

Review of Boise Front Geothermal Monitoring Data for Water Year 2003 (October 1, 2002 – September 30, 2003)

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1. EXECUTIVE SUMMARY

Water Year 2003, which ran from October 1, 2002 through September 30, 2003 had the most complete set of monitoring data on record for the Boise Front Low Temperature Geothermal Ground Water Management Area. This accomplishment is the direct result of the monitoring plan which was implemented as part of the Agreement signed by representatives for six of the geothermal entities on July 24, 2002. Appreciation is extended to everyone who faithfully collected and submitted data to the Idaho Department of Water Resources.

The following observations summarize Water Year 2003:

1. Gross and net withdrawals from the four downtown Boise heating systems have been fairly consistent for the last three water years.
2. The water level in the BLM well in September 2003 was at its highest level since 1983, with the exception of one value in 2001. Peak water levels in the Boise Warm Spring Water District East and West wells were lower in 2003 than in 2002; however, overall, upward trends in these wells have continued since 1998.
3. Supply temperatures have dropped a little more than two degrees Fahrenheit in the Capital Mall system since late 1997.
4. Total withdrawal from the four major systems in Ground Water District 63S (Stewart Gulch) was just over 200 million gallons for Water Year 2003 (WY03), which is the first year that total production could be calculated for the District.
5. Water level changes in the nine wells measured in Water District 63S (WD63S) varied considerably with wells showing either increasing or decreasing trends. Local withdrawals may be causing some of these trends.

This report is a condensed version compared to the two previous reports. Additional hydrographs for the downtown Boise, Harris Ranch, and WD63S wells, and the flow calibration checks for the four downtown Boise systems can be found on the IDWR geothermal website (www.idahogeothermal.org).

2. DOWNTOWN BOISE/HARRIS RANCH

In WY03, gross and net withdrawals from the four downtown Boise district heating systems were 734.4 and 274.3 million gallons, respectively (Table 1). About 63 percent of the fluids were reinjected. Both gross and net withdrawals for WY03 were fairly consistent with the two previous water years (Figure 1). Calibration checks using a polysonic meter on the four systems showed that the installed measuring devices are underreporting the flow rates by 2.5% to 12%. IDWR has a policy that measuring

devices are to be accurate to within ± 10 percent. The Sparling meter on the BWSWD was the only one that exceeded 10%. Thus, the Sparling data should be adjusted by multiplying the instantaneous flow readings by 1.136 and by multiplying the calculated monthly totals (based on the totalizer readings) by the same correction factor.

Water levels in the BLM well in September 2003 were at their highest levels since 1983 except for one unusual peak in 2001 (Figure 2). Peak water levels in the BLM well increased 17.8 feet from October 1998 to September 2003 (the City of Boise Injection well began service in early 1999). Water levels in the BWSWD East and West wells continue to show upward trends, although the peak value was a little lower in 2003 than in 2002. Overall, the peak value in the West well was 29 feet higher in August 2003 than in August 1998. The peak water level in the BWSWD #3 well was almost as high as the peak reading in 1983. Water levels in the Harris Ranch wells have climbed steadily since August 2002 (West well +3.6 feet; East well +5.2 feet) with some slight indication of annual cycles. Water levels in the Old Pen well have remained similar to historic data.

Based on the maximum monthly temperature, the supply temperatures in the Capital Mall system have dropped a little more than two degrees Fahrenheit since late 1997 (Figure 3). The temperature sensor on the supply well was switched with the sensor from the injection well in order to determine if the declining trend might be related to inaccurate equipment. However, Bill Hudson (Idaho Department of Administration, personal communication) found that the two thermometers read essentially the same temperature, which gives validity to the observed trend

Table 1. Production from the four district heating systems in the downtown Boise area for Water Year 2003 (October 1, 2002 through September 30, 2003).

