOLOGICAL MONITORING**

To complement the biological investigations conducted by Normandeau Associates in the 2006 and 2008 field seasons, Poland Spring initiated a long-term biological monitoring program of Wards Brook beginning in 2009. Bio-monitoring, conducted every other year, was conducted in 2011 and will be conducted next in 2013.

## **8.0 FINDINGS**

This report represents the fourth annual report for Fryeburg, Maine prepared on behalf of Poland Spring and is a summary of hydrologic data collected from the Wards Brook Aquifer through the 2012 calendar year. Poland Spring also provides these data voluntarily to the Town of Fryeburg, Fryeburg Water District and the Fryeburg Water Company on a monthly basis in the form of a monthly report that began with the December 2008 report. These data provide an on-going comprehensive summary of hydrologic conditions in the Wards Brook Aquifer. Findings for 2012 include the following:

- Spring water withdrawal from PBH-1 for 2012 totaled 93,358,622 gallons;
- 93,358,622 gallons represents approximately 42% of the discretionary water available as determined by Emery & Garrett Groundwater, Inc.;
- Normal seasonal variations of groundwater levels were observed at all monitoring well locations;
- Highest groundwater elevations for 2012 were observed primarily in June and the lowest groundwater elevations were recorded in the fall (September – December);
- Surface water levels showed normal seasonal variation in 2012;
- Total precipitation for the 2012 calendar year was 45.33 inches as recorded by the on-site rain gauge, 6.20 inches less than 2011.

## 9.0 CONCLUSIONS

Based on our analysis of groundwater and surface water data collected in Fryeburg, Luetje Geological Services and McDonald Morrissey Associates have not observed any adverse impact to waters of the State, water-related natural resources and existing uses as a result of the sale of water by the Fryeburg Water Company to Poland Spring.

If you have any questions regarding the data, explanations, or interpretations included in this report, please do not hesitate to contact Ed Luetje (207) 415-9898.

Sincerely,

Luetje Geological Services, LLC



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Ed Luetje C.G.

McDonald Morrissey Associates, Inc.



Daniel J. Morrissey

cc: Fryeburg Water District (Mr. Richard Krasker)  
Fryeburg Water Company (Mr. Hugh Hastings)  
Emery & Garrett Groundwater, Inc. (Mr. Peter Garrett)  
Poland Spring (Mr. Mark Dubois)

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Table 2	2012 Precipitation Summary
Table 3	PBH-1 2012 Withdrawal Summary

**TABLE 1**  
**FRYEBURG MONITORING PROGRAM PLAN**

<b>Monitoring Station</b>	<b>Frequency</b>
<b><i>Monitoring Wells</i></b>	
TW-2 <sup>1</sup>	Monthly
TW-9	Monthly
MW-101 <sup>2</sup>	Monthly
MW-103	Monthly
MW-105	Monthly
MW-107	Monthly
MW-108	Monthly
MW-109	Monthly
MW-110	Monthly
MW-113	Monthly
MW-114	Monthly
<b><i>Surface Water Stations</i></b>	
WPMP-1 <sup>3</sup>	Monthly
WPSG-2A <sup>4</sup>	Monthly
SRMP-1 <sup>5</sup>	Monthly
LPSG-1 <sup>6</sup>	Monthly
<b><i>Precipitation</i></b>	
RG – On-site Rain Gauge	Continuous
ICAO Station KIZG (Fryeburg Airport)	Continuous
<b><i>Withdrawal Data</i></b>	
PBH-1	Continuous

- Notes:
1. TW refers to 'test well'.
  2. MW refers to 'monitoring well'.
  3. WPMP refers to 'Wards Pond Monitoring Point'.
  4. WPSG refers to 'Wards Pond Staff Gauge'.
  5. SRMP refers to 'Saco River Monitoring Point'.
  6. LPSG refers to 'Lovewell Pond Staff Gauge'.

