

USGeothermal

C L E A N G R E E N R E N E W A B L E E N E R G Y

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January 30, 2006

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Department of Water Resources
Southern Region

Mr. James E. Stanton
Sr. Water Resource Agent
Idaho Department of Water Resources
1341 Fillmore Street, Suite 200
Twin Falls, ID 83301

Re: Application for Transfer 72440

Dear Mr. Stanton,

In response to your letter of December 14, 2005, please find below a description of the existing irrigation system with our estimate of its operational efficiency. In addition, Bill Wilcock, the current property owner has submitted an affidavit stating his experience with irrigation on the property.

I have also included information that supports the transfer in satisfaction of Sec. 42-222(1) of the Idaho Code that demonstrates no significant impact on the agricultural base of the local area. In fact, the development of the geothermal resource at Raft River will enhance the economic base of Cassia County and may well improve agriculture in the area.

We disagree with the implication in the department's December 14, 2005 letter that we "...can only transfer the portion of the decreed annual volume of these irrigation rights that can be justified as historic consumptive use based on the operational efficiency of the irrigation system..." assuming that IDWR seeks to apply textbook values of operational efficiency. We argue that the department should consider transfer of the total decreed annual volume, provided that the transfer does not enlarge the diversion rate, consumptive volume, or total annual diversion volume. Further, application efficiency can greatly exceed typical textbook values, and can approach 100% under deficit conditions (USDA, 1983; Burt et al, 1997). We ask the department to consider the following points:

- The proposed and anticipated cooling system will not be 100% consumptive. Approximately 30 to 35% of the diverted water is currently estimated to become blowdown, which will be either land applied and/or discharged into infiltration basins. Land application during the growing season will result in consumption of the applied water by crops or pasture. However, discharge into infiltration basins and land application during winter months would be expected to result in deep percolation and a return of water to the common water supply.

- In a deficit irrigation condition, the values of field application efficiency can increase substantially. Under deficit condition, deep percolation losses can approach zero. Further, Mr. Wilcock states that he is not aware of any runoff from this farm. Deep percolation and runoff are significant contributors to the inefficiencies described in the FAE values. We estimate that only negligible quantities of the applied water become deep percolation.
- The spray and surface evaporation portions of the FAE values are consumptive. We estimate these losses to be in the range of 5 to 15% based on values found in literature (Raine and Foley, 1999; McLean, Ranjan, and Klassen, 2000). If the department were to limit the transfer to only the consumptive portions of the diverted water, these losses must be included in that quantity.

Based on Allen and Brockway (1983), the average irrigation requirement for 928 acres of a 50/50 mix of alfalfa hay and winter grain for this area is 2262 acre-feet. These data support conditions of deficit irrigation, and of full water right utilization.

In summary, we estimate that historically a negligible quantity of water diverted for irrigation was not consumed and returned to the common supply to become available for further appropriation by other water users. Further, we anticipate that under the proposed plan, non-consumptive use will not decrease, and will most likely increase, providing additional returns to the common ground water source.

Historic consumptive use and operational efficiency of irrigation system

Description of Irrigation System

The current irrigation system consists of four well pumps and one surface water pump diverting and delivering water to an interconnected irrigation system. Water is applied to fields using one center pivot and numerous handlines, as further described here:

- Handlines are fitted with 1/8" diameter nozzles and operate at approximately 40 psi. Handlines are used to irrigate everywhere except those acres covered by the center pivot.
- The center pivot is 1511 feet long and operates in a "half circle" (180° sweep), irrigating approximately 80 acres. The pivot is designed to deliver 500 gpm at 30 psi. Mr. Wilcock had this pivot installed in 2001. Prior to 2001, these acres were irrigated with handlines.

Crop Rotation

Bill Wilcock has operated the farm from 2001 to 2005. From 2001 to 2004, the 928-acre farm's crop rotation was 60% alfalfa and 40% grain. In 2005, the rotation was approximately 50% alfalfa and 50% grain. Mr. Wilcock's employee has irrigated this ranch for 17 years, and this employee states that historically, 200 to 300 acres were planted in grain, and the remainder in alfalfa hay.

Irrigation system efficiency

On page 38 of their *Report Regarding Evaluation of Irrigation Diversion Rates*, Dreher and Tuthill (1999) refer to application efficiency values presented by the University of Idaho in a

1994 report by the Idaho Irrigation Water Conservation Task Force. The range of application efficiency for hand move sprinklers is 60-75%, and for center pivot lateral the range is 75 to 85%. Field application efficiency (FAE) is defined by Dreher and Tuthill (1999) as an “expression in percent of the amount of water applied to a field that becomes available to the crop.” We agree that the systems utilized on this farm are of the types that would typically be included in these anticipated ranges of efficiency.