System	Gross Withdrawals (gallons)	Net Withdrawals ¹ (gallons)
Boise Warm Springs Water District	250,509,000	250,509,000
Capitol Mall (State of Idaho)	130,257,355	0
City of Boise	180,094,820	23,747,788
Veterans Administration	173,542,686	0
Total	734,403,861	274,256,788

¹Net Withdrawals equal Gross Withdrawals minus Injection amount.

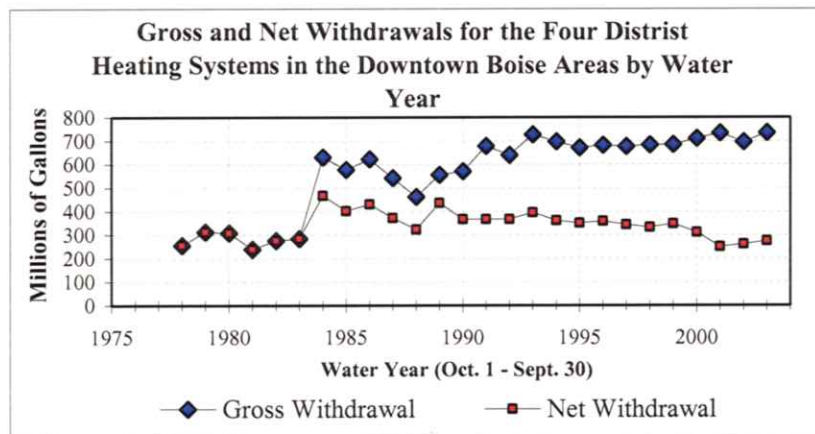


Figure 1. Gross and net withdrawals for the four district heating systems in the downtown Boise area for water years 1978 through 2003.

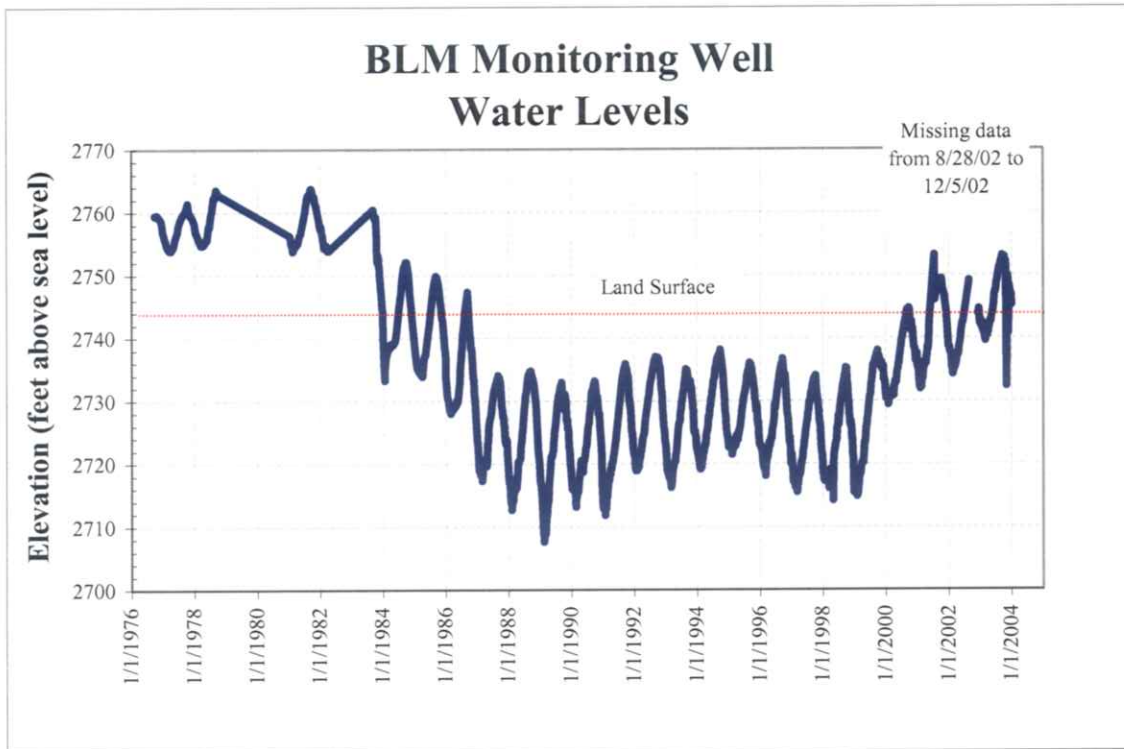


Figure 2. Water level hydrograph for the BLM monitoring well.

