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DEPARTMENT OF
WATER RESOURCES

**BEFORE THE DIRECTOR
OF THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO**

IN THE MATTER OF DISTRIBUTION FOR
WATER TO WATER RIGHT NOS. 36-02551
AND 36-07694

(RANGEN, INC.)

**SPRONK WATER ENGINEERS, INC.
EXPERT SECOND SUPPLEMENTAL
REPORT
DATED MAY 13, 2013 PREPARED
FOR THE CITY OF POCATELLO**

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Table of Contents

| | | |
|-----|---|---|
| 1.0 | Introduction..... | 1 |
| 2.0 | Revised Curren Tunnel Regression Analysis | 2 |
| 3.0 | References..... | 3 |

Figures

| | |
|------------|---|
| Figure 1 | Total Curren Tunnel Flow vs. Total Curren Spring Flow Regression, September 1993 – 2011 |
| Figure 2 | Total Curren Tunnel Flow vs. Total Curren Spring Flow Regression, September 1993 – 2011 |
| Figure 2-2 | Total Curren Tunnel Flow vs. Total Curren Spring Flow Regression, September 1993 – 2011 |

**Expert Second Supplemental Report
Dated May 5, 2013
Prepared for the
City of Pocatello**

1.0 Introduction

On December 13, 2011, Rangen, Inc. (“Rangen”) filed a Petition for Delivery Call (“Rangen Petition,” or “Rangen Call”) with the Idaho Department of Water Resources (“IDWR”) seeking curtailment of ground water rights in the Eastern Snake Plain Aquifer (“ESPA”) with priority dates junior to Rangen’s Water Right Nos. 36-02551 (July 13, 1962 priority) and 36-07694 (April 12, 1977 priority). Spronk Water Engineers, Inc. (“SWE”) has prepared the following expert reports for the Rangen Call on behalf of the City of Pocatello:

- Expert Report dated December 21, 2012 (“2012 Expert Report”)
- Expert Rebuttal Report dated February 7, 2013 (“2013 Expert Rebuttal Report”)
- Expert Response to IDWR Staff Memorandum dated April 5, 2013 (“2013 Response Report”)
- Expert Supplemental Report dated May 5, 2013 (“2013 Supplemental Report”)

A hearing before IDWR Director, Gary Spackman, commenced on May 1, 2013 and is still ongoing. As Pocatello’s expert in the case, I gave testimony on various matters, including the historical under-measurement of water use by Rangen and a regression equation that describes the linear relationship between the flow of the Curren Spring and the flow of the Martin-Curren Tunnel (“Curren Tunnel”). The data and results of the regression analysis were presented in Figure 1 of the 2013 Supplemental Report. The regression equation was used to (a) estimate the Curren Tunnel flows prior to 1993 when IDWR began measuring the tunnel flow, and (b) to estimate the portion of increased Curren Spring flow following curtailment of ESPA pumping junior to Rangen’s July 13, 1962 priority that would occur at the Curren Tunnel.

At the end of my testimony, Director Spackman inquired whether the regression analysis and results would change if the Rangen’s historical water use data were corrected for the historical

under-measurement of Rangen's flows. I responded that the regression equation and results would change. In light of the Director's inquiry, I have corrected the historical Rangen flow records to eliminate the under-measurement and have repeated the regression analysis with the corrected data. This report describes the updated analysis and presents an updated regression equation.

2.0 Revised Curren Tunnel Regression Analysis

Rangen reports its water use based on the sum of the measured flows in the CTR Raceways and the measured flows in Billingsley Creek at the Lodge Dam. Based on comparison of Rangen's measurements to flows measured in Billingsley Creek immediately downstream of the confluence with the outfall from CTR Raceways, I previously determined that Rangen has been under-measuring its flows by an average of 15.9 percent.

I corrected the historical Rangen flows by the amount of the historical under-measurement and repeated the regression analysis using the monthly data from September 1993 – 2011 that were used in the original analysis described in the 2013 Supplemental Report. The following is a description of how the revised analysis was performed.

