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DEPARTMENT OF
WATER RESOURCES

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DEPT. OF WATER RESOURCES
SOUTHERN REGION

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

PROOF OF BENEFICIAL USE

The Idaho Department of Water Resources considers this form a statement that the permit holder(s) has/have completed all development that will occur under this permit and that water has been applied according to the provisions of the permit for the beneficial use(s) described below. This form must be accompanied by a license examination fee, when necessary, or be accompanied by a completed field examination report prepared by a certified water right examiner.

1. Permit No.: 37-8205 Telephone No.: (208) 726-4113
2. Name of Permit Holder(s): Sun Valley Land & Minerals, Inc.
3. Mailing Address: P.O. Box 1959
City: Sun Valley State: ID Zip: 83353
4. Source of Water: Groundwater If **GROUNDWATER** (well), Date Drilled: mo. various / yr. _____
Well Driller: Hiddleston Drilling Drilling Permit No.: various
5. Use(s) (as authorized by the water right permit):
Domestic (No. of households): _____ Stockwater (No. and type of stock): _____
Irrigation (No. of acres): _____ Other: Heating & Recreation
6. Total rate of diversion and/or volume for which proof is submitted: 2.5 cfs OR _____ acre-feet
7. Measuring Device Requirement: (refer to the approval conditions on your permit and respond accordingly)
(This question is **not optional**. Please check either yes or no. Proofs returned not checked accordingly, will be considered incomplete)
Measuring Device: Is a measuring device required? ☐ Yes or ☒ No
Has the measuring device been installed? ☒ Yes or ☐ No
8. Fee Enclosed: \$ _____ (See Fee Schedule on back of the instructions for filing proof of beneficial use.)
9. Person to contact to accompany the Department representative during field examination of the water system.
Name: _____ Telephone Number: _____
Address: _____
10. **The information given on this form is my true statement of the extent to which the above numbered permit has been developed and water has been diverted. I agree to relinquish any underdeveloped portion of the permit to the State of Idaho.**

Signature of permit holder: Armar Kelsey, President of

(include your title, if on behalf of company or organization)

Date: 10-16-09

Sun Valley Land & Minerals, Inc.

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SOUTHERN REGIONSTATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No.: 37-8205

1. Owner: Sun Valley Land & Minerals, Inc.

Phone No.: (208) 726-4113

Current Address: P.O. Box 1959, Sun Valley, ID 83353

2. Accompanied by: Donna Kelsey, owner; Mike Evans, contractor

Exam Date: 10/13/09

Address:

Phone No.:

Relationship to Permit Holder: As noted

3. Source: Groundwater tributary to

B. OVERLAP REVIEW

1. Other water rights with the same place of use: See narrative

2. Other water rights with the same point of diversion: See narrative

C. DIVERSION AND DELIVERY SYSTEM

1. Point(s) of Diversion:

Ident No	Gov't Lot	1/4	1/4	1/4	Sec.	Twp.	Rge.	County	Method of Determination / Remarks
			SW	SE	27	3N	17E	Blaine	GPS / aerial photo
			SW	SE	27	3N	17E	Blaine	GPS / aerial photo
			SW	SE	27	3N	17E	Blaine	GPS / aerial photo

2. Place(s) of Use:

Indicate Method of Determination:

TWP	RNG	SEC	NE				NW				SW				SE				TOTALS
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
3N	17E	27															X	X	

X = Heating and Recreation

3. **Delivery System Diagram:** Indicate all major components and distances between components. Indicate weir size/ ditch size/ pipe i.d. as applicable.

See Report and Map

- ☒ Copy of USGS Quadrangle attached showing location(s) of point(s) of diversion and place(s) of use *(required)*.
☒ Aerial photo attached *(required for irrigation of 10+ acres)*.
☒ Photo of diversion and system attached.

4.

Well or Diversion Identification No.*	Motor Make	Hp	Motor Serial No.	Pump Make	Pump Serial No. or Discharge Size
Well #3	Franklin	15		Goulds	250L15
Well #75-1	Franklin	20		Goulds	320L20
Well #11	Franklin	20		Goulds	320L20

D. FLOW MEASUREMENTS

1.

Measurement Equipment	Type	Make	Model No.	Serial No.	Size	Calibration
In-line meter		McCrometer	MF-100		8"	New

2. Measurements: See report
- _____
- _____
- _____

E. NARRATIVE / REMARKS / COMMENTS

See report

Have conditions of permit approval been met? ☒ Yes ☐ No

F. FLOW CALCULATIONS

☒ Additional Computation Sheets Attached

Measured Method: See report

G. VOLUME CALCULATIONS

1. Volume Calculations for Irrigation:

$V_{I.R.} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) =$ _____

$V_{D.R.} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation Season}) \times 1.9835 =$ _____

$V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} =$ _____

2. Volume Calculations for Other Uses:

See report

H. RECOMMENDATIONS

1. Recommended Amounts

Beneficial Use	Period of Use		Rate of Diversion Q (cfs)	Annual Volume V (afa)
	From	To		
<u>Heating</u>	<u>1/1</u>	<u>12/31</u>	<u>0.84</u>	<u>122.1</u>
<u>Recreation (or Heating)</u>	<u>1/1</u>	<u>12/31</u>	<u>1.39</u>	<u>819.9</u>
_____	_____	_____	_____	_____
TOTALS:			<u>1.76</u>	<u>942.0</u>

2. Recommended Amendments

☒ Change P.D. as reflected above

☐ Add P.D. as reflected above

☐ None

☒ Change P.U. as reflected above

☐ Add P.U. as reflected above

☒ Other

I. AUTHENTICATION

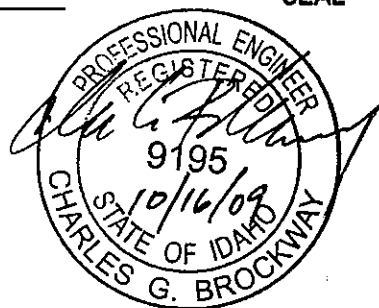
Field Examiner's Name: Charles G. Brockway

Date: 10/16/09

Reviewer: _____

Date: _____

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DEPARTMENT OF
WATER RESOURCES

Project No. 337-07-2000

Beneficial Use Field Report for Permit 37-8205

Prepared for:

Sun Valley Land & Minerals, Inc.

