

Memo

To: File

From: Nathan Erickson 

Date: 4/4/2007

Re: Response to March 21, 1989 Memorandum: Field examination for permit no. 47-7478 in the name of College of Southern Idaho

In response to the memo from Gary Spackman, I will attempt to answer the questions and provide an explanation of what could be done.

1. The source of the cold water is possibly from the city of Twin Falls system. However it should not affect the licensing of the hot water use because it was subtracted from the calculation of fish propagation portion of the water right. The fish propagation portion of the water right has not been in use since sometime around 1987, therefore the cold water is no longer used.
2. This was a hard one to address since the fish propagation no longer exists. However there were some pictures of the field exam available that led to the following conclusions. The picture taken of the tanks at the time of the field exam appears to show that the six tanks are actually lined up in three rows, two to a row. The water flows into three of the tanks and then is poured into the next three tanks. This would explain the need to only measure three of the six tanks. We will assume that all three tanks were allowed to flow at the same time while measurements were taken for each of the three tanks. The calculation of the tank volume does include all six tanks plus the round tank.
3. The place of use:

Fish propagation – 10S 17E 4 NESW

Heating – 10S 17E 4 NESW, SESW, NWSE
4. The calculation of the domestic heating flow rate in attachment #1 was not used in determining the total diversion rate for heating. Rather the rate of diversion for well 2 was taken from attachment #3, where the total flow of the well was measured using a Model 75 Annubar. Attachment #2 shows the total flows that were used for each building.
5. It appears that well 2 is only used in the Vo-tech D building and for fish propagation.
6. The field exam used 259 days to calculate the volume used for heating. I am unsure of where this number came from. The question is: what type of reasoning needs to be used in determining the number of days and is it appropriate to multiply the number of days by the instantaneous flow rate?

CSI volume calculation WR 47-7478

The annual volume requirement for water right 47-7478 was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988. The memorandum contained an equation for calculating the annual water requirements for geothermal heating. The equation is listed below with an explanation of the variables; data was taken from the 1985 field exam and the National Oceanic and Atmospheric Administration (NOAA).

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2}$$

Where

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

C_D = Empirical correction factor for heating effect vs. 65 °F degree-days

Δt_1 = Design temperature difference

k = Correction factor to account for losses in, use 0.90

C = Constant to correct for desired units, 2.72×10^6 BTU/AF-°F

Δt_2 = Temperature of incoming geothermal water minus temperature of outgoing geothermal water in °F

Values used:

HL = 3,655,000 BTU/hr (Recorded in 1985 field exam)

DD = 6,715 (NOAA, Average number of degree days 1971-2000)

24 = 24 hrs/day

C_D = .64 (Taken from table based on degree days)

Δt_1 = 73 °F (Indoor temperature (70°F) minus design outdoor temperature (-3°F))

k = 0.90

C = 2.72×10^6 BTU/AF-°F

Δt_2 = 7.3 °F (99.5 °F – 92.3 °F, taken from 1985 field exam)

Volume of water required for heating:

$$V = \frac{3,655,000 \times 6,715 \times 24 \times .64}{73 \times 0.90 \times 2,720,000 \times 7.3} = \mathbf{289 \text{ af}}$$