1. Tabulate the portion of the historical total Curren Spring flows that were comprised of the raceway and Billingsley Creek flows measured by Rangen.
2. Multiply the historical Rangen flows by a factor of 1.189 (computed as $1 / [1 - 0.159]$) to correct for the historical under-measurement of flows by Rangen. The historical flows are 84.1 percent of the corrected flows, which is consistent with the historical 15.9 percent under-measurement.
3. Add the actual and estimated farmers' diversions for irrigation during 1993 – 2002 to the corrected Rangen flows to compute the corrected total Curren Spring flows.
4. Repeat the regression analysis using the total Curren Tunnel flows from the original analysis (sum of the measured Curren Tunnel flows and the reported 6-inch white pipe diversions) and the corrected total Curren Spring flows.

The results of the revised regression analysis are shown in **Figure 1**. A graph comparing the data and results for the original and revised regression analyses is shown in **Figure 2**. The following is the linear equation from the revised regression analysis that describes the relationship between the flow of the Curren Tunnel and the total Curren Spring flow.

$$\text{Curren Tunnel (cfs)} = 0.6337 \times \text{Curren Spring (cfs)} - 5.8553$$

In my opinion, the above equation should be used to compute the portion of the increased total Curren Spring flow following curtailment that would accrue to the Curren Tunnel. This is also the equation that should be used to estimate the Curren Tunnel flows that existed prior to 1993 when IDWR began measuring the flows.

The increase in the flow of the Curren Tunnel can be estimated by multiplying the increase in the Curren Spring flow following curtailment predicted by ESPAM 2.1 by 0.6337, which is the slope of the regression line. The ESPAM 2.1 predicts that curtailment of pumping junior to Rangen's July 13, 1962 water right would result in an increase in the total flow of the Curren Spring by 17.9 cfs at steady-state. Based on the revised regression equation, 63.37% of the increase in the total Curren Spring flow at steady-state following curtailment, or 11.3 cfs, would accrue to the Curren Tunnel.

Figure 2-2 from the May 2013 Supplemental Report showed the current monthly flows of the Curren Tunnel and Curren Spring and the estimated flows that would result after curtailment at steady-state. The results in Figure 2-2 were revised using the updated regression equation and an updated **Figure 2-2** is attached.