**TABLE 2  
2012 PRECIPITATION SUMMARY**

<i><b>MONTH</b></i>	<i><b>ON-SITE RAIN GAUGE DATA</b></i>	<i><b>FRYEBURG EASTERN SLOPES AIRPORT (ICAO STATION KIZG)</b></i>
Jan 2012	3.60	3.58
Feb 2012	0.77	0.89
Mar 2012	1.54	1.58
Apr 2012	3.04	3.30
May 2012	5.58	5.67
Jun 2012	7.91	8.43
Jul 2012	1.79	2.28
Aug 2012	4.72	6.33
Sep 2012	4.80	4.92
Oct 2012	5.42	3.95 <sup>1</sup>
Nov 2012	0.62	0.84
Dec 2012	5.54	5.76
<b>2012 TOTAL</b>	<b>45.33</b>	<b>47.53</b>

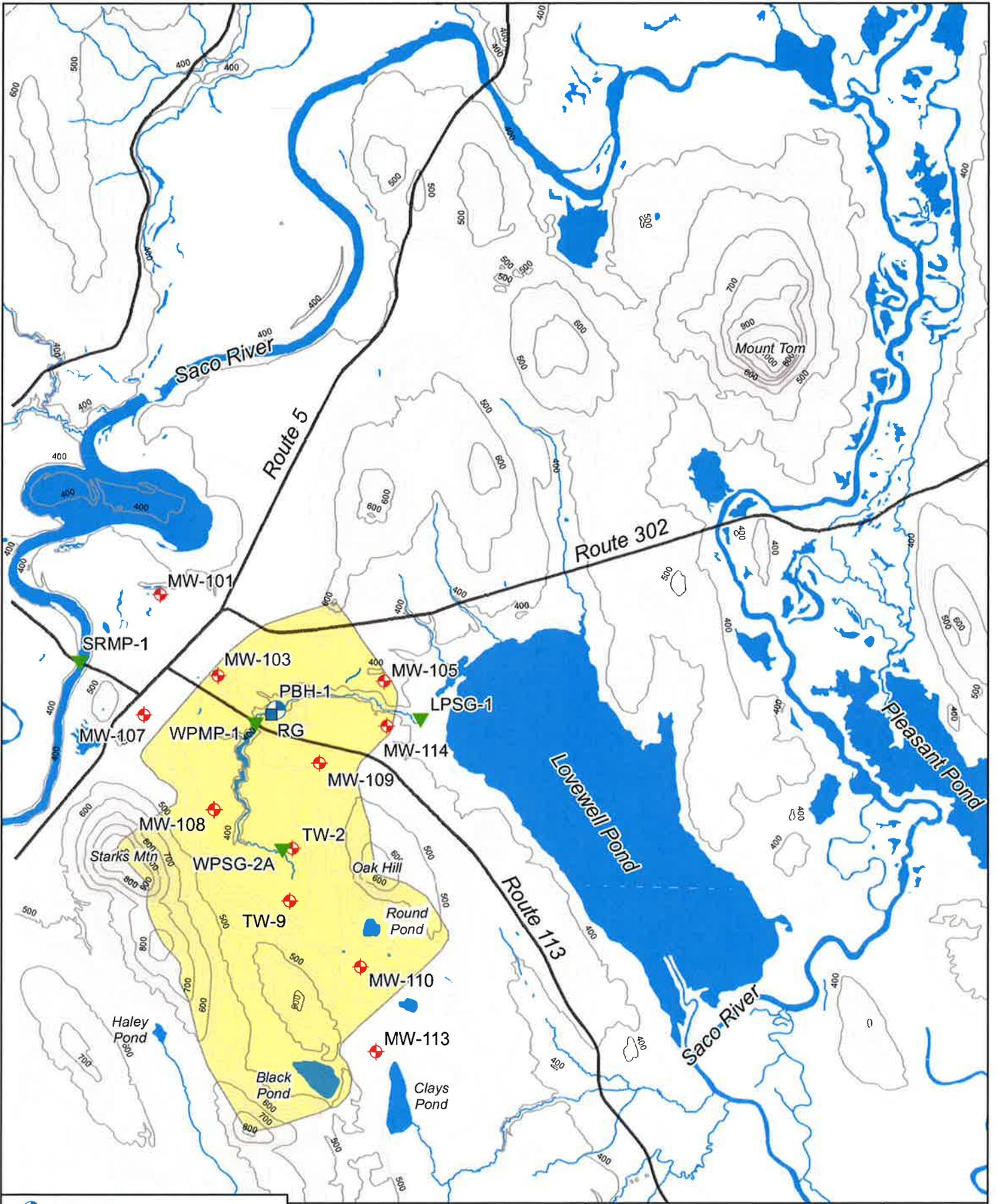
Notes: 1. KIZG station missing data for October 29<sup>th</sup>. On-Site gauge recorded 1.17" of precipitation on October 29<sup>th</sup>.