October 16, 2009

Revised December 30, 2009

For information concerning this report, contact
Charles G. Brockway, Ph.D., P.E.



BROCKWAY
ENGINEERING
P.L.L.C.

CHARLES E. BROCKWAY, PH.D., P.E.
CHARLES G. BROCKWAY, PH.D., P.E.

2016 NORTH WASHINGTON, SUITE 4
TWIN FALLS, IDAHO 83301

Project No. 337-07-2000

Beneficial Use Field Report for Permit 37-8205

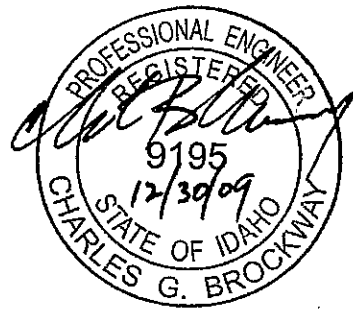
Prepared for:

Sun Valley Land & Minerals, Inc.

October 16, 2009

Revised December 30, 2009

For information concerning this report, contact
Charles G. Brockway, Ph.D., P.E.



CHARLES E. BROCKWAY, PH.D., P.E.
CHARLES G. BROCKWAY, PH.D., P.E.

2016 NORTH WASHINGTON, SUITE 4
TWIN FALLS, IDAHO 83301

Beneficial Use Report for Permit 37-8205 Sun Valley Land & Minerals

Brockway Engineering, PLLC
Charles G. Brockway, P.E.

October 16, 2009
REVISED December 30, 2009

A. Administrative Overview

This permit authorizes diversion of geothermal water from up to six (6) wells for heating and recreational purposes. The permit authorizes 5.0 cfs for each use, with the total limited to 5.0 cfs. No annual volume limitation is shown on the permit.

The permit was originally approved in 1985, and has been the subject of multiple extensions of time to submit proof of beneficial use. The last extension was granted on April 13, 2006 which extended the proof date to October 17, 2009.

An amendment of the permit was approved on March 20, 2009, which changed the points of diversion to agree with existing and planned wells to allow drilling permits to be granted. A petition for reconsideration of this amendment was denied. Another amendment of the permit is pending as of this date. The purpose of this amendment was to modify language on the permit regarding nature of the facilities anticipated to be served by the geothermal water.

Charles G. Brockway, Ph.D., P.E. was the design engineer for the geothermal development project. As such, Dr. Brockway has been on the site numerous times during the planning, design, and construction phases. The contractor for the project was Katco Excavation of Bellevue, Idaho. The official beneficial use exam took place on October 13, 2009. At this time, it was found that the construction was complete, the system was operating, and the only work left to do consisted of minor punch-list items that do not relate to the ability to deliver and use the water.

B. Description of System

The water diversion and delivery system consists of three pumped geothermal wells delivering hot water to a distribution network for three beneficial uses: 1) maintaining an outdoor heated pond/spa recreational facility; 2) melting snow on the roadways within the project by the direct-use hydronic method using a network of buried radiators; and 3) heating two small residences on the property.

The proposed development plan for the geothermal water was described in detail in an engineering report by Brockway Engineering dated June 8, 2009. This report was submitted to the Department for the purpose of review and comment, and contains detailed information regarding the well drilling, well testing, aquifer hydrogeology, system hydraulics, heat loss calculations, and climatologic data. Since the report is contained in the Department's files, much of the detailed information will not be repeated here. The

engineering report also contains large-format drawings representing the development plan; the actual system as constructed does not differ significantly from these plans. As-built drawings are in the process of being created, and will be submitted to the Department upon completion.

The attached aerial map illustrates the major components of the system.

C. Other Related Water Rights

Several other rights exist on the property, related to both the geothermal system and cold water usage from Deer Creek. All rights have been recommended in the SRBA.

The existing pool / spa is part of a multiple-pond system which is authorized by water rights 37-2446 and 37-4369 from Deer Creek. These rights originally pertained to the original Clarendon Reservoir, which was a single impoundment. A transfer approved in 2003 allowed restructuring of the pond system upstream of the on-stream embankment, and also allowed impoundments to take place off stream.

Water right 37-22128 authorizes geothermal diversion from five (5) wells for the purposes of irrigation (1 acre and 0.03 cfs), heating (0.13 cfs and 40 afa), and recreation (0.13 cfs and 24 afa). Two of the five wells (Well #3 and #75-1) are the same as those on permit 37-8205. This right is unrestricted as to consumptive use.

Water right 37-4368B authorizes geothermal diversion from springs within the main development area in the SWSE Sec. 27 for the purposes of heating (0.13 cfs), and recreation (0.13 cfs), with a total of 0.13 cfs. This right is unrestricted as to consumptive use or diversion volume.

Water right 37-4100 covers an artesian well located in NENW Sec. 34, some distance from the main development. This well serves a swimming pool and the source is the same limestone aquifer as the other wells, but the well is not connected by pipeline to the main development or the water system under permit 37-8205.

Water right 37-21614 authorizes cold water usage from Deer Creek for recreational purposes (0.24 cfs). This right is pumped from Deer Creek for the same pool covered by hot water right 37-4100. The right is unrestricted as to consumptive use or diversion volume.

No combined-use conditions are found on any of the above recommendations.

D. Water Sources

The sources for the geothermal water under permit 37-8205 are three 8-inch wells located on the permittee's property. These wells are cased through the upper alluvial strata, typically 30 to 50 feet thick, and are open to the limestone formation which bears the geothermal water. Beneath the limestone at approximately 160 to 200 feet below

ground a granite basement formation exists. All wells were drilled through the limestone to reach the granite. Geothermal water within the limestone is under artesian pressure. Aquifer testing conducted in 2008 and 2009 by Brockway Engineering confirmed that all three wells are tapping the same aquifer, or zone of fracturing, within the limestone formation.

Well #3R is a replacement well for and old well designated as Well #3 at the same location. The new well was drilled approximately 10 feet from the old well. The old well was abandoned by filling it with bentonite. Well #75-1 was originally drilled in 1975. This well was enlarged to 8" diameter and deepened to reach the granite formation. Well #11 is a new well drilled in 2009. The location of this well was selected based on an analysis of the subsurface geology, particularly the zones of fracturing within the limestone, utilizing lithologic records from numerous wells that have been drilled on the property over the last 30 years. Well #11 proved to be the most productive well of the three and flowed 102 gpm under artesian pressure at the time of drilling. Well drilling records are included in Appendix A.

