Consultants in natural resources and the environment

Denver • Boise • Durango • Western Slope

Review of Allocation of Replacement Water In The Thousand Springs Area

Prepared for—

Barker Rosholt & Simpson, LLP
1010 W. Jefferson, Ste.102
Boise, Idaho 83701

Prepared by—

ERO Resources Corporation
3314 Grace Street
Boise, Idaho 83713
(208) 373-7983

December 2, 2008

12-2-08

ERO

ERO Resources Corp.
3314 Grace Street
Boise, ID 83703
(208) 373-7983
Fax: (208) 373-7985
www.eroresources.com
eroboise@eroresources.com

Review of Allocation of Replacement Water In The Thousand Springs Area
December 2, 2008

Introduction

The purpose of this report is to: 1) review the procedure described in Finding of Facts 15 and 16 of the Director's July 8, 2005 Order IN THE MATTER OF DISTRIBUTION OF WATER TO WATER RIGHTS NOS. 36-04013A, 36-04013B AND 36-07148 (SNAKE RIVER FARM); AND TO WATER RIGHTS NOS. 36-07083 AND 36-07568 (CRYSTAL SPRINGS FARM) (Clear Springs Order); and 2) Assess the impact of this procedure on the viability of the proposed mitigation alternatives offered, specifically the use of water under 36-4076.

The Findings refer to spring discharge measurements published by the USGS in the Devil's Washbowl to Buhl Gage spring reach and to the Buhl Gage to Thousand Springs spring reach. The Findings indicate the spring discharge measurements were taken at various times when the springs in the Thousand Springs area were near their historical maximums and these data were used to calibrate the ESPA ground water model. The Findings conclude the Snake River Farm's (SRTF) water rights total 7 percent of the measured reach gains in the Buhl Gage to Thousand Springs spring reach and the Crystal Springs Farm's water rights total 31 percent of the measured reach gains in the Devil's Washbowl to Buhl Gage spring reach.[1]

The referenced measurements were published in a 1989 USGS Miscellaneous Investigation Series publication by H. R. Covington and Jean N. Weaver, Map 1-1947-A through Map 1-1947-E, (1989 Report). The authors indicate estimates were made for the discharge of small springs, up to 10 cfs, in 1988 but no discharge measurements were made. The authors relied entirely upon previously published measurement data to compile their report. The references cited by the authors report measurements made from 1899 to 1947, 1948 to 1967, 1966 to 1970 and 1981. Most of the measurements reported referenced a 1982 USGS Water Data Report for Water Year 1981.

Analysis

The 1982 Water Data Report for Water Year 1981, the 1968 Idaho Department of Reclamation Water Information Bulletin No. 6 by Thomas reporting measurements from 1948 to 1967 and the 1958 USGS Water Supply Paper 1463 by Nace, et.al reporting measurements from 1899 to 1947 were reviewed. One purpose of reviewing these references was to determine if any adjustments were made attempting to adjust the measurements to reflect a common period of time. It does not appear any adjustments were attempted.

---

[1] Finding of Fact 15 in the Director's May 19, 2005 Order IN THE MATTER OF DISTRIBUTION OF WATER TO WATER RIGHTS NOS. 36-02356a, 36-07210, AND 36-07427 find the measured flows at the head of Alpheus Creek account for 20 percent of the reach gains to the Devil's Washbowl to Buhl Gage spring for the steady state conditions used to calibrate the ESPA ground water model.

The 1989 Report lists the discharge of Blue Heart Springs to be 65.6 cfs and references the 1958 Nace, et. al. report. A review of Nace, et. al. shows Blue Springs were measured at 65.6 cfs on October 6, 1931 indicating no adjustment over time for Blue Heart Springs.

The 1989 Report lists the discharge of Box Canyon Springs to be 409 cfs and references the 1968 Thomas report. A review of Thomas shows the 409 cfs is the mean annual discharge of Box Canyon Springs for the 17 year period from October 1951 through September 1967. The 1989 Report lists 400 cfs as the additional spring discharge within the Box Canyon drainage and again references the 1968 Thomas report. Thomas shows a single measurement of the total discharge from the Box Canyon drainage of 852 cfs taken April 6, 1956. A logical calculation would seem to be to deduct the mean monthly discharge of Box Canyon Springs for April 1956, 377 cfs, from the total 852 resulting in 475 cfs rather than 400 cfs reported in the 1989 Report.