3.0 References

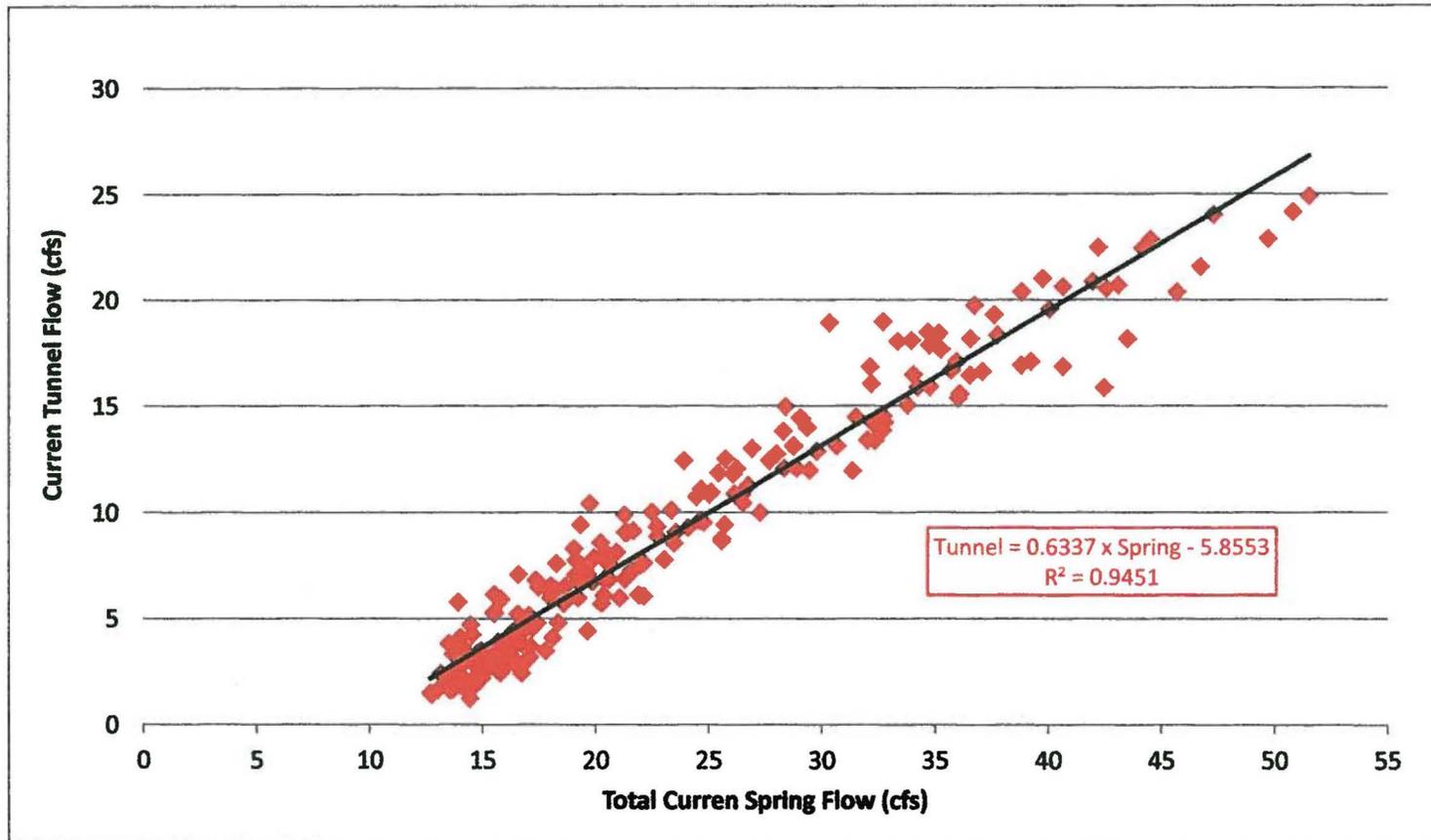
The following information was relied on in preparing this report.

1. Idaho Department of Water Resources, Diversion records for Total Rangen Fish Hatchery flow, Site ID: 360410089, March 1995 – 2011 and diversion records for Rangen Pipe, Site ID: 360410041, 2006 – 2011 Available from:
http://maps.idwr.idaho.gov/qwraccounting/wra_select.aspx
2. Idaho Department of Water Resources, Staff memorandum in response to expert reports submitted for Rangen Delivery Call (In the Matter of Distribution for Water to Water Right Nos. 36-02551 and 36-07694), February 27, 2013.
3. Idaho Department of Water Resources, Response to Information Request, March 3, 2013.

4. Idaho Department of Water Resources, Decrees and Licenses downloaded from Water Right and Adjudication Database, 2013. Available from:
<http://www.idwr.idaho.gov/apps/ExtSearch/WRAJSearch/WRADJSearch.aspx>.
5. Sullivan, G.K., Spronk Water Engineer's Expert Report In Matter of Distribution of Water to Rangen, Inc's Water Right Nos. 36-02551 and 36-07694, Prepared for Pocatello, December 21, 2012.
6. Sullivan, G.K., Spronk Water Engineer's Expert Rebuttal Report In Matter of Distribution of Water to Rangen, Inc's Water Right Nos. 36-02551 and 36-07694, Prepared for Pocatello, February 7, 2013.
7. Sullivan, G.K., Spronk Water Engineer's Expert Response to IDWR Staff Memorandum In Matter of Distribution of Water to Rangen, Inc's Water Right Nos. 36-02551 and 36-07694, Prepared for Pocatello, April 5, 2013.
8. Sullivan, G.K., Spronk Water Engineer's Expert Supplemental Report In Matter of Distribution of Water to Rangen, Inc's Water Right Nos. 36-02551 and 36-07694, Prepared for Pocatello, May 5, 2013.