Well #3 and #11 were tested utilizing a submersible pump and portable generator. The tests consisted of a controlled step-drawdown test with a total duration of 6 hours. Well 75-1 was tested by blowing air with the drill rig, collecting the discharge from the well into a channel, and measuring the flow with a portable flume.

Pertinent characteristics of each well are provided in Table 1.

Table 1. Well information.

	Well #3R	Well #75-1	Well #11
Date drilled or modified	12/17/2008	12/8/2008	1/22/2009
Total depth (ft)	200	185	160
Depth to bottom of water-bearing limestone (ft)	183	177	146
Artesian flow (gpm)	30 (est.)	45 (est.)	102
Maximum pumped capacity (gpm)	200	275	315
Water temperature (°F)	127	127	114
Installed pump	15HP	20HP	20HP

Each wellhead was completed with a blank flange seal, a pitless adapter, and a buried resilient-wedge gate valve on a length of ductile-iron pipe extending from the casing. A pressure gauge and air-vacuum valve was installed on the top of the casing. A bypass pipe and valve from the casing above ground to the buried ductile iron pipe was installed to allow artesian flow to discharge unimpeded from the well, if desired, without activating the pump. The artesian pressure on the wellheads at the time of the exam was zero, as the water level in the wells was drawn down by the pumps.

The pumps in the wells are variable-speed units operated according to the water level in the collection box as described below.

E. Distribution System

Buried pipelines from the three wells extend to a concrete collection box near Well 75-1. Upstream of the box, the pipes from the wells are manifolded to a single 8-inch pipe. A McCrometer propeller meter is located in this pipe with sufficient clear distance upstream and downstream of the meter.

Exiting the collection box is a 6-inch PVC mainline which runs from the box to the recreational pond & spa. Approximately midway along this pipe is a manifold which feeds eight (8) separate zones for the roadway snowmelting network. There is a fall of about 60 feet from the collection box to the spa. The 6-inch mainline is kept full and pressurized by throttling a valve located at the end of the mainline where it discharges to the pond. In this way, approximately 15 to 20 psi is maintained for the snowmelting system and the water depth in the collection box is maintained from 3 to 4 feet. The flow within each snowmelting zone is regulated using valves at the tailpipe from each zone. Any zone can be completely shut off by closing valves at the main manifold. Discharge from the tailpipes of Zones 1, 3A, and 3B returns to the main reservoir; discharge from Zones 2, 4A, 4B, and 4C returns to the heated pool / spa.

The variable-speed drives on the well pumps are programmed to operate according to the water depth in the box. If the demand downstream in the system increases, the box level will drop and the pumps will increase speed to maintain the level. If demand decreases, the pumps will decrease speed. The pumps are programmed with the following set points:

Pump #1 (Well 75-1):	42" Lead
Pump #2 (Well 11):	40" Lag 1
Pump #3 (Well 3R):	38" Lag 2

The water supply and distribution components are illustrated on the attached aerial map.

F. System Capacity Measurements

The flow rate from the wells was measured using the installed McCrometer meter. In addition, a Fuji Portaflow X meter was installed on the same pipe just upstream of the meter. However, due to air within the pipe, a consistent reading could not be obtained at all flows. Therefore, the McCrometer meter was presumed to be the more accurate meter, being new and installed properly in the pipe.

Prior to the date of the beneficial use exam, the wells had been run continuously for approximately 2 weeks at a total flow rate of about 550 gpm, which was less than the total well capacity because the pump speed was set at 80% of maximum. During this period, water was being delivered directly to the pond and through the snowmelting systems. Beneficial use within the pond was occurring during this period.

On the date of the exam, the wells were turned off at 7:30 am. However, by 10:30 am the wells had not recovered to their previously artesian condition.

F.1. Condition #1: All water to pond.

Under this condition, the flow capacity of the 8" pipe greatly exceeds the capacity of the wells due to the large elevation drop from the box to the pond; hence the valves at the pond and at the main manifold must be throttled to keep the pipe and box full, and the flow meter operating properly. When activated, the wells initially discharged 790 gpm, which declined slowly as the drawdown in the wells increased, as follows:

Time	Flow
11:40	All wells at full speed
11:44	790 gpm
11:49	750 gpm
12:16	690 gpm
12:19	710 gpm
12:33	680 gpm
13:00	665 gpm

From 12:34 to 12:44 a 10-minute totalizer reading was taken and the average flow found to be 663 gpm. From this test it can be concluded that the initial capacity of the well field is 790 gpm (1.76 cfs) and the sustained capacity is 663 gpm (1.48 cfs). Although not confirmed by a test, the length of the transient period before the sustained capacity is reached is likely to be much longer if the wells have not been pumped recently and are flowing under artesian pressure when the pumps are started. The diversion rate on the water right should recognize the initial capacity so that the transient period is covered and does not result in a violation of the diversion rate.

F.2. Condition #2: All water to snowmelting

The valve at the pond was closed and all water was directed to the snowmelting system. It was confirmed that the capacity of the snowmelting system with all zones operating greatly exceeds the output of the wells, and the tailpipe valves needed to be throttled to the nearly closed position in order to maintain a water level in the collector box. The valves were initially throttled to about ¾ closed, which resulted in a flow from the wells of 620 gpm. With the valves throttled to nearly closed, the pumps reduced speed further and the flow rate to the snowmelting system was approximately 470 gpm.

G. Verification of Beneficial use Prior to Proof Date

Heated water was being used in the recreational pool/spa facility for at least two weeks prior to the beneficial use examination. Water has been used for space heating for several years from the artesian wells. Therefore beneficial use of these two components of the water right appears to be confirmed.

Beneficial use for snowmelting prior to the proof date is more difficult to confirm. Anecdotal information from the overseer of the property, who lives on the site, indicates that at least some snowfall was received during the first few weeks of October. Weather

data was researched for all known weather stations around the site which may be representative of the site and which specifically include snowfall data. These stations include: 1) the two nearest NRCS Snotel sites – Dollarhide Summit, Hyndman Peak, and Chocolate Gulch; 2) the NWS weather station at the Hailey airport; and 3) the Agrimet station at Picabo, which is the only Agrimet station to have a snow pillow instrument.