**TABLE 3**  
**PBH-1 2012 WITHDRAWAL SUMMARY**

<b>Month</b>	<b>Monthly Total (gal)</b>
Jan-12	5,747,670
Feb-12	1,138,592
Mar-12	6,803,690
Apr-12	6,424,093
May-12	16,299,028
Jun-12	16,364,049
Jul-12	14,822,868
Aug-12	10,236,845
Sep-12	3,224,636
Oct-12	3,532,881
Nov-12	4,699,117
Dec-12	4,065,153
<b>2012 Total</b>	<b>93,358,622</b>

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	BOREHOLE
	MONITORING WELL
	RAIN GAUGE
	SURFACE WATER STATION
	CONTOUR LINES
	WARDS BROOK WATERSHED (APPROXIMATE)

**FIGURE 1**  
**2012 ANNUAL AQUIFER MONITORING REPORT**  
**EVERGREEN SPRING**  
**FRYEBURG, MAINE**

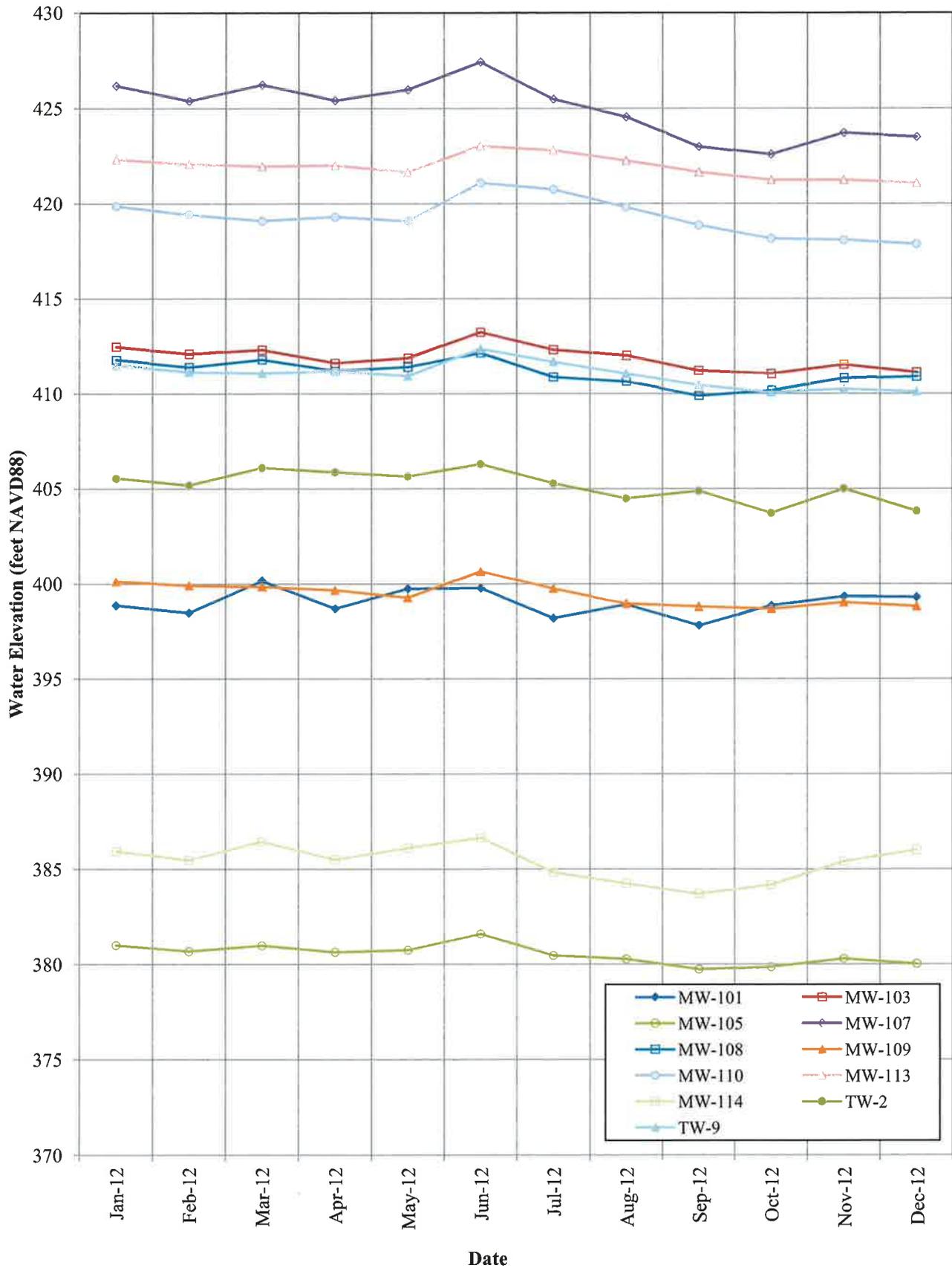


NOTES:  
 1. ALL GENERAL DATA LAYERS ACQUIRED FROM THE MAINE OFFICE OF GIS.  
 2. CONTOURS ARE 20' INTERVALS.