The 1989 Report references the 1982 Water Data Report for the discharge of 8 springs in the Devil's Washbowl to Buhl Gage spring reach and for the discharge of 6 springs in the Buhl Gage to Thousand Springs spring reach. The 1982 Water Data Report lists 2 measurements for each spring, the first taken in early to mid November 1980 and the second in early to mid March 1981. The 1989 Report does not consistently use either the November or March measurements from the 1982 Water Data Report and in the case of Blue Lakes Spring does not use either of the measured discharge amounts. In most, but not all cases, the November measurement is greater than the March measurement but the 1989 Report does not consistently use either the larger or smaller measurement amount. The difference between the November and March measurements is significant ranging from about 4% to almost 120% of the average of the 2 measurements.

Examining these reported measurements, most based on single measurements and another based on a 17 year mean annual discharge raises questions about their application in the Director's Order. First, is a single measurement a good representation of the annual discharge of a spring? Second, has there been a change over time such that a measurement taken in 1931 and the 17 year average in the 50s and 60s might not be comparable to measurements taken in 1981 and, apparently, used to calibrate the ESPA ground water model? In an effort to address the first question the USGS discharge data for Blue Lakes, Box Canyon, Devil's Washbowl and Briggs Springs along with the privately reported data for SRTF were analyzed by comparing mean monthly discharges for the period 1986 through 2007[2]. Since each of the springs have different rates of discharge, a comparison of the variation in discharge among the various springs is not as instructive as comparing the percent changes by month. Figure 1 shows a comparison of the percent variation from the mean annual discharge of each spring. Four of the 5 springs compare reasonably well for percent

[2] The period was chosen to have sufficient data to compare several springs. Although there is some older data for Devil's Washbowl Springs the current data for both Devil's Washbowl Springs and Briggs Springs limits the comparison to begin in the mid 80s.

change by month and show the flows vary by about 10% from the high to low periods of each year. This monthly comparison suggests it may be possible to adjust single measurements to be more representative of mean annual discharge. It also suggests measurements taken in early November are probably not representative of the mean annual discharge of a spring but measurements taken in early March may be more representative of mean annual discharge for some springs.

To address the second question about changes over time, the USGS records for discharge of the above springs along with Niagara Springs[3] and the reach gain of the Snake River between the Buhl Gage and the Below Lower Salmon Falls Gage were examined for changes over time. The discharge records for Blue Lakes and Box Canyon begin about 1951 and that was selected as the beginning period for this analysis based solely upon available data. Additional mean monthly and mean annual discharges for Devil's Washbowl Springs for the period 1950 through 1959 are reported in Thomas, 1968 and are included in this analysis.

Figure 2 shows a chart of the mean annual discharges for the selected springs for their respective periods of record. A linear regression line is plotted along with the mean annual discharge to help visualize any trend over time. Each of the records shows a declining trend ranging from about 20 cfs per year of the reach gains to the river to about 0.2 cfs for Devil's Washbowl Springs. None of the mean annual plots suggest the need for anything other than a linear trend and the associated R^2 values indicate the linear trend to be a reasonably good fit.

Since the trends in Figure 2 are in terms of cfs per year the slope of the trend line is dependant upon the rate of discharge of the various springs and the discharge of the river in addition to the change over time. For purposes of determining similarities between springs of various sizes all the mean annual discharges were scaled to range from 0 to 1 for their respective periods of record. The resulting trend lines and regression equations can then be compared directly to one another to compare the rate of decline of the various springs and the reach gain of the river.

Figure 3 shows the resulting chart of mean annual discharge scaled to range from 0 to 1 and the associated trend lines and regression equations. Figure 3 further supports the fact the spring discharges have been declining over time and selecting measurement data from dates ranging for the early 50s to the early 80s are not comparable and does not give an accurate representation of spring discharge near their historical maximum or current conditions.

Another important observation of Figure 3 shows most of the discharge records do not show a tendency to flatten in recent years. In fact, most show an increased downward trend in recent years. This is an indication recent efforts to stabilize the ground water levels and spring discharge are not having the expected results.

---

[3] The discharge for Niagara Springs reported by the USGS does not include diversions that occur between the springs and the gage location. The data used here has been modified to include estimated diversions upstream for the USGS gage location. The estimates were based upon Thomas, 1968.

These continuing downward trends also call into question the viability of using the discharge from additional springs as mitigation for SRTF. Additionally, the proposed spring should be expected to suffer the same within year variability shown by the SRTF springs meaning less water is available for mitigation during the times the SRTF supply is at its lowest levels. Apparently no data have been provided to show the viability of using the spring discharge under 36-4076 for the current of future mitigation requirements for SRTF.