The data from these stations is provided in Appendix B. A summary of the findings are as follows:

NRCS Snotel site at Dollarhide Summit

Elevation 8420

12" of snowfall occurred 10/4-10/5

9" of snowfall occurred 10/13-10/14

NRCS Snotel site at Hyndman Peak

Elevation 7440

5" of snowfall 10/4-10/5

4" of snowfall 10/13-10/14

NRCS Snotel site at Chocolate Gulch

Elevation 6440

Rainfall 10/4-10/5 and 10/13-10/15, no snow accumulation

NWS Station at Hailey airport

Elevation 5312

10/3 – Rain

10/4 – Rain, Snow

10/5 – Rain, Snow

10/13 – Rain

10/14 – Rain

No precipitation accumulation indicated

Agrimet Picabo Station

Elevation 4900

Snow water equivalent is reported from the snow pillow data.

Snowfall indicated on 10/3-10/4 (0.16" SWE), 10/11-10/13 (0.15" SWE), and 10/16-10/18 (0.12" SWE)

In summary, it appears that weather systems passed through the area on 10/3-10/5 and 10/13-10/14, and perhaps a third storm passed through the south valley on 10/16-10/18.

Elevation of the subject property is approximately 5630 feet. The Hailey station is similar in elevation to the subject property and is perhaps the most representative station. The Dollarhide and Hyndman sites are located at high elevations and therefore the snowfall will be overestimated in comparison to the subject property. The Chocolate Gulch station is higher in elevation but recorded only rainfall. In contrast, the Picabo station is lower in elevation but recorded significant snowfall.

The conclusion of this data evaluation is that storms producing both rainfall and snowfall moved through the area twice in October before the proof date of 37-8205. It may be reasonable to assume that snowfall did occur at the project site during these storms. At the time of the first storm (10/3-10/5), the snowmelting system was not fully complete – only one or two zones were operating. At the time of the second storm (10/13-10/14), the snowmelting system was complete and all zones were operating.

The Department will need to make a decision as to whether or not the beneficial use of snowmelting occurred. It is the opinion of the field examiner that it is reasonable to assume that some small amount of snowmelting occurred, and the benefit of the doubt should be given to the rightholder.

The calculations of diversion rate and annual volume described in Sections H and I assume that snowmelting will be included as a beneficial use. If the Department decides not to include snowmelting in the license, then the amounts would be reduced accordingly.

H. Diversion Rate Calculation

The peak diversion rate to be licensed for each of the beneficial uses should be based on the maximum flow rate required under conservatively high short-term demand conditions, but the total licensed rate should be limited to the system capacity of 1.76 cfs. Refer to the engineering report for more information on this calculation and justification of the assumptions made for each use. Pond heat losses were calculated using the GeoHeat center spreadsheet tool. Snowmelting flow requirements were based on Lund (2000). Residential heating requirements were based on the IDWR spreadsheet tool developed for this purpose. Minor updates in climatic parameters have been made and the updated spreadsheets are provided in Appendix C.

The surface area of the pond / spa was calculated from the 2006 aerial photo to be 1.17 acres. Areas of the snowmelting zones were calculated based on the survey site plan and topographic map described in the engineering report, and roadway widths were spot-checked by field measurements to ensure that the areas were accurate. The width of the roadmix placed over the radiator pipes ranged from 16 feet to 21 feet. The snowmelting area includes a pathway leading to the terrace, and the terrace itself. This path was designed to be 5 feet wide but was actually built as 8 feet to 11 feet wide. A tabulation of areas is provided in Table 2.

Table 1. Snowmelting zone areas.

Zone	Area (ft ²)
1	6,592
2	3,927
3A	4,773
3B	2,944
4A	5,940
4B	4,860
4C	4,220
Path & Terrace	5,666
TOTAL	38,922

Two residences are being served by the geothermal system. One residence is the caretakers house, with a footprint of approximately 888 ft². The other is a bath house of approximately 507 sq. ft. Both of these structures are single-story and poorly-built with poor insulation value.

Table 3 shows the required diversion rates based on the spreadsheet calculations, and a brief summary of the assumptions made. The sum of the diversion rates in Table 3 is 2.23 cfs, but total diversion rate should be limited to the transient capacity of the well supply sources, or 1.76 cfs.

Table 3. Summary of calculated diversion rate requirements.

Use	Peak Requirement	Comments / assumptions
Heated pond / spa	622 gpm (1.39 cfs)	Maintain 85F in pond, January conditions, average wind velocity, 80% exceedance level of minimum January temperature
Snowmelting system	382 gpm (0.85 cfs)	January conditions, 90% exceedance level daily snowfall occurring over 4 hours, snow density 0.1, average wind speed, effluent temperature 70F
Residential heating	14.4 gpm (0.032 cfs)	888 sq. ft. residence and 507 sq. ft. bath house, single-story, poor efficiency, inside temperature 72F

I. Annual Diversion Volume Calculation

The annual diversion volume requirement for each beneficial use was not addressed in the engineering report, and so the calculation methodology is described here.

1.1. Heated pond/spa

The annual diversion volume to be licensed is the amount needed on an annual basis to maintain the target pond temperature of 85F under assumed climatic conditions. It is assumed that the flow to the pond will be regulated in order to maintain the pond temperature near this target value.

To make this calculation, a monthly analysis of pond heat losses and flow requirement was made using average values of temperature, relative humidity, and wind speed at the Hailey 3NNW station. Since the licensed diversion volume must be large enough to cover years with demand higher than average, an argument could be made for using something more conservative than average monthly climatic data. However, a cursory sensitivity analysis with the heat loss calculations shows that the heat balance can be maintained even under more extreme conditions with only 2 to 3 degrees drop in pond temperature, which cannot be discerned by a human swimmer. Therefore, the use of average values is reasonable. The calculations are shown in Appendix C.