The report further describes that a portion of the gross irrigation application is not available to the crop with some water “lost to deep percolation, runoff or other losses.” Other losses would include:

- Spray losses include water that exits sprinkler nozzles, but that evaporates and does not reach the field.

Surface evaporation losses include water applied to the field that does not run off, and that does not infiltrate into the soil profile to become available to the crop roots. This includes droplets intercepted by the crop vegetation that eventually evaporate, and water that evaporates from the soil surface.

Of these losses, runoff and deep percolation are potentially non-consumptive and can return to the common water supply. Spray and surface evaporation losses are consumptive [see Idaho Code § 42-202B(1)].

Mr. Wilcock has stated that he is not aware of any runoff on this farm. Both the center pivot with its low-flow design, and handlines with relatively small nozzle sizes and low operating pressures, are indicative of low application rates that allow water to infiltrate into the soil profile and to not run off. Runoff losses are therefore expected to be negligible or non-existent.

Mr. Wilcock has also stated that he anticipates deep percolation losses to be very limited. He described that typical irrigation applications provide 12 to 18” of wetted depth in the soil profile. A significant, widespread hardpan layer exists at about 18” depth. This layer acts as an aquitard, inhibiting deep percolation. The evidence in this case indicates that this farm is operated in a deficit-irrigation situation. Due to limited supplies of water, farm operators have historically planted a balance of grain and alfalfa, crops which are both conducive to deficit irrigation conditions. As seasonal water levels decline and less water becomes available for diversion, irrigation of grain ceases and only alfalfa is irrigated. The total authorized diversion rate from ground water is 5.63 cfs for 928 acres, providing 0.006 cfs per acre. This is a notably low application rate, lending further support to a deficit-irrigation condition.

Contor (2004) investigates conditions of deficit irrigation for purposes of enhancing the Eastern Snake Plain Aquifer Model. He references USDA (1983) and states “Likewise, well-managed sprinkler systems ‘should not produce’ deep percolation” and “Runoff and percolation can be eliminated by severely underwatering, but an E_a [application efficiency] near 100 percent can result.” In addition, Contor cites Burt et al (1997) saying “It is possible to obtain a very high AE [application efficiency] in a field by under-irrigating.”

Under these condition where (1) available water supplies are limited (2) application rates are low, (3) irrigation water is applied to supply only the upper 12 to 18" of soil profile, (4) a widespread hardpan aquitard layer exists near 18" depth, (5) crops have sufficient rooting depth to utilize water from the complete wetted layer, (6) and crops grown are conducive to deficit irrigation conditions, it is probable that nearly all applied water that becomes available to the crops is consumed by the crops. Spray and surface evaporation losses are consumptive. Therefore, we anticipate that nearly all diverted water is consumed, either from crop evapotranspiration or spray and surface evaporation losses. We estimate only a negligible amount of diverted water results in deep percolation. Finally, runoff losses are negligible based on Mr. Wilcock's experience and statements.

Change in nature of use

We do not anticipate that the change in nature of use of these agricultural rights to significantly affect the agricultural base of the local area for the following reasons:

- Prior owners of the farm have found the operation to be economically marginal for growing crops.
- The current owner, Bill Wilcock, wants to lease the property for a cattle operation including dry-land and pasture grazing. Residual flows (blowdown) from the geothermal operation will be land applied for pasture, and water right 43-10070 is available to supply stockwater requirements. .
- This farm of 928 acres is not significant when compared to the extensive agricultural base of the Raft River basin. Shane Bendixsen, in his June 20, 2000 memorandum to Dave Tuthill states "1986 LAND SAT data indicated that approximately 104,800 acres were currently being irrigated in the basin."
- The proposed power production facility is planned to have about 12 full time employees and as such will improve the economic job and tax base of Cassia County. A March 2004 impact study by the University of Idaho estimates the first phase 10MW project will result in \$6.3 million in sales, \$4.9 million in value-added, \$1.4 million in earnings, 26 total jobs (direct and indirect), and \$0.718 million in indirect business taxes annually.
- The diversification of employment and economic resources provided by the proposed development is expected to have a positive net benefit to the local economy in the form of increased tax revenue, etc.
- Power produced by the proposed development will be sold to Idaho Power, which will then be available for Idaho farm operators, providing a renewable, sustainable supply of power for Idaho.