Figures

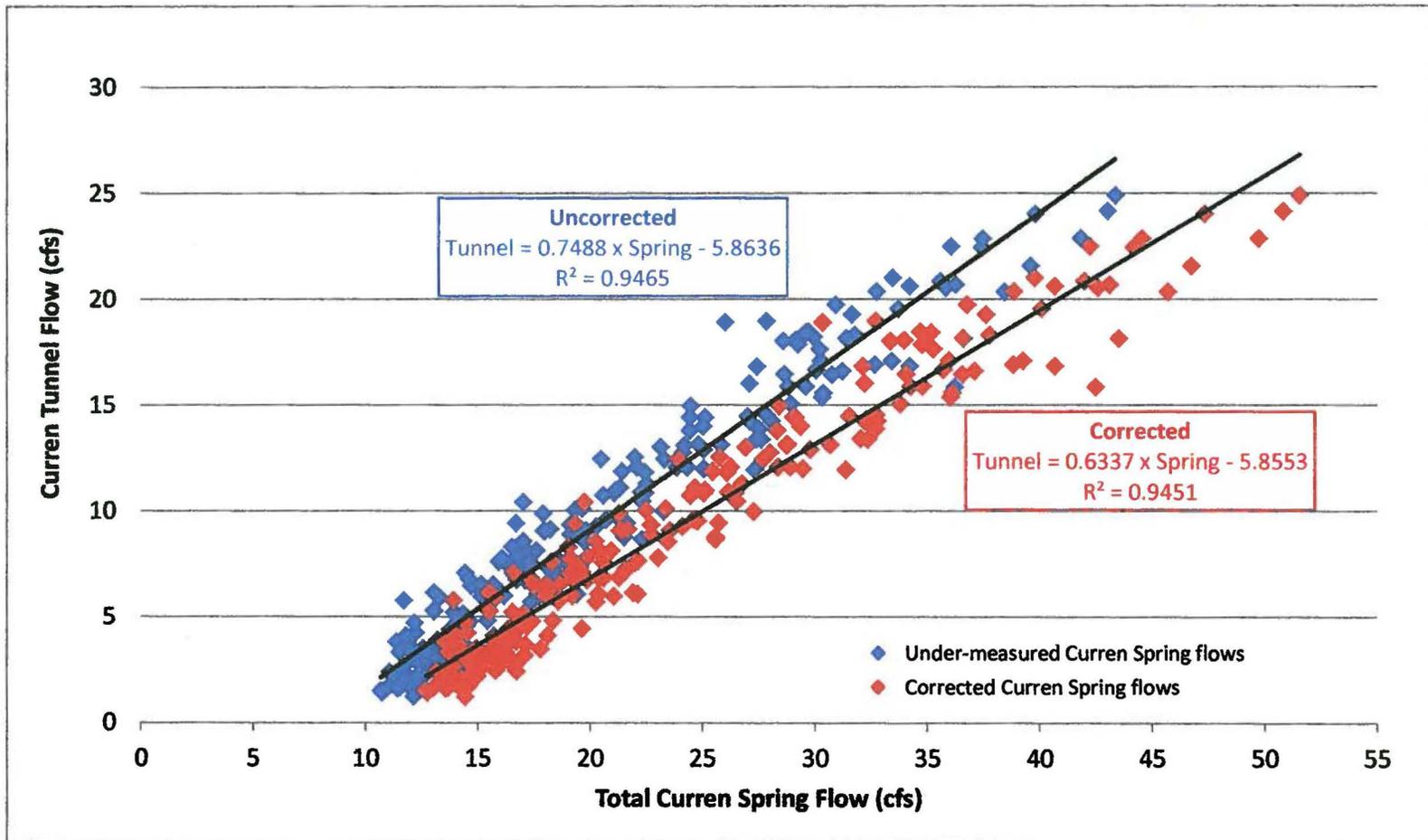
Figure 1
Total Curren Tunnel Flow vs.
Total Curren Spring Flow Regression
Total Curren Spring Flows Corrected for Under-measurement of Rangen Flows
September 1993 - 2011