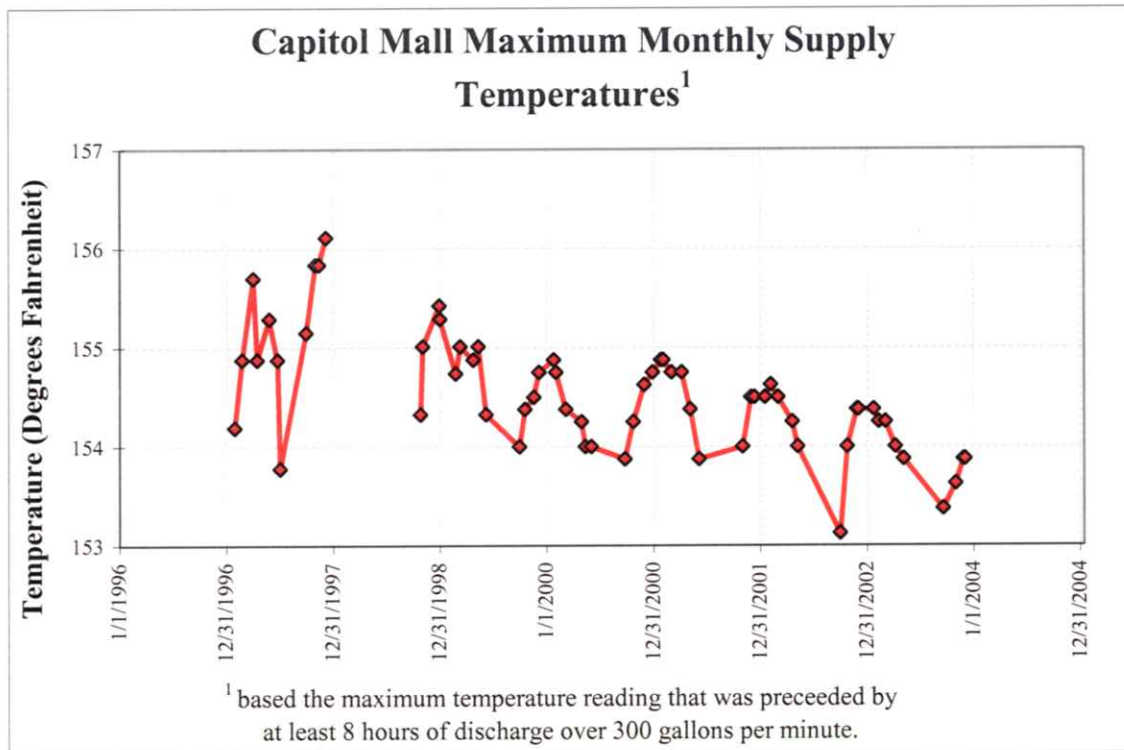


Figure 3. Water supply temperatures for the Capitol Mall system.

3. STEWART GULCH GROUND WATER DISTRICT 63S

Monitoring in the WD63S has improved significantly in the last year. Data are submitted to IDWR according to the monitoring plan of the Agreement signed in 2002 as part of the City of Boise's application for additional withdrawals. In addition to new monitoring equipment installed on the Terteling Ranch and Flora Company wells, monitoring data have been collected monthly since June 2003 by the Water Master of WD63S. Twice a year, the measurement frequency is to increase to once a week for six weeks (Sept-Oct, and Feb-March). The measurements were missed in Sept-Oct due to an oversight by the Water Master, but are being collected weekly for the Feb-March interval at the time of this report. The hydrographs in this report and those posted on the website contain both the data submitted by the reporting entity and the data collected by the Water Master.