Conclusions

The procedure used by the Director to allocate reach responses to individual springs or spring complexes needs to be reevaluated. The procedure does not meet the requirements of good science. It appears the data relied upon by the Director is inconsistent and probably does not represent any actual conditions. The 1989 Report is not an appropriate basis for conjunctive administration of water rights.

The continuing downward trend for most of the springs shown in Figures 2 and 3 calls into question the use of discharge from additional springs for mitigation water supply. The discharge from additional springs are likely to experience annual fluctuations in discharge similar to the fluctuations of the SRTF spring supply meaning mitigation water would be least available at times when SRTF's own supply is at its lowest levels. No data have been provided to show the current or projected spring discharge for 36-4076 will meet the mitigation requirements for SRTF.

Figure 1
Monthly % Variation 86 - 07

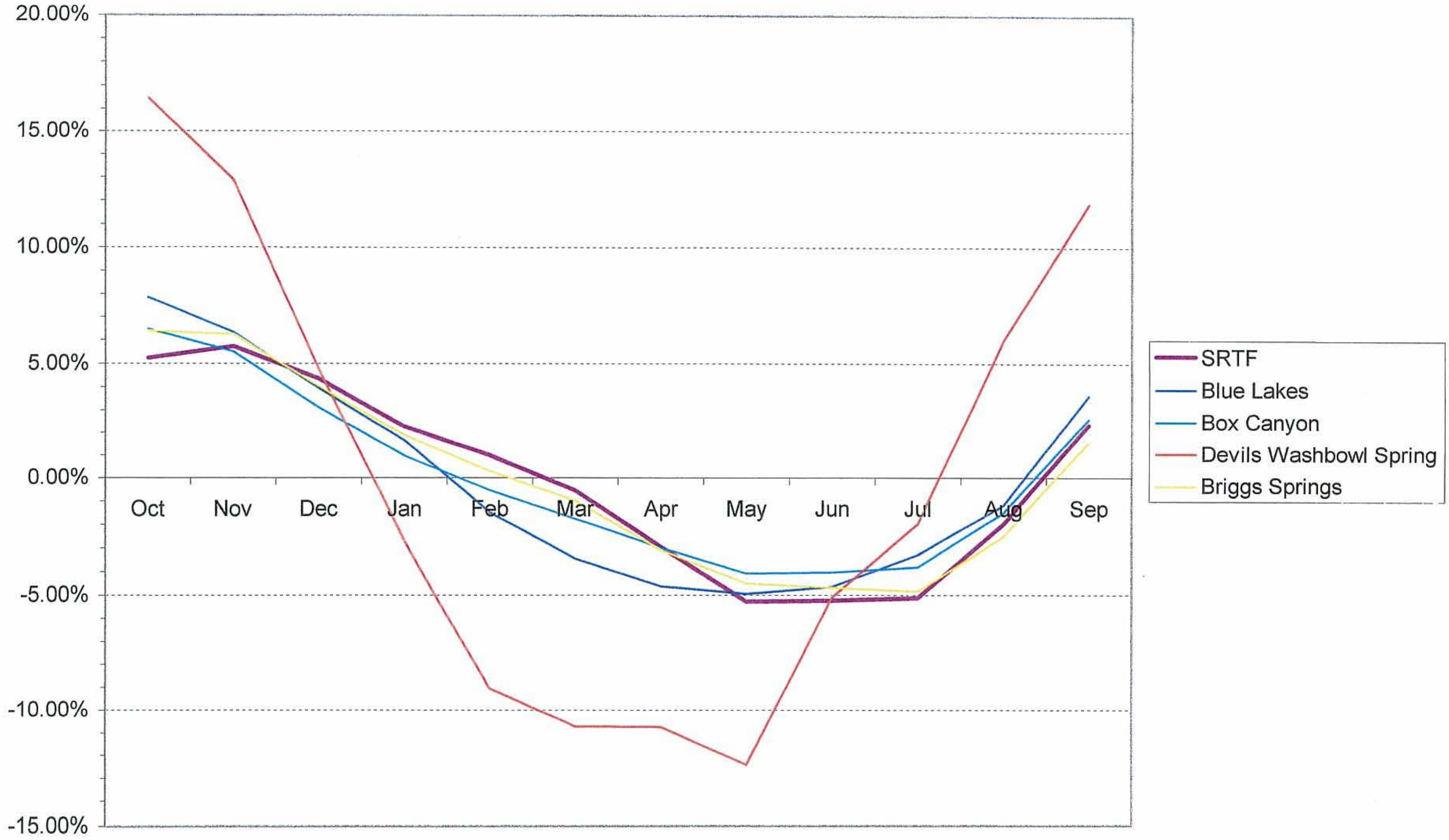

Figure 2
Spring Flows

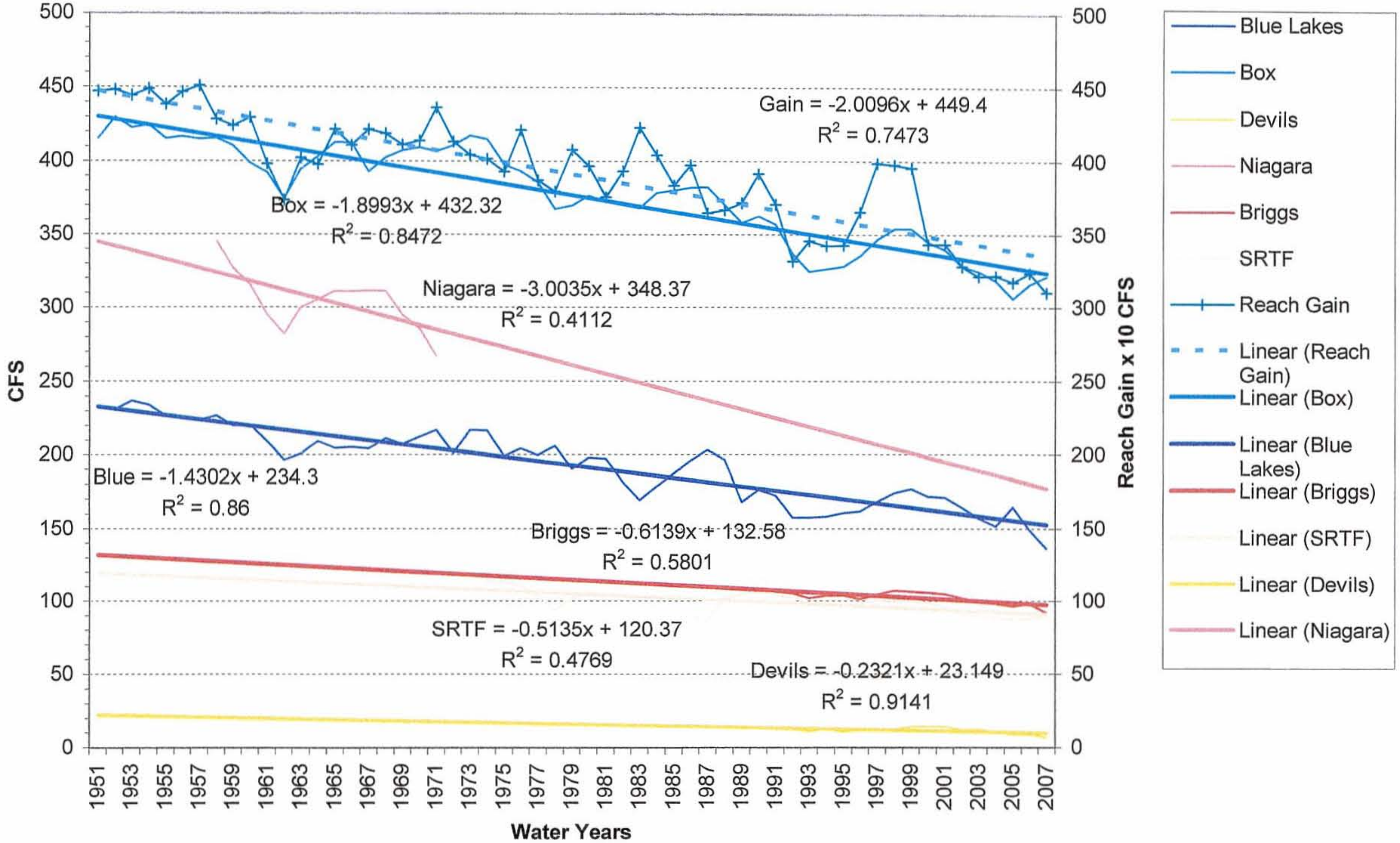

Figure 3
Scaled Spring Flow