Notes:

- (1) The Current Tunnel Flow is the sum of the tunnel flows measured by the IDWR (9/1993 - 2011) and the 6-inch wite pipe flow records provided by IDWR (1996 - 2011). Missing Rangen pipe flow data from 9/1993 - 1995 were estimated using the 1996-2011 average.
- (2) The Current Spring flow is the sum of the corrected Rangen Hatchery flows (flow in the raceways plus flow in Billingsley Creek at the Lodge Dam) plus the actual and estimated diversions to irrigation at the Farmers' Box prior to cessation of those diversions after 2002. The Rangen Hatchery flows were corrected for the historical 15.9% undermeasurement of flows by Rangen by multiplying the reported flows by a factor of 1.189 (computed as $1 / [1 - 0.159]$).
- (3) The values plotted in the graph are the historical natural flows of the Current Tunnel and the Current Spring.

Figure 2
Total Current Tunnel Flow vs.
Total Current Spring Flow Regression
Total Current Spring Flows Corrected and Uncorrected for Rangen Under-measurement
September 1993 - 2011



Notes:

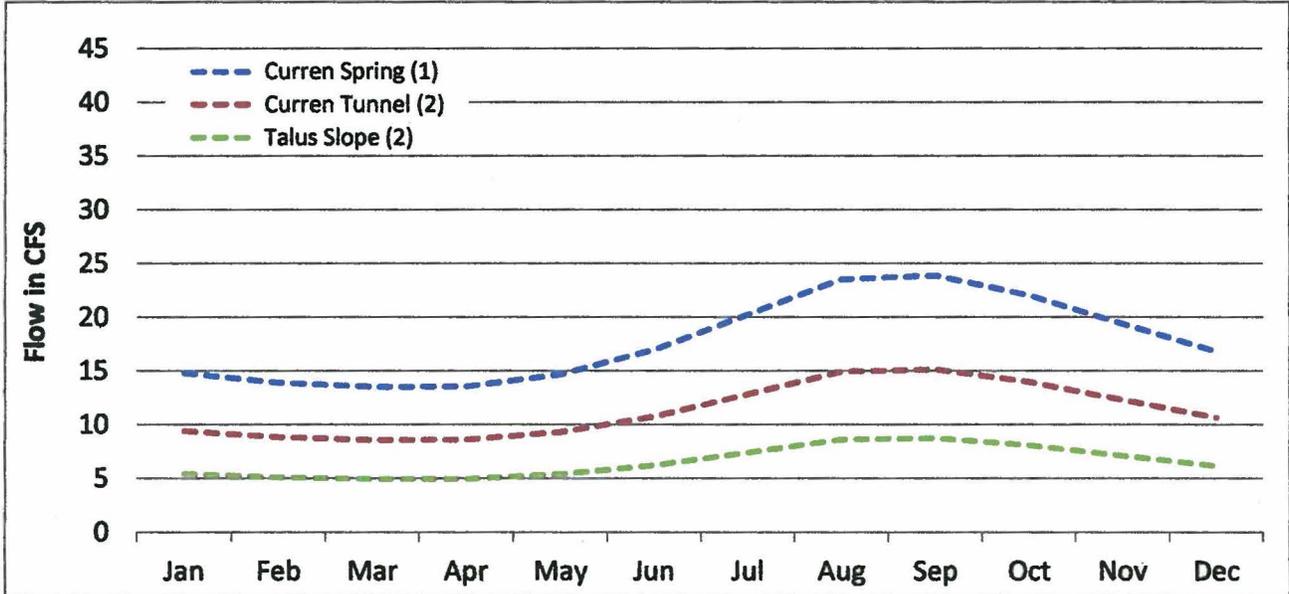
- (1) The blue dots and associated regression line are based on the historical total Current Spring flows, a large portion of which were under-measured by Rangen. These data and results were presented in Figure 1 of Pocatello's May 5, 2013 Supplemental Expert Report.
- (2) The red dots and associated regression line are based on the Current Spring data that have been corrected for the under-measurement by Rangen. These data and regression line are presented in Figure 1 of Pocatello's May 13, 2013 Second Supplemental Expert Report.