Table 2 shows withdrawals for WD63S wells for WY03. In addition to the total reported on Table 2, there is unknown amount of domestic withdrawal from three wells that each service a single residence, and from a well known historically as "Stralow" that provides water to four homes. The domestic wells are exempt from monitoring. However, IDWR is currently reviewing a request by a water user within WD 63S to require the installation of measuring equipment on the Stralow well.

Water level¹ changes varied considerably in the WD63S wells. Overall, water levels were lower in 2003 than in 2002. However, 2002 was an unusual year of high water levels in some of the wells. Therefore, water levels from 2003 were compared to 2001 to try to obtain a longer term picture of trends.

In the Edwards well, peak water levels dropped 8.1 feet from 2001 to 2003 (Figure 4). In the nearby Flora Company Tiegs (Triangle) well, peak water levels dropped 5.8 feet for the same time period (Figure 5). Water levels increased 7 feet in the Flora Company Silkey (Shed) Well, but the September 2001 reading was missing which should have been the highest reading in the year. The Flora Company House well experienced a decline of 4.6 feet from 2001 to 2003. Water levels in the Quail Hollow Golf Course wells were higher in 2003 than in 2001; +3.7 feet in the Lower well and +6.7 feet in the Upper well. The Terteling Ranch Windsock well had an increase in peak values of 1 foot from 2001 to 2003 (Figure 6). Both of the other two Terteling geothermal wells had decreases; -4.6 feet at the Pool well and -16.6 feet at the Windsock well (excluding the very high reading in May 2001).

The reason for variations in water levels in WD63S is unknown, but it is suspected that local pumping conditions may be a primary influence.

¹Shut in pressure readings were converted to the equivalent feet above reference points for flowing wells.

Table 2. Withdrawals from Stewart Gulch Water District 63S geothermal wells for Water Year 2003 (October 1, 2002 through September 30, 2003).

Well	Withdrawals (gallons)
Flora Company Tiegs (Triangle)	0
Flora Company Silkey (Shed)	42,548,250
Flora Company House (Office)	3,214,900
Edwards Greenhouse	45,514,890
Terteling Ranch Windsock	74,214,130
Terteling Ranch Pool	19,944,015
Terteling Ranch Motorcycle Club	0
Quail Hollow Upper	13,431,300
Quail Hollow Lower	5,016,500
Total	203,883,985