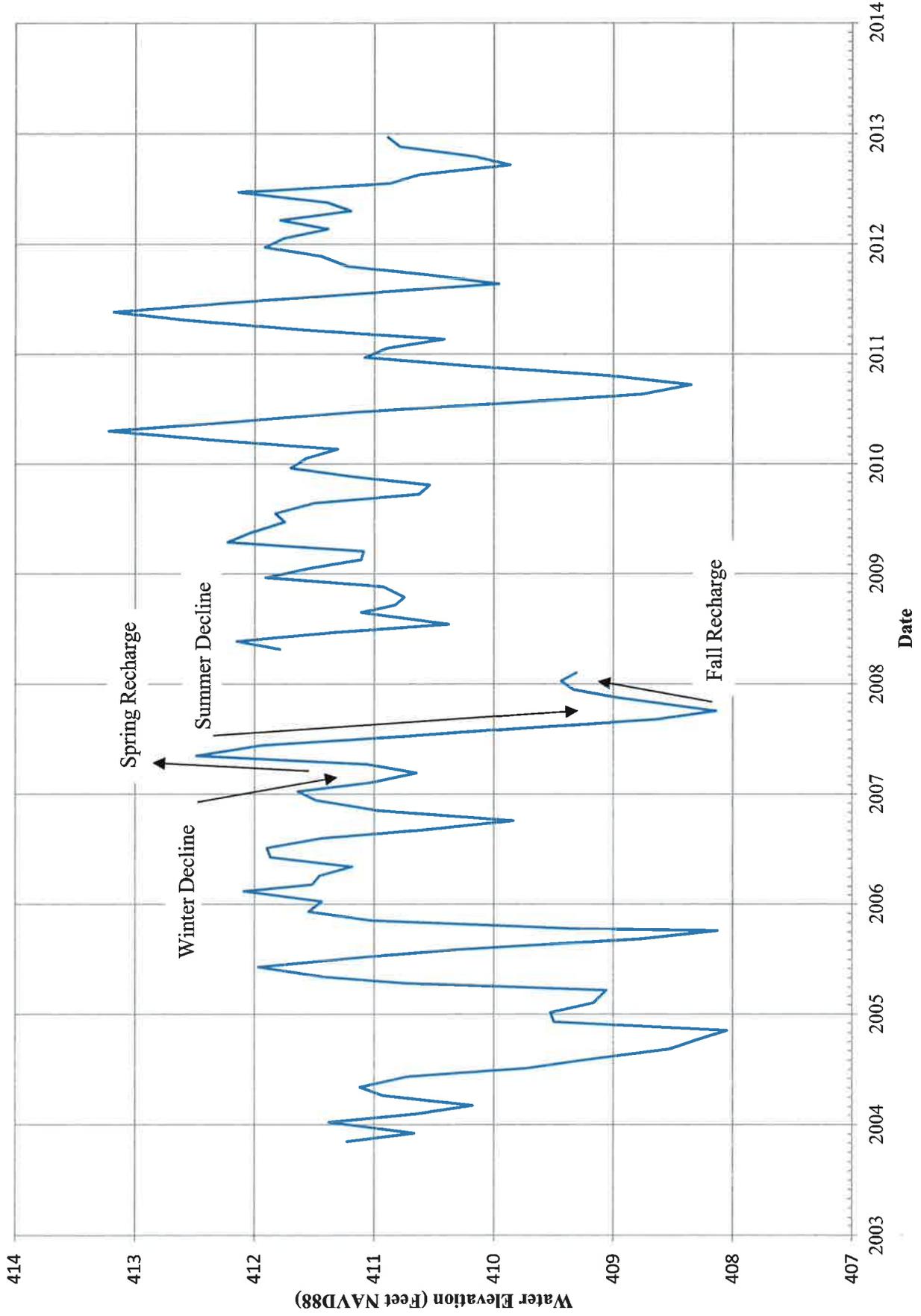
N  
  
 DATE: 2/15/2012

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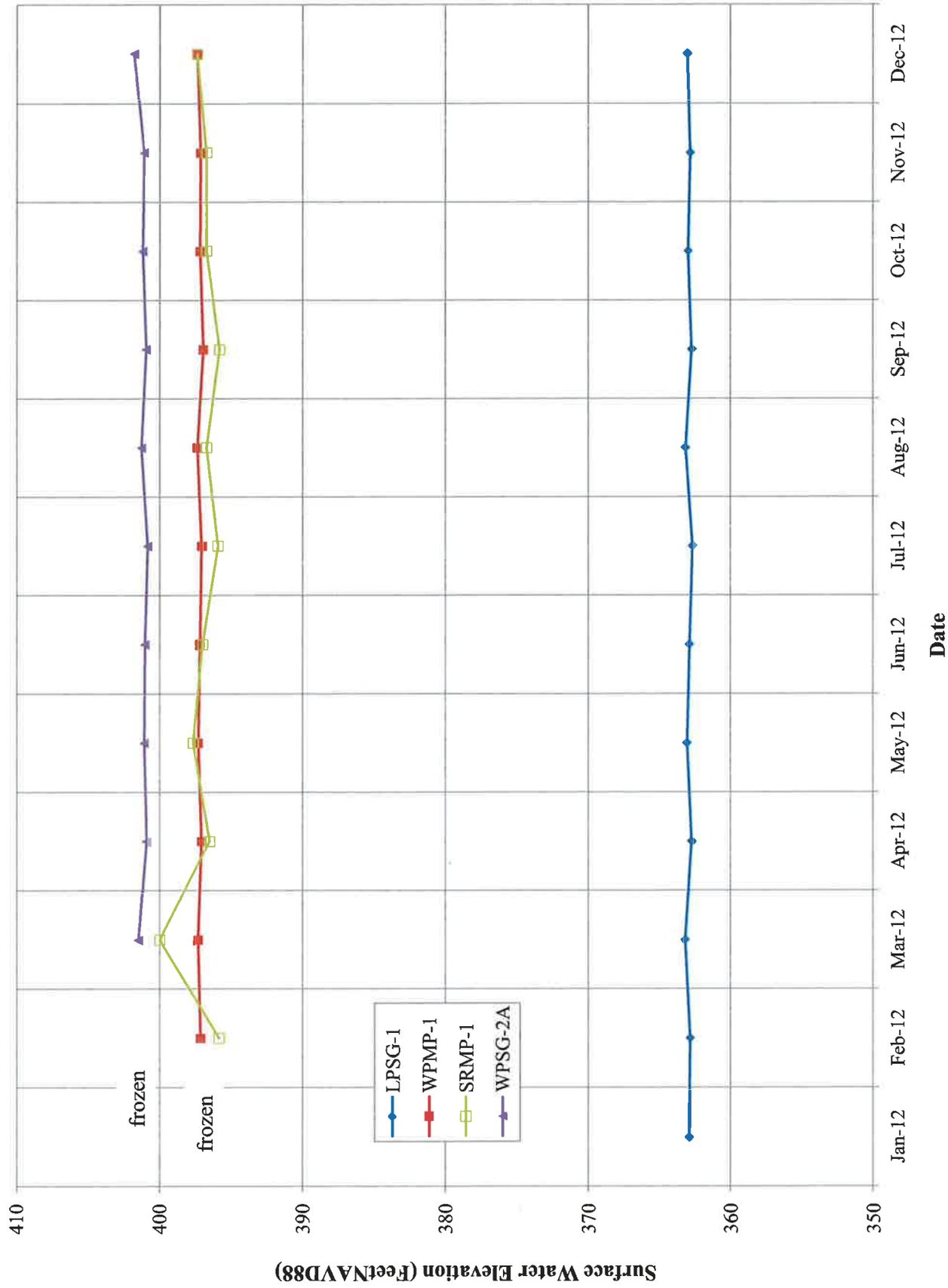
**FIGURE 2**  
**HYDROGRAPH FOR 2012 GROUNDWATER ELEVATIONS**



**FIGURE 3**  
**HYDROGRAPH FOR MW-108 - COMPLETE RECORD**



**FIGURE 4**  
**HYDROGRAPH FOR 2012 SURFACE WATER**



## Appendices

Appendix A	Photographs
Appendix B	Groundwater and Surface Water Elevation Data Table

## **APPENDIX A**

### **Photographs**

Photographs A and AA: Measuring depth to water using a water level indicator at MW-114.



