

Keen, Shelley

From: Stanish, David [david.stanish@ag.idaho.gov]

Sent: Thursday, April 19, 2007 3:31 PM

To: Keen, Shelley

Subject: RE: State Geothermal Data

Hi Shelley:

Would the 10% uncertainty factor be applied to the 199.9 million gallon figure below (i.e., 220 million gallons)?

Sincerely,

David I. Stanish

Natural Resources Division
Office of Attorney General
700 W. Jefferson Street
P.O. Box 83720
Boise, ID 83720
(208)334-4549
david.stanish@ag.idaho.gov

-----Original Message-----

From: Keen, Shelley [mailto:Shelley.Keen@idwr.idaho.gov]

Sent: Wednesday, April 18, 2007 4:26 PM

To: Stanish, David

Subject: FW: State Geothermal Data

David,

I received the following email from Ken Neely this afternoon. Ken is available to discuss it with you, if you'd like to call him. His number is 287-4852.

Shelley Keen
Idaho Department of Water Resources
P.O. Box 83720
Boise, ID 83720-0098
(208) 287-4947
shelley.keen@idwr.idaho.gov

-----Original Message-----

From: Neely, Ken

Sent: Wednesday, April 18, 2007 3:54 PM

To: Keen, Shelley; Retelle, Erin

Subject: State Geothermal Data

Hi Shelley and Erin,

4/23/2007

I spoke with Christian Petrich yesterday regarding the State of Idaho's production totals on Table 1 of my Open File Report (attached). Based on our conversation, I decided to confirm the Trend Log total that I had calculated for calendar year 1993 (which was reported as 180.3 million gallons). Thankfully, I was able to find the spreadsheet file. In reviewing the file, I realized that there are some missing discharge readings, and that some discharge readings are suspect based on comparing the preceding and succeeding readings. At the time of that Open File report, I was not adjusting the data for incompleteness or questionable data. Since then, I have developed an approach to account for missing and questionable data. This is how I accomplish the adjustments:

1. If a discharge reading is missing, I create an entry. To do this, I compute an average of the discharge readings before and after the missing record, using the same time interval of the missing data. As a hypothetical example, let's say that the discharge reading for May 2, 6.00 hours is missing. And the reading for the May 1, 6.00 hour is 475 gpm, and the reading for May 3 is 525 gpm. Therefore, the missing reading is filled in with 500 gpm.
2. Some data are obviously suspect because they are lower or higher than nearby readings. As a hypothetical example, let's say there is a single discharge reading of 1,700 gpm which is sandwiched between numerous preceding and succeeding readings that are in the range of 700-800 gpm. Based on my knowledge of this geothermal system, a discharge reading of this magnitude is not realistic. Or suppose a discharge reading of 67 gpm occurs in December when normal discharge readings are 450-800 gpm. This may be a valid reading, but is highly suspect based on the nearby data+. Like with missing data, I compute an average based on preceding and succeeding readings.
3. In the 1993 file, there were also some discharge readings of "0" that I considered suspect based on other system data in the file, and on the preceding and succeeding discharge readings. Again, I compute an average value from nearby data.
4. In a couple cases, there is insufficient preceding or succeeding data to calculate an average. In these situations, I used the most reasonable nearby data to fill in the missing or suspect record.

Based on this approach, the new calculation of the total withdrawal for the Trend Logs in 1993 is 199.9 million gallons. I feel confident that this is a more accurate and defensible calculation than the calculation that I did initially for the Open File report.

After I hear your opinions on this, I will forward the information to Christian.

Sincerely,

Ken

<<State Geo Report page 7 Table 1.pdf>>

Kenneth W. Neely, Technical Hydrogeologist
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Statewide Program Website:

www.idwr.idaho.gov/hydrologic/info/statewide/

Geothermal Website:

www.idahogeothermal.org

Table 1 Annual production for the Capitol Mall geothermal system, 1983-1994 (in millions of gallons).

Year	Berkeley Group Inc. (1990)	Daily Logs	Trend Logs
1983	79.1	65.8	
1984	204.8	169.5	
1985	196.4	187.5	
1986	188.6	179.7	
1987	N/A	148.6	
1988	212.6 ^a	122.7	
1989	106.3 ^a	155.6	
1990		83.4	
1991		159.4	43.6
1992		136.3	75.3
1993		240.2	180.3
1994		167.9	96.3

^a Estimated from Totalized value of 3.10×10^6 gallons for the period from January, 1988 through June, 1989 (Berkeley Group Inc (1990)).

Monthly Production

Figure 6 shows the total monthly production for 1983 to 1994 as calculated from the Daily and Trend Logs. Monthly production ranged from 0 to 30.5 million gallons. Appendix A lists the monthly production data.

Daily Discharges

Figures 7 through 18 show the daily discharge readings from the Daily Logs for 1983-1994. The average daily discharge readings from the Trend Logs for 1991-1994 are included in Figures 15-18. The X axis for each figure is incremented by Julian days in the respective calendar year (Day 1 = January 1; Day 365 = December 31).

Daily discharges fluctuate from about 600 to 800 gallons per minute during the peak heating season (approximately days 1-90 and 300-365), to about 300-500 gallons per minute during the non-peak heating season (approximately days 91-180 and 240-299), to 0-300 gallons per minute during the summer (approximately days 181-239). Clearly, some years have more complete data than other years. Figures 9, 10, and 17 appear to be the most complete. Therefore, the annual production as calculated from the Daily and Trend Logs may be the most accurate for 1985, 1986 and 1993 (Table 1).