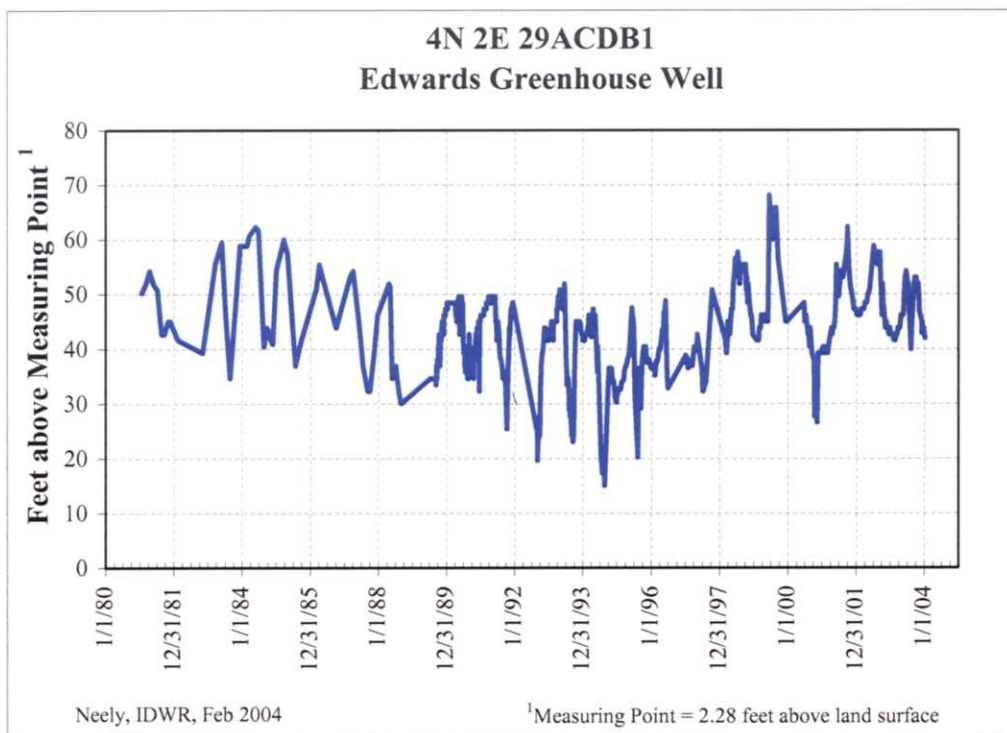


Figure 4. Water level hydrograph for the Edwards Greenhouse well.

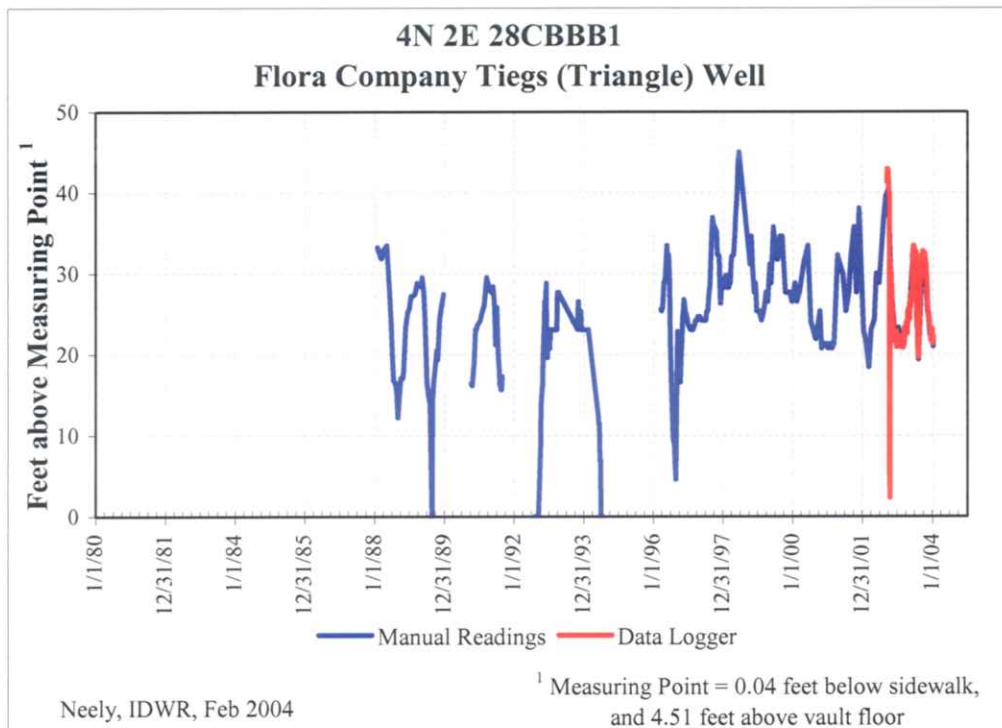


Figure 5. Water level hydrograph for the Flora Company Tieg's (Triangle) well.