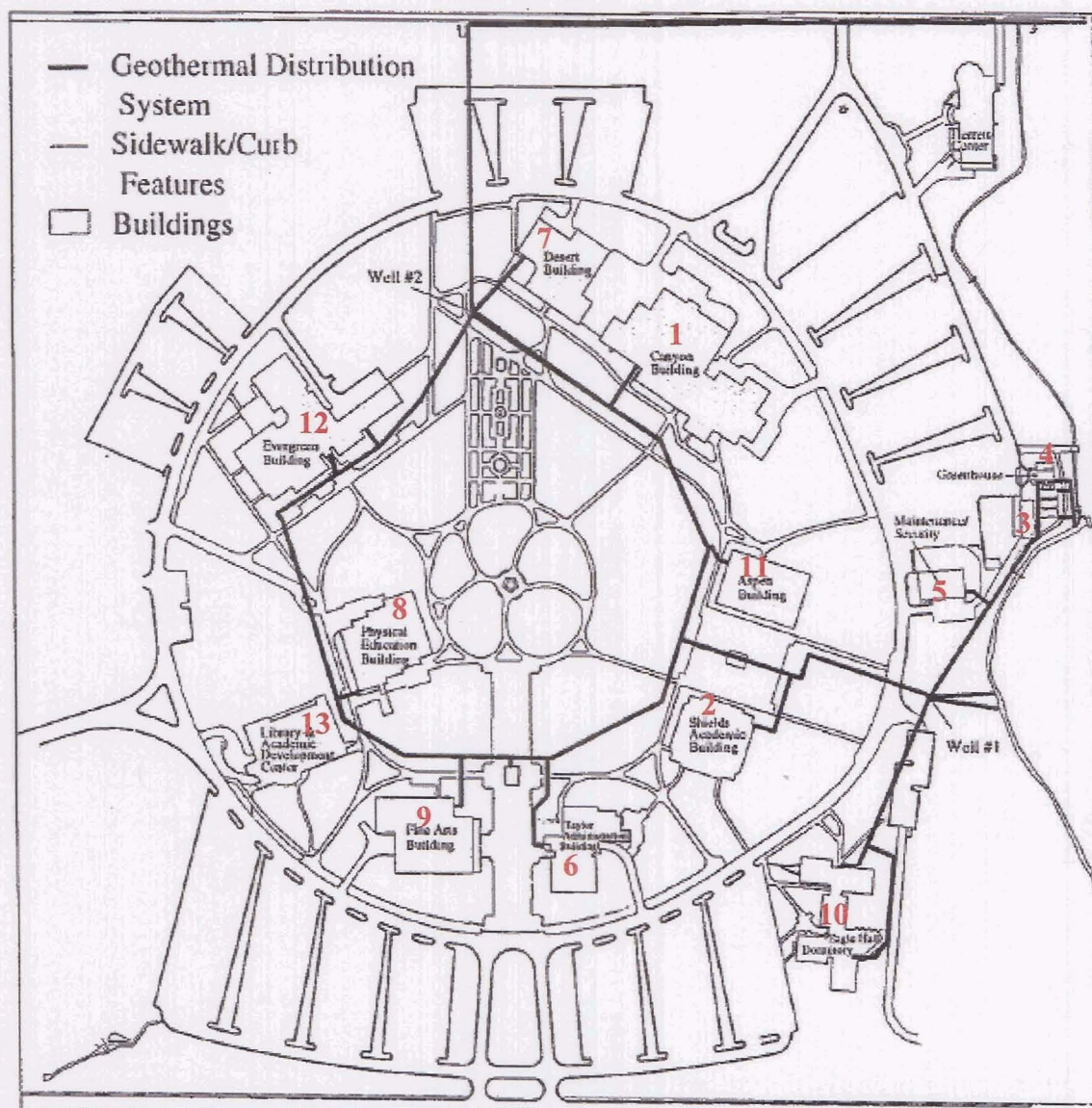
Volume of water required for fish propagation:

$$0.08 \text{ cfs} \times 1 \text{ year} = \mathbf{58 \text{ af}}$$

Total volume for WR 47-7478: **347 af**

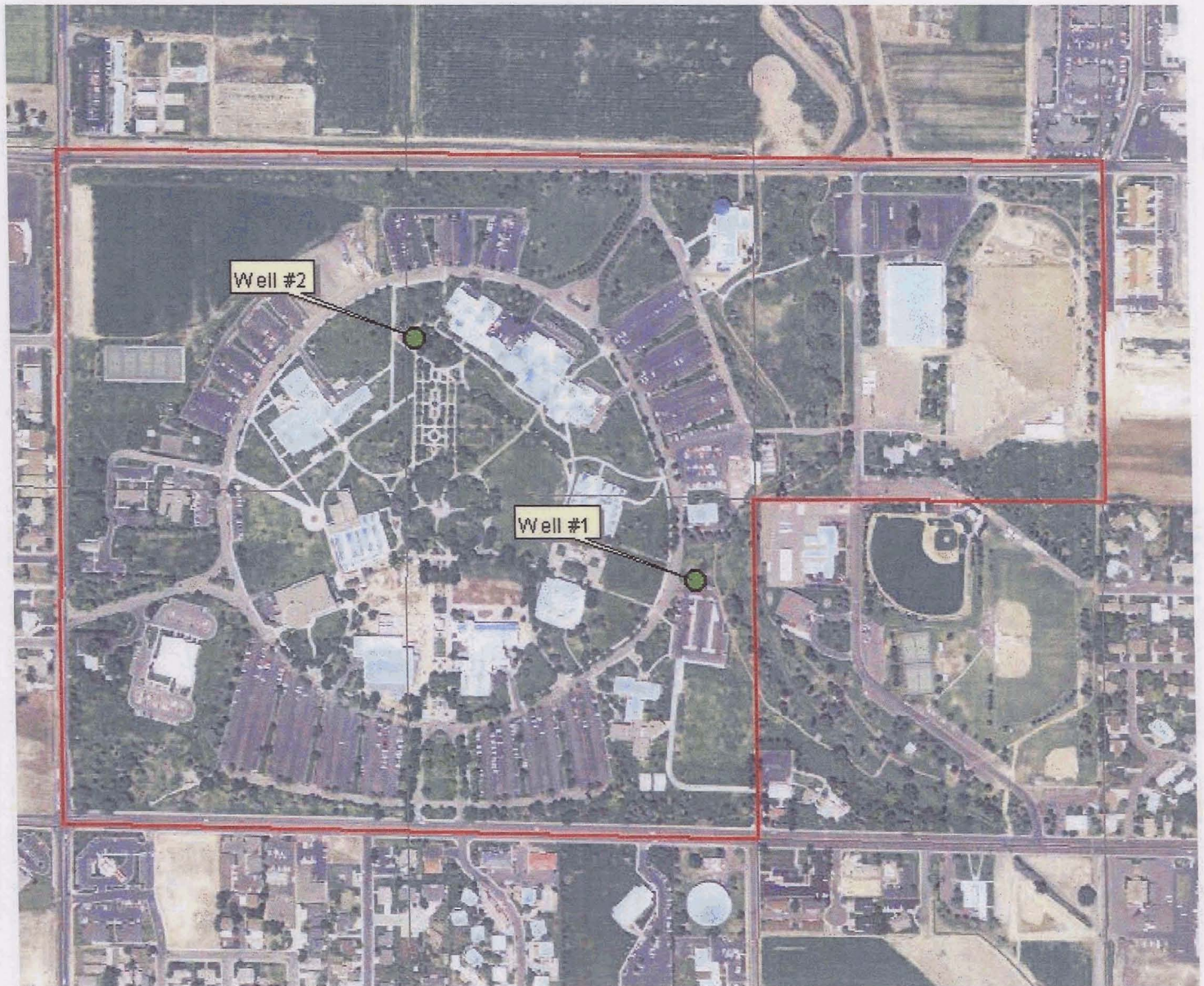
CSI Geothermal development Timeline

- 1978 – 47-7478 Application, 5cfs, heating and fish propagation
- 1979 – Well #1 completed (800gpm)
- 1979 – 47-7606 Application, 15cfs, heating and fish propagation
- 1981 – Well #2 completed (1100gpm)
- 1981 – Vo-Tech D connected to system (1)
- 1982 – Shields retrofit (2)
- 1982 – Physical Plant connected (3)
- 1982 – Greenhouse connected (4)
- 1982 – Maintenance shop connected (5)
- 1983 – 47-7478 Proof of beneficial use
- 1985 – Taylor building retrofit (6)
- 1985 – 47-7478 Amendment, added 2nd well
- 1985 – 47-7606 Amendment, added 2nd well
- 1985 – 47-7478 Field exam (see Gary Spackman Memo)
- 1986 – Desert retrofit (7)
- 1987 – Plastic Greenhouse added (4)
- 1987 – P.E. Gym retrofit (8)
- 1988 – Fine Arts retrofit (9)
- 1988 – Wells 1 and 2 interconnected
- 1988 – Dormitory retrofit (10)
- 1989 – 2 Greenhouses added (4)
- 1989 – Canyon retrofit (1)
- 1989 – Aspen retrofit (11)
- 1989 – Evergreen retrofit (SIDC) (12)
- 1989 – Agreement diversion rate will not exceed 6cfs
- 1990 – 734 af
- 1991 – 726 af
- 1992 – Installed pumps in wells
 - Well #1 max pumping rate 1,272 gpm (2.8 cfs)
 - Well #2 max pumping rate 1,550 gpm (3.5 cfs)
- 1992 – Added A&B wings of Evergreen building
- 1992 – 570 af
- 1993 – 47-7606 Proof of beneficial use
- 1993 – 688 af
- 1994 – 827 af
- 1995 – Meyerhoeffler building added (13)
- 1995 – 710 af
- 1998 to Present – Various expansions and improvements to system
- 2001 – Well #1 Meter certification (400gpm)
- 2001 – Well #2 Meter certification (400gpm)

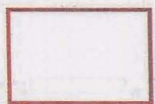


CSI Geothermal Wells

Water Right 47-7478



0.25 0 0.25 0.5 Miles



POU



3/13/07

Things to keep in mind when licensing CSI rights 47-7478 and 47-7606

1) The total of the two rights are limited to 6 cfs. According to the maximum capacity of the two pumps on the wells the system is capable of pumping 6.3 cfs however the college pumps at a lower rate. The following are the highest instantaneous flow measurements recorded over the last few years.