Figure 2-2

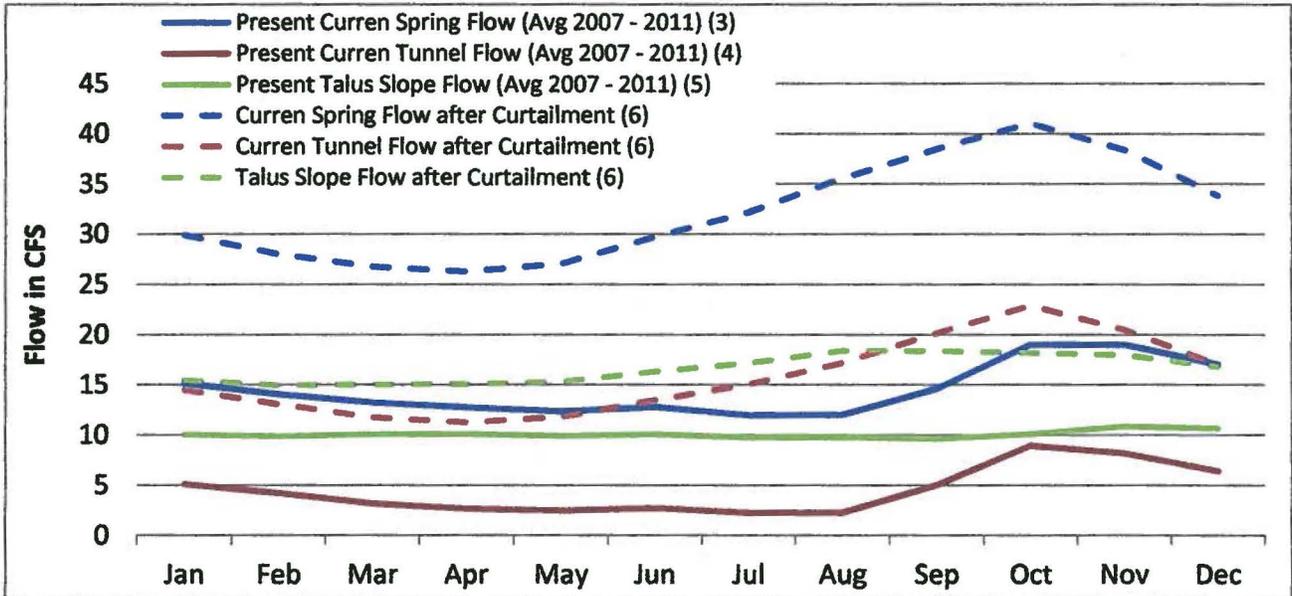
(revised May 11, 2013)

Predicted Increase in Curren Spring Flow at Steady-State from Curtailment of Ground Water Rights Junior to July 13, 1962

Steady-State Increase in Curren Spring Flow Following Curtailment



Curren Spring Flow Before and After Curtailment



Notes:

- (1) ESPAM 2.1 Model results provided by AMEC for effect of curtailment after 80 years (~ steady state).
- (2) Curren Tunnel Flow calculated using Total Curren Spring vs. Curren Tunnel regression (SWE).
The regression equation was revised to correct for the historical under-measurement of Rangen flows.
- (3) Monthly Rangen flow data provided by IDWR.
- (4) Curren Tunnel flow data provided by IDWR plus 6" white pipe flow data provided by the IDWR.
- (5) Calculated as present Curren Spring flow (3) minus present Curren Tunnel flow (4).
- (6) Calculated as present flow (3, 4, 5) plus predicted increase in flow (1, 2).