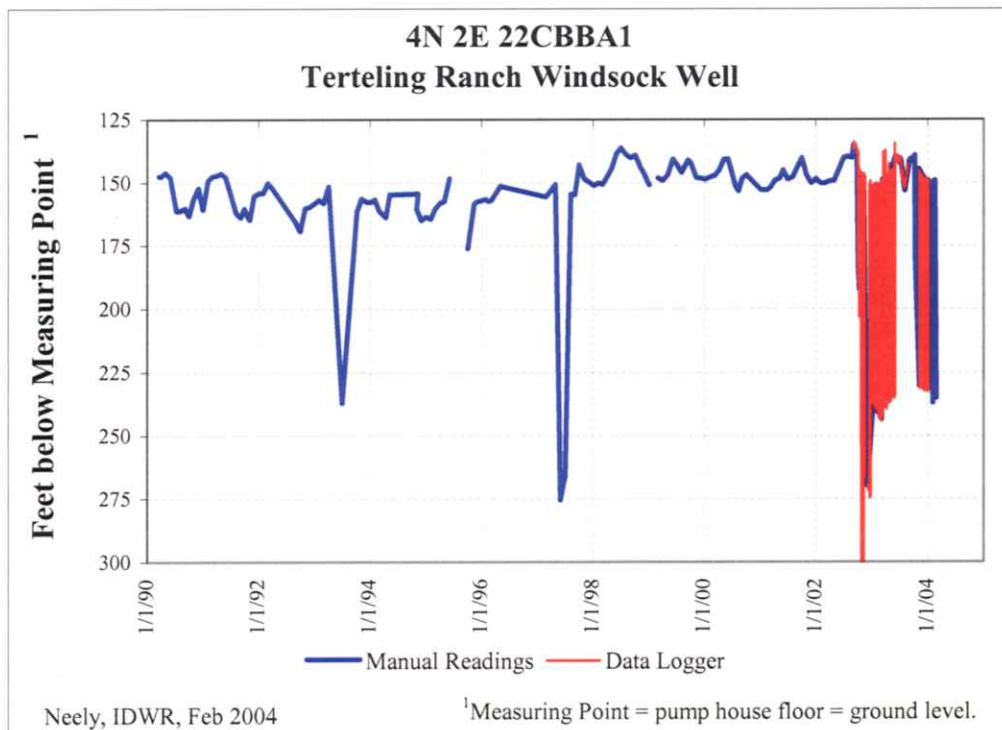


Figure 6. Water level hydrograph for the Terteling Ranch Windsock well.

4. RECOMMENDATIONS

1. Boise Warm Springs Water District.

- a. The Sparling data should be adjusted by multiplying the instantaneous flow readings by 1.136 and by multiplying the calculated monthly totals (based on the totalizer readings) by the same correction factor. Indicate in the quarterly submittals to IDWR that this adjustment has been made to the data.
- b. Enter the log sheet data into an electronic file and submit this to IDWR for the quarterly reports.
- c. Install data loggers to collect information in a more "continuous" manner as required by the order of 1987.

2. Edwards Greenhouse

- a. Enter the log sheet data into an electronic file and submit this to IDWR for the quarterly reports.

3. Veterans Administration (Non-Party).

- a. Enter the log sheet data into an electronic file and submit this to IDWR for the quarterly reports.
- b. Install data loggers to collect information in a more "continuous" manner as required by the order of 1987.
- c. Determine if the air line on the production well is working properly for collecting water level data.
- d. Collect water levels in the injection and test injection wells on a weekly basis.

4. Change IDWR's reporting requirements as follows:

- a. Complete an annual report following the submission of the 3rd quarter data. This report will cover the previous water year and will be due from IDWR by November 30. The report will be similar to this report, and will include representative hydrographs, updated productions tables, and data interpretations. Additional hydrographs will be posted on the IDWR geothermal website.
- b. Complete a brief (1-2 page) memo following the submission of the 1st quarter data. The memo will include a general overview of the previous six months of monitoring and production, an update on the BLM well hydrograph, and an updated temperature plot for the Capitol Mall system. Any unusual situations or issues that need to be addressed will be reported in the memo, which will be due from IDWR by May 31. Flow calibration checks conducted during the heating season will be posted on the IDWR website.