Temperature data was obtained from the Western Regional Climate Center (WRCC) for the NWS station Hailey 3NNW. Data on wind speed is also compiled by WRCC but reflects data collected at the Hailey airport AWOS station. Relative humidity data for a long period of record at Hailey was not found; however, average monthly data from the NCDC for Boise was assumed to be applicable to Hailey. The pond heat loss calculation is very insensitive to humidity level, so the lack of site-specific data is not crucial.

The total annual volume requirement for the pond / spa is 819.9 acre feet.

1.2. Snowmelting system

The snowmelting system will operate at a fixed flow rate. The tailpipe valves will be set so that the flow rate is approximately 364 gpm, the maximum that would be required to melt the design snowfall event. The system flow cannot feasibly be adjusted to exactly match the heat requirement of the many snowstorms that will occur over a given year. Instead, the system will likely be turned on whenever snowmelting is required, and turned off whenever the snowfall ceases or snowmelting is no longer required. Given this method of operation, the annual volume that should be licensed is best calculated by estimating a conservatively high number of days each year that the system will be operated.

The number of days of snowfall for each month is not readily available for the Hailey 3NNW station. However, daily snowfall data is available at the the NRCS snotel sites at Hyndman and Dollarhide Summit, located 16.5 miles and 12.8 miles, respectively, from the project site. This data was analyzed and a frequency analysis performed. Both data sets exhibited a probability distribution with bi-modal characteristics and could not be fitted with a standard probability distribution; therefore frequencies were determined by

the plotting position method. The data is provided in Appendix C and the results shown in Table 3.

Table 4. Number of days of snowfall from November – March at NRCS snotel sites.

	Hyndman	Dollarhide Summit
Mean	49.0	64.2
Standard deviation	10.1	12.8
Exceedance probability:		
0.5	51	61
0.75	58	74
0.8	59	76
0.9	62	82
0.95	63	85

The 90% level was selected as a reasonable criteria to ensure that the annual licensed volume is sufficient. Due to its lower elevation, the Hyndman site is likely a better representative of the project site conditions even though it is farther from the site. Therefore, the volume calculation was based on 62 days per year of snowfall. A diversion rate of 382 gpm operated over 62 days per year yields an annual volume of 104.7 acre-feet.

1.3. Residential heating

Annual volume for residential heating was calculated using the same IDWR spreadsheet used to calculate the instantaneous flow rate described above. The number of heating days per year was assumed to be 273, which represents the period September through May. The annual volume is 17.4 acre-feet.

1.4. Comparison of Developed Volume with Original Proposal

Department staff have indicated that, even though the permit was approved with no volume limitation, the volume that may be licensed is limited by whatever volume was contemplated by the originally permittee. An attempt was made to estimate the original volume based on information submitted by the original applicant, and various assumptions that are believed to be reasonable. This analysis is outlined in the technical memorandum included in Appendix D. The annual volume was estimated to be 1084 ac-ft per the original submittal and 933 ac-ft per the revisions outlined in a 1993 letter to IDWR. Therefore, it appears that the actual developed volume requirement does not exceed the originally-contemplated use.

J. Summary of Findings

- Water has been applied to beneficial use in the recreational pool/spa and for space heating purposes as described in this report. Snowmelt beneficial use appears to have occurred based on weather data.
- The capacity of the source (well field) that has been put to beneficial use is 1.76 cfs (transient) and 1.48 cfs (sustained).
- The capacity of the distribution system is much greater than the source capacity and therefore the distribution system must be throttled.
- The justifiable beneficial use for the heated pond / spa is 1.39 cfs and 819.9 afa.
- The justifiable beneficial use for the snowmelt system is 0.81 cfs and 104.7 afa.
- The justifiable beneficial use for the residential heating is 0.032 cfs and 17.4 afa.
- The annual volume requirement developed does not exceed the originally-contemplated use.

K. Licensing Recommendations

K.1. Recommended amounts and licensing amendments

The diversion rates and volumes for each beneficial use are recommended to be equal to the actual required amounts calculated above. The category "heating" is assumed to include the residential heating and the snowmelt system. The category "recreation" is assumed to cover the heated pond / spa. However, this use could also plausibly be covered under "heating" also. Based on the evaluations and measurements described above, the maximum instantaneous diversion rate from the wells is recommended to be 1.76 cfs.

Heating (residential)	0.032 cfs	17.4 afa
Heating (snowmelt)	0.81 cfs	104.7 afa
Recreation or Heating (pond / spa)	1.39 cfs	819.9 afa
TOTAL	1.76 cfs	942.0 afa

Only three of the six authorized wells are used for the geothermal system under this permit. Therefore, a licensing amendment is needed to list three (3) wells in SWSE Section 27. GPS points for these wells are as follows:

Well #3	43.559750	-114.415267
Well #75-1	43.559700	-114.415100
Well #11	43.559133	-114.415417

The place of use of the water usage is located within SWSE Sec. 27 and SESE Sec. 27. A licensing amendment is needed to delete the unused 40s.

K.2. Analysis of Permit Conditions

The permit as amended on March 20, 2009 contains eleven conditions. Each condition is restated below along with an opinion as to whether it has been met.

1. Proof of application of water to beneficial use shall be submitted on or before October 17, 2009.

The beneficial use field report and proof of beneficial use statement was submitted on October 19, 2009 in accordance with Rule 56 of the Rule of Procedure.

2. Subject to all prior water rights.

No comment needed.

3. After specific notification by the Department, the right holder shall install a suitable measuring device or shall enter into an agreement with the Department to use power records to determine the amount of water diverted and shall annually report the information to the Department.

No such notification has been issued by the Department; however the rightholder has installed a measuring device that should be suitable to the Department.

4. Right holder shall comply with the drilling permit requirements of Section 42-235, Idaho Code and applicable Well Construction Rules of the Department. The permit holder shall submit a drilling prospectus to the Department for review and approval prior to any well construction. The permit holder is required to file and maintain a bond with the Department in the amount required by the Department prior to the construction of any well.

The rightholder submitted a drilling permit application and prospectus for each well drilled or modified. The Department approved each permit, and a bond acceptable to the Department was posted.

5. Use of water under this right shall be non-consumptive. If use is found to be consumptive in the future, the consumption must be replaced or the user of the water must cease diversion until a plan of replacement is implemented.