References:

- Allen, R.G. and Brockway, C.E. (1983). *Estimating consumptive irrigation requirements for crops in Idaho*. Idaho Water and Energy Resources Research Institute, University of Idaho, Moscow, Idaho, August 1983.
- Burt, C.M., A.J. Clemmens, T.S. Strelkoff, K.H. Solomon, R.D. Bleisner, L.A. Hardy, T.A. Howell, D.E. Eisenhauer, (1997). *Irrigation performance measures: Efficiency and uniformity*. Journal of Irrigation and Drainage Engineering, Nov/Dec 1997.

Contor, Bryce A. (2004). *Percolation, runoff, and deficit irrigation*. Idaho Water Resource Research Institute, Technical Report 04-004. University of Idaho, August 31, 2004.

Dreher, Karl J., and Tuthill, David R. Jr. (1999). *Report regarding evaluation of irrigation diversion rates*. In Re SRBA, Twin Falls County Civil Case No. 39576. Idaho Department of Water Resources, January 14, 1999.

McLean, R.K., Sri Ranjan, R. and Klassen, G. (2000). *Spray evaporation losses from sprinkler irrigation systems*. Canadian Agricultural Engineering, 42:001-008.

Raine, S.R. and J. Foley (1999). Performance of in-field application systems. In *Research, development and extension in irrigation and water use efficiency: A review for the Rural Water Use Efficiency Initiative*. S.R. Raine (ed). National Centre for Engineering in Agriculture Publication 179743/2, USQ, Toowoomba.

United States Department of Agriculture, 1993. National Engineering Handbook, Part 623. Chapter 2, Irrigation Efficiencies.

Nelson, James R., Widner, Lindy, and Peterson, Stephen, 2004. *Estimated Impacts of Proposed Idaho Geothermal Energy Projects*. University of Idaho, Department of Agricultural Economics and Rural Sociology. A.E. Extension Series No. 04-01

Please don't hesitate to contact me when new questions arise.

Best Regards,

A handwritten signature in black ink, appearing to read "Doug Glaspey". The signature is fluid and cursive, with the first name "Doug" being more prominent than the last name "Glaspey".

Doug Glaspey
Chief Operating Officer

**Affidavit of William C. Wilcock in Support of Application
for Transfer of Water Right No. 72440
Pending Before the Idaho Department of Water Resources**

STATE OF IDAHO)
) ss:
County of)

R E C E I V E D

FEB 08 2006

Department of Water Resources
Southern Region

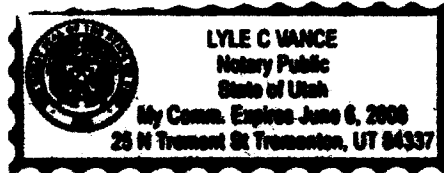
I, WILLIAM C. WILCOCK, being first duly sworn, state that the following facts are true and correct and based upon my personal knowledge. If called to testify regarding these facts, I am competent to do so and would testify as follows:

1. I currently own certain property ("Property") in Cassia County, Idaho more particularly described in Exhibit A to this Affidavit.
2. Since I have owned the Property, I have irrigated the Property to grow alfalfa hay and winter wheat pursuant to Decreed Water Rights 43-2381, 43-2534B, 43-10069, 43-120 and 43-2167B. Irrigation has been via hand lines and one low pressure pivot. The low pressure pivot is able to irrigate approximately 80 acres at a designed rate of 500 gallons per minute (GPM). The remaining acreage on the Property is irrigated via hand lines.
3. Due to limited supply of water in the area, I manage irrigation practices on the Property to maximize water use efficiency and to avoid any wasteful use of water such as surface run-off or infiltration beyond the crop's root zone.
4. During my ownership of the Property, I have never observed any surface water run-off as a result of irrigation applications. Further, the topsoil on the Property is relatively shallow (12-18 inches) and underlying the topsoil throughout the Property is a hardpan layer. Therefore, I believe that very little irrigation water applied to fields infiltrates beyond the crop root zone and therefore, practically all irrigation water is consumed by the crops on the Property.

DATED this 23 day of January, 2006.

William C. Wilcock
William C. Wilcock

SUBSCRIBED AND SWORN to before me this 23 day of January, 2006.



[Signature]
NOTARY PUBLIC in and for the State
of Idaho, residing at: 127 W. 1st St.
My Commission Expires: 6/6/2006