March 1999 – 5.1 cfs

November 2000 – 2.4 cfs

February 2001 – 4.9 cfs

February 2002 – 4.6 cfs

February 2003 – 2.3 cfs

January 2004 – 4.0 cfs

January 2005 – 4.1 cfs

2) Right 47-7478: At the time of the field exam the total capacity of the system was 1.38 cfs, however the recommended rate was 1.21 cfs. The lower rate was determined by combining the designed flow rate with the measured flow rate and use the lower of the two values. I believe that the total system capacity should be used (1.38 cfs)

3) If right 47-7478 is licensed for 1.38 cfs, right 47-7606 could be licensed for 4.62 cfs. In 1992 when the pumps were installed the system had the capacity to pump over 6 cfs.

4) The volume of water that was recommended for licensing in right 47-7478 was 624.2 af. This volume was based on the period of use of 259 days. The basis and reasoning for the number of days needs to be determined. The result will change the original recommended volume.

5) The total volume for the two rights should be based on what has been historically used. Between 1990 and 1993 the recorded yearly volume was between 570 af and 734 af. Because the proof of beneficial use was submitted in 1993 it would be reasonable to use the high of 734 af as the total volume for the two rights. However in 1994 the volume increased to 827 af with no recorded changes or additions to the system. It may be reasonable to use the 1994 volume.

6) In addition to the recorded volume of water that was used by CSI, there is the fish propagation use that was recorded in right 47-7478. The fish propagation was in use during the field exam in 1985 but ended a few years later. The recommended volume for right 47-7478 did not include the volume of geothermal water used in fish propagation. It is possible that the year round use of 0.08 cfs for fish propagation would have used 58 af. Should this volume be included in addition to what is recommended for the annual volume ($827\text{af} + 58\text{af} = 885\text{af}$)? After licensing of the right CSI would be able to transfer the use of the fish propagation to heating.