This unusual condition does not appear to encumber the licensing process, but may necessitate that a mitigation requirement is included in the license. The rightholder has indicated that water right 37-22128 or 37-4368B will be made available for consumptive mitigation purposes, if required by the Department. Both rights allow geothermal water from the same source, are unrestricted as to consumptive use, and could be used presently for a 100% consumptive purposes. However, the benefit of these rights for mitigation may be limited to the actual historic consumptive use. Irrigation in the amount of 6.0 acres was claimed on 37-22128, but this right along with every other right on the property

has been objected to the SRBA, and no resolution has been reached. If irrigation is ultimately decreed, forgoing of the irrigation could be one source of mitigation water.

A potential increase in evaporation from the pond due to the introduction of heated water may need to be considered in evaluating whether 37-8205 can be considered non-consumptive. The technical memorandum included in Appendix D describes the potential increase in consumptive use due to the heating of the pond, which is significant. Therefore, it appears that a mitigation requirement may be warranted.

6. Water diverted must either be injected into the ground water or discharged to a natural stream

This condition has been satisfied.

7. Return flow discharged to a subsurface system must be authorized by a separate injection well permit and if return flow is discharged to a surface water system shall meet Idaho Water Quality Standards.

No subsurface return is occurring. No exceedance of state standards for water quality is expected.

8. This right does not grant any right-of-way or easement across the land of another.

No comment needed.

9. The heating use under this right is for heating 45 domestic dwellings, 11 5 townhouses, commercial, office space, greenhouses, a gym, and an indoor pool. 10. The recreational use under this right is for a horse center, an indoor pool, gym, and tennis facilities.

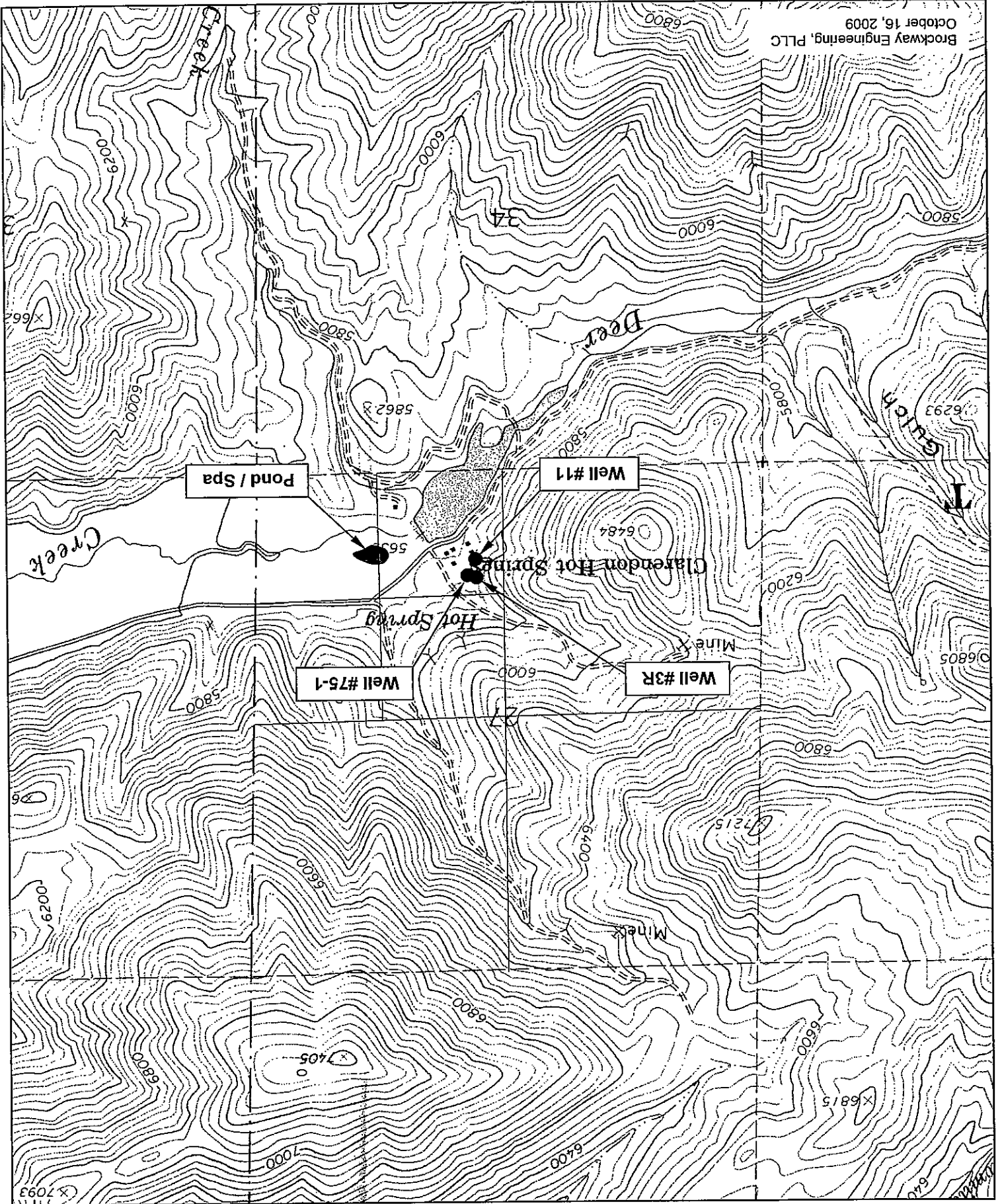
These conditions should be modified to reflect current uses as described in this report. Since the type of water uses differ considerably from those contemplated under the original permit, an estimate was made of the annual volume requirement of the original uses (refer to the attached technical memorandum). Based on this calculation, the current uses either do not exceed, or are well within the margin of error of these types of estimates. Therefore, it appears that the permit can adequately cover the actual developed uses in terms of annual volume.

11. Failure of the permit holder to comply with the conditions of approval of his permit shall be cause for the Department to cancel the permit pursuant to Section 42-31 1, Idaho Code.

No comment needed.

