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AUG 22 2011

DEPARTMENT OF
WATER RESOURCES

WA

August 18, 2011

Mr. Shelley Keen
Idaho Dept. of Water Resources
P.O. Box 83720
Boise, ID 83720

Re: SDRTR, LLC Water right 37-8388

Dear Shelley:

I have reviewed the draft license for this water right and the license review memorandum prepared by M. Edl.

Ms. Edl's depiction of the chronology of information exchange and administrative decisions is correct. The Beneficial Use Field Report was submitted by Brockway Engineering on July 7, 2008 and was determined to be inadequate with a request for additional information from Ms. Edl on March 4, 2011 or nearly 32 months after the first submittal. My response to that first request for additional information which allowed 30 days for response was, in fact, made on April 18, 2011 or 15 days late. This resulted in the advancement of the priority date for the permit of 15 days. It seems that the applicant has fairly strict time constraints but the Department has no time constraints for administrative actions. I am therefore requesting that the permit priority date advancement be rescinded.

A review of Ms. Edl's licensing review memorandum of 7/22/2011 reveals several assumptions made which are technically incorrect and which result in significant differences in recommendations for licensed discharge rates and annual volumes. The results of a review by C.G. Brockway of Ms. Edl's memorandum is attached.

Perhaps the most significant finding by Ms. Edl is that the licensed discharge is limited by the long term sustainable discharge of the source, as determined by IDWR and not the peak discharge even though the peak discharge duration and magnitude is determined to be beneficially utilized, especially for the snow melting function.

The determination of the space heating annual volume is best defined by a compilation using the monthly heat load calculation as outlined in the attached memorandum. This analysis was performed and results in an annual volume of 33.1 acre feet as compared with Ms. Edl's recommendation of 16.1 acre feet per year.

I am requesting that the Water Right License reflect the instantaneous measured discharge of 0.46 cfs and a maximum diversion volume of 126.5 acre feet as in the following table.

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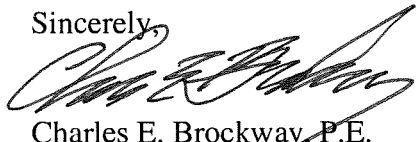
FAX: 736•8506

USE	Discharge cfs	Annual Vol. af
Domestic	.01	.6
Recreation	.13	29.1
Space Heating	.10	33.1
Snow Melting	.46	83.4
Total limited	.46	146.2

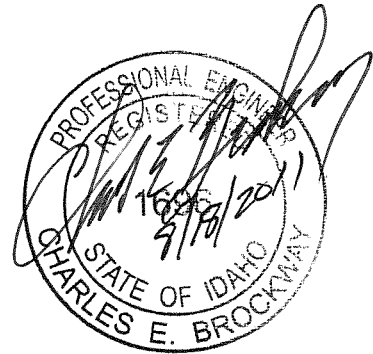
Processing of this Beneficial Use Field Exam and administrative procedures has taken an inordinate amount of time and effort. It appears that Ms. Edl has dedicated an anomalous number of hours to evaluation and development of the draft license. There will undoubtedly be additional applications and necessary evaluations of beneficial uses for geothermal sources in the future, and Brockway Engineering hopes to be involved in some of them. However, it would be well to streamline the process considerably as compared to this present procedure. I am therefore requesting that a meeting be scheduled to discuss the terms of the proposed license prior issuance of the final and to examine the evaluation process and provide some additional direction to water right examiners. I would suggest that at least the following individuals be included in the meeting:

Gary Spackman-Director IDWR
Shelly Keen-IDWR
Jeff Peppersak -IDWR
Jim Speck
C.E. Brockway
C.G. Brockway

Sincerely,


Charles E. Brockway, P.E.
Certified Water Rights Examiner

Cc: J. Speck



Attachments: Geothermal Heating Monthly Volume Analysis
Memo C.G. Brockway Review of M. Edl License Review

RESIDENTIAL GEOTHERMAL HEATING PEAK FLOW AND MONTHLY AVERAGE FLOW REQUIREMENT

Brockway Engineering PLLC
8/16/2011

Total square footage of livable space (A)	11489 s.f.
Inside design temperature (Ti)	72 F
Resource temperature (Ts)	115.5 F
2-story (No = 1, Yes = 2)	2
Efficiency factor (e)**	0.44
Design outside temperature for peak load (Tp)	-1.7 deg F

PEAK FLOW CALC:	Heat load	298052 BTU/hr	
	T drop	13.05 deg F	
	Peak Q	45.7 gpm =	0.10 cfs

MONTHLY FLOW CALC:

Month	No. Days	To [deg F]*	Heat Load [BTU/hr]	T drop [deg F]	Average Req'd Q (gpm)	Volume [ac-ft]
January	31	13.3	237324	13.05	36.4	4.98
February	28	18.2	217525	13.05	33.3	4.13
March	31	26.1	185677	13.05	28.5	3.90
April	30	37.8	138247	13.05	21.2	2.81
May	31	47.8	97995	13.05	15.0	2.06
June	30	54.8	69737	13.05	10.7	1.42
July	31	64.7	29422	13.05	4.5	0.62
August	31	62.6	37861	13.05	5.8	0.79
September	30	52.6	78374	13.05	12.0	1.59
October	31	42.3	120061	13.05	18.4	2.52
November	30	27.9	178423	13.05	27.3	3.63
December	31	17.1	222058	13.05	34.0	4.66

Annual volume 33.10

*Monthly temperature at Hailey NWS [degrees F] with a 90% exceedance

*Efficiency factors:

- 0.28 Best energy efficiency - extra insulation, caulked and weatherstripped, with storm windows and doors
- 0.44 Better energy efficiency - standard insulation, caulked and weatherstripped, with storm windows and/or doors
- 0.67 Average residence - standard insulation, no weatherproofing but with storm windows or double panes
- 1.11 Poor energy efficiency - minimal insulation, no weatherproofing or storm windows (older homes, shops or greenhouses)

MEMORANDUM

To: File 495-02-2008 / Robbins SDRTR

Date: August 16, 2011

From: C. G. Brockway, Ph.D., P.E.