Photograph A



Photograph AA

Photograph B: WBSG-2 – Typical staff gage used for measuring surface water elevation.  
Photograph BB: Lovewell Pond from boat ramp off Rt. 113 facing north (6/20/2012).



Photograph B



Photograph BB



Photograph C: On-site Rain Gage

## **APPENDIX B**

### **2012 Groundwater and Surface Water Elevation Data Table Fryeburg, Maine**

APPENDIX B  
2012 GROUNDWATER AND SURFACE WATER ELEVATION DATA TABLE  
FRYEBURG, MAINE

<i>Monitoring Wells Reference Elevation (feet NAVD88) <sup>1</sup></i>	MW-101 <sup>2</sup>	MW-103	MW-105	MW-107	MW-108	MW-109	MW-110	MW-113	MW-114	TW-2	TW-9
1/20/2012	398.87	412.45	381.01	426.19	411.76	400.14	419.88	422.32	385.95	405.55	411.50
2/20/2012	398.48	412.09	380.68	425.40	411.39	399.91	419.42	422.08	385.47	405.18	411.13
3/20/2012	400.16	412.31	380.99	426.25	411.79	399.85	419.10	421.96	386.45	406.10	411.08
4/20/2012	398.70	411.61	380.64	425.42	411.20	399.67	419.31	422.01	385.50	405.87	411.18
5/18/2012	399.75	411.87	380.75	425.98	411.40	399.27	419.08	421.65	386.11	405.64	410.93
6/20/2012	399.77	413.23	381.60	427.42	412.14	400.66	421.09	423.02	386.64	406.29	412.36
7/20/2012	398.19	412.31	380.46	425.49	410.87	399.75	420.75	422.80	384.83	405.28	411.67
8/17/2012	398.91	412.00	380.27	424.56	410.63	398.96	419.81	422.26	384.25	404.48	411.05
9/18/2012	397.81	411.21	379.73	423.01	409.87	398.80	418.87	421.65	383.70	404.87	410.44
10/17/2012	398.85	411.04	379.85	422.59	410.16	398.68	418.16	421.24	384.17	403.71	410.06
11/19/2012	399.33	411.53	380.29	423.72	410.79	399.02	418.09	421.24	385.40	405.00	410.24
12/20/2012	399.30	411.12	380.02	423.52	410.89	398.81	417.87	421.08	386.01	403.82	410.10

<i>Surface Water Stations Reference Elevation (feet NAVD88) <sup>1</sup></i>	LPSG-1 <sup>3</sup>	WPMP-1 <sup>4</sup>	SRMP-1 <sup>5</sup>	WPSG-2A <sup>6</sup>
1/20/2012	364.85	401.27	418.79	403.97
2/20/2012	364.85 <sup>3</sup>	frozen	frozen	403.72 <sup>6</sup>
3/20/2012	362.91	397.14	395.84	frozen
4/20/2012	362.83	397.31	399.99	401.46
5/18/2012	363.18	397.07	396.51	400.91
6/20/2012	362.73	397.30	397.64	401.08
7/20/2012	363.05	397.18	397.00	401.03
8/17/2012	362.88	397.07	395.94	400.83
9/18/2012	362.67	397.36	396.74	401.27
10/17/2012	363.14	396.96	395.81	400.94
11/19/2012	362.73	397.18	396.74	401.18
12/20/2012	362.97	397.14	396.74	401.07
	362.82	397.36	397.37	401.76

Notes:

1. NAVD88 is the North American Vertical Datum 1988. Elevations are in feet NAVD. Measuring points were re-surveyed in the summer 2009 by Bliss Associates and new reference elevations are reflected in this chart.
2. MW refers to monitoring well
3. LPSG refers to Lovewell Pond Staff Gauge; new reference elevation (April 2012)
4. WPMP refers to Wards Pond Monitoring Point
5. SRMP refers to Saco River Monitoring Point
6. WPSG refers to Wards Pond Staff Gauge; New reference elevation (April 2012)