PERMIT 37-8205 BENEFICIAL USE EXAM - QUADRANGLE MAP

SCALE: 1" = 1333'

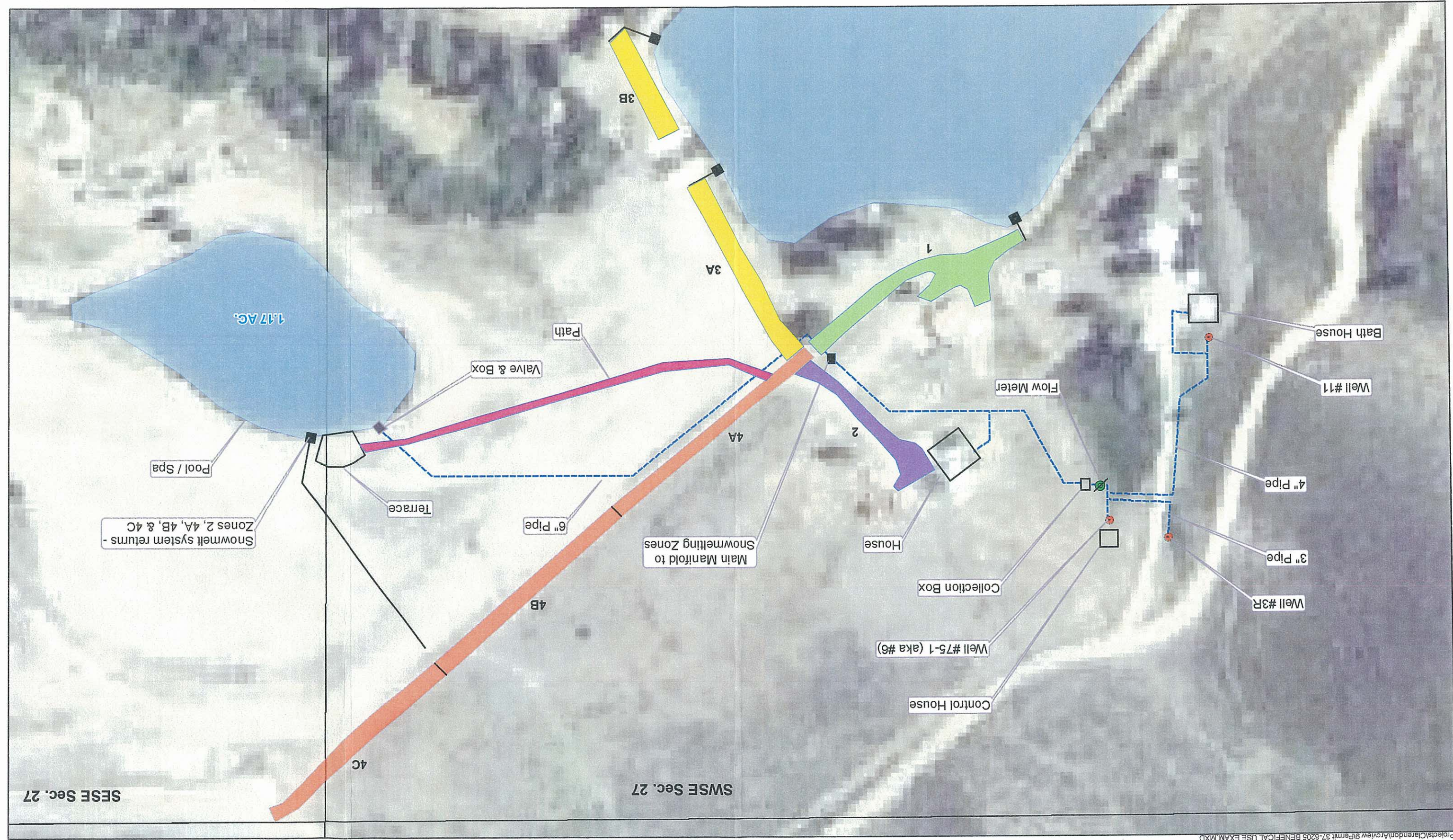


1 inch equals 100 feet

SUN VALLEY LAND & MINERALS PERMIT 37-8205 BENEFICIAL USE EXAM NAIP 2006 AERIAL PHOTO

Legend

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Ponds
- 37-8205 WELLS
- 103n17e
- Pipelines
- Snow_Melting_Zone
- Return Flow



Appendix A
Well Drilling Records

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORTRECEIVED
JAN 26 2009
DEPT. OF WATER RESOURCES
SOUTHERN REGION

1. WELL TAG NO. D 0050559

Drilling Permit No. 854165

Water right or injection well # 37-8205

2. OWNER

Name Sun Valley Land & Minerals

Address PO Box 1959

City Sun Valley

State ID Zip 83353

3. WELL LOCATION:

Twp. 3 Sec. 27 North 17 East 1/4 or South 1/4 East 1/4 or West 1/4

Gov't Lot 10 40 acres 160 acres

County Blaine

Lat. (Deg. and Decimal minutes)

Long. (Deg. and Decimal minutes)

Address of Well Site

City

Lot. Bik. Sub. Name

4. USE:

☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection☒ Other Heating & Recreation

5. TYPE OF WORK check all that apply (Replacement etc.)

☐ New Well ☐ Replacement well ☒ Modify existing well☐ Abandonment ☐ Other

6. DRILL METHOD:

☒ Air Rotary ☐ Mud Rotary ☐ Cable ☐ Other

7. SEALING PROCEDURES

Seal material From (ft) To (ft) Quantity (lbs or ft³) Placement method/procedure

Cement 50 0 2908 lbs. Tremie from bottom up

8. CASING/LINER:

Diameter (nominal) From (ft) To (ft) Gauge Schedule Material

8 +3 50 322 Steel

Casing Liner Threaded Welded

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 50'

9. PERFORATIONS/SCREENS:

Perforations ☐ Y ☒ N MethodMethod of installation ☐ Y ☒ N Type

10. FILTER PACK:

Packer ☐ Y ☐ N Type

Length of Headpipe

From (ft) To (ft) Slot size Number/ft Diameter (nominal) Material Gauge or Schedule

11. FLOWING ARTESIAN:

Flowing Artesian? ☒ Y ☐ N Artesian Pressure (PSIG) 4

Describe control device Valve / Flanges

12. STATIC WATER LEVEL and WELL TESTS:

Depth first water encountered (ft) 124

Water temp. (°F) 124

Bottom hole temp. (°F)

Describe access port

Well test:

Test method:

Flowing ☒ Air ☐ Baler ☐ Pump

Drawdown (feet) Discharge or yield (gpm) Test duration (minutes)

Flow 45 gpm

Water Quality test or comments:

13. LITHOLOGIC LOG and/or repairs or abandonment:

Bore Dia. From (ft) To (ft) Remarks, lithology or description of repairs or abandonment, water temp.