Following are comments pertaining to my review of a licensing review memo for permit 37-8388, dated July 22, 2011, prepared by Michele Edl of IDWR.

Space heating maximum rate

The spreadsheet developed by IDWR to estimate geothermal water requirements for space heating has been used and accepted by IDWR for licensing purposes. The spreadsheet incorporates heat loss equations based on thermodynamic principles, with coefficients to adjust for the efficiency of the structure insulation. It is not a misapplication of the spreadsheet to use it to estimate heat load for a structure, any more than utilizing equations to calculate evapotranspiration would be a misapplication to estimate irrigation water requirements.

The reviewer seems to imply that in order to be valid, a measurement would have to be made on a day when the exact design climatic conditions happen to exist. In my experience, this is not how beneficial use determinations are made for water rights like irrigation and geothermal, where it is impossible to conduct an exam on the exact day of maximum beneficial use. In these cases, the typical approach is a) the system capacity is measured, b) the maximum water requirement under the design condition is calculated, and c) the license is issued for the lesser of the two (assuming the permit and proof listed something equal or greater). In the case of an irrigation right, the maximum water requirement is assumed to be 0.02 cfs/acre. In the case of a geothermal right, the maximum water requirement is based on conservative design values for temperature and other climatic factors, which lead to estimates of peak water demand based on thermodynamic principles.

Space heating annual volume

The value of 8131 for heating degree days at the Hailey 3NNW station is a long-term average value. For water right licensing purposes, use of an average value is not appropriate to determine annual volume allowance, as a greater volume will be required in roughly half of the years resulting in frequent violation of the water right. Using an irrigation right as an example, the annual volume licensed (e.g. 3.5 afa) is meant to cover not the average, but a reasonably high-demand year with a high-usage crop. For geothermal space heating, it would be appropriate to utilize a year with some conservatively high heating requirement, such as the 90% or 95% exceedance level. If the degree-day totals for all years at the Hailey 3NNW station are analyzed, they follow approximately a normal distribution. The 90% value is 8572 and the 95% value is 8726.

Another defensible approach would be to calculate the average monthly flow rate demand based on conservative climate parameters for each month. An attempt to do this is shown in the attached spreadsheet, with the resulting annual volume of 33.1 ac-ft.

Recreational annual volume

The reviewer agrees with a volume of 29.1 ac-ft; however this volume is based on first-use rather than second-use water. Therefore it should be additive with the other uses since the system has been used, and could be used, in this manner.

Snow melting

The reviewer's assumption that a single, monolithic slab of snow is to be melted is incorrect. The function of a pavement snowmelting system is to supply enough heat to melt and evaporate the snow as it falls on the heated area, not after it has already fallen and accumulated, i.e. the objective is to prevent accumulation during the design event. The "monolithic slab" assumption leads to an incorrect interpretation of the equation in Lund (2000). The required pavement heat output rate [Btu/hr] must be sufficient to:

1. Bring the falling snow to 32°F (sensible heat), and
2. Melt the falling snow (heat of fusion), and
3. Evaporate the melted snow (heat of evaporation), and
4. Overcome heat transfer from the pavement to the air via convection and radiation

The Lund (2000) equation does not assume that the process starts with some depth of accumulated snow, which must then be melted and evaporated. The reviewer's analysis at the bottom of page 5 and top of page 6 of the memo is not correct. First, the triple point of water has nothing to do with this analysis. Second, the "governing rate" for snowmelting is not the heat of fusion: all of the heat inputs per hour are required to warm, melt, and evaporate a certain rate of snowfall per hour. When the design snowfall event happens, the sum of these inputs, in Btu/hr/ft², are required to complete the process. Breaking the system into zones may be more convenient but does not change the fact that the total heat input (or pavement heat output) must be the sum of these four factors when the design snowfall is occurring.

A check of the reasonableness of the calculated pavement heat output of 214.5 Btu/hr/ft² can be made by comparing it with values given in Lund (2000), taken from the ASHRAE 1995 Applications Handbook, for Class II (moderate) applications of snowmelting. For a Class II system, typical values for Chicago and New York City are 165 and 298 Btu/hr/ft², respectively. It is likely that the snowmelting heat requirement at the subject property would be at least as high, or higher, than the requirement in these two cities. Therefore, the calculated value of 214.5 Btu/hr/ft² appears to be reasonable.

System capacity

Based on my experience in similar situations, the water right should be licensed for the instantaneous system capacity. The instantaneous capacity of 0.45 cfs (200 gpm) can be sustained for several hours, and during this period the full rate has been shown to be required for snowmelting plus other uses. Therefore, 200 gpm can be beneficially used, and has been beneficially used, and therefore should be licensed. The annual volume limitations will provide a check on the long-term diversion from the system.