12 Cobble & Gravel 35 0

12 Sand & Gravel 35 43

12 Limestone 43 50

8 Limestone w/fractures 50 177

8 Granite 177 185

8 185

RECEIVED

JAN 22 2009

WATER RESOURCES

WESTERN REGION

Completed Depth (Measurable) 185

Date Started 11-14-08

Completed 12-8-08

14. DRILLER'S CERTIFICATION

We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Hiddleston Drilling

Co. No. 35

Principal Driller

Operator II

Operator I Alex Pitzer

Date 12/31/08

Date 1/21/09

Signature of Principal Driller and rig operator are required.

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORTRECEIVED
JAN 26 2009
DEPT. OF WATER RESOURCES
SOUTHERN REGION

1. WELL TAG NO. D 0050560

Drilling Permit No. 854188

Water right or injection well # 37-8205

2. OWNER

Name Sun Valley Land & Minerals Inc.

Address PO Box 1959

City Sun Valley

State ID Zip 83353

3. WELL LOCATION:

Twp. 3 North ☒ or South ☐ Rge. 17 East ☒ or West ☐

Sec. 27 1/4 SW 1/4 SE 1/4

Govt Lot Blaine County

Lat. (Deg. and Decimal minutes)

Long. (Deg. and Decimal minutes)

Address of Well Site Clarendon Hot Springs

City

Lot. Blk. Sub. Name

4. USE:

☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection☒ Other Heating and Recreation

5. TYPE OF WORK check all that apply (Replacement etc.)

☐ New Well ☒ Replacement well ☒ Modify existing well☐ Abandonment ☐ Other

6. DRILL METHOD:

☒ Air Rotary ☐ Mud Rotary ☐ Cable ☐ Other

7. SEALING PROCEDURES

Seal material From (ft) To (ft) Quantity (lbs or M³) Placement method/procedure

Cement 0 30 1692 lbs. bottom up

8. CASING/LINER:

Diameter (nominal) From (ft) To (ft) Gauge/Schedule Material

8 +3 30 322 Steel

Casing Liner Threading Welded

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 30'

9. PERFORATIONS/SCREENS:

Perforations ☐ Y ☒ N Method

Method of installation

Length of Headpipe ☐ Y ☐ N Type

10. FILTER PACK:

Filter Material From (ft) To (ft) Quantity (lbs or M³) Placement method

11. FLOWING ARTESIAN:

Flowing Artesian? ☒ Y ☐ N Artesian Pressure (PSIG)

Describe control device

14. DRILLER'S CERTIFICATION

Date: Started 12-10-08 Completed 12-17-08

Completed Depth (Measurable) 200

We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Hiddleston Drilling

Principal Driller Date 12/31/08

Operator II Date

Operator I Date 1/21/09

Signature of Principal Driller and rig operator are required.

Form provided by Forms On-A-Disk - (214) 340-9425 - www.FormsOnADisk.com

IDAHO DEPARTMENT OF WATER RESOURCES WELL DRILLER'S REPORT

1. WELL TAG NO. D 0050587

Drilling Permit No. 854548

2. OWNER
Water right or injection well #

Name Sun Valley Land & Minerals

Address PO Box 1959

City Sun Valley

State ID Zip 83353

3. WELL LOCATION:
Twp. 3 Sec. 27

North ☒ or South ☐ East ☒ or West ☐

Gov't Lot _____

Lat. _____

Long. _____

Address of Well Site Clarendon Hot Springs

City Sun Valley

4. USE:
Lot _____ Blk. _____ Sub. Name _____

☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection

☒ Other Test well

5. TYPE OF WORK check all that apply (Replacement etc.)

☒ New Well ☐ Replacement well ☐ Modify existing well

6. DRILL METHOD:
☐ Abandonment ☐ Other

☒ Air Rotary ☐ Mud Rotary ☐ Cable ☐ Other

7. SEALING PROCEDURES

Seal material _____

Portland cement _____

pumped bottom up

8. CASING/LINER:

Diameter (nominal) _____

From To _____

Gauge Schedule _____

Material _____

Casing Liner Threaded _____

Welded _____

9. PERFORATIONS/SCREENS:

Was drive shoe used? ☒ Y ☐ N

Shoe Depth(s) 35 feet

Method of installation

Manufactured screen ☐ Y ☒ N

Perforations ☐ Y ☒ N

Method _____

Length of Headpipe _____

Packer ☐ Y ☒ N

10. FILTER PACK:

From (ft) To (ft) _____

Quantity (lbs or ft³) _____

Placement method _____

11. FLOWING ARTESIAN:

Flowing Artesian? ☒ Y ☐ N

Artesian Pressure (PSIG) 8

Describe control device Flange and valve

12. STATIC WATER LEVEL AND WELL TESTS:

Depth first water encountered (ft) 43'

Water temp. (°F) 123

Bottom hole temp. (°F) _____

Describe access port _____

Well test:

Drawdown (feet) _____

Discharge or yield (gpm) _____

Test duration (minutes) _____

13. LITHOLOGIC LOG and/or repairs or abandonment:

Remarks, lithology or description of repairs or abandonment, water temp.

Water _____

12" 0' Broken Limestone

12" 6' Gray Limestone

8" 35' Gray Limestone

8" 73' Gray Limestone

8" 91' Gray Limestone

8" 146' Gray Limestone

8" 146' Granite

Water _____

14. DRILLER'S CERTIFICATION

Date: Started 11/22/2009

Completed 11/22/2009

Completed Depth (Measurable) 160 feet

We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Hiddleston Drilling

Principal Driller _____

Date 3-27-09

Co. No. 35

Driller _____

Operator II _____

Operator I _____

Signature of Principal Driller and rig operator are required.

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Date _____

Appendix B
Weather Data for October 2009

Date	Time (PST)	Snow Water Equivalent (inches)	Snow Depth (inches)	Year-to-Date Precipitation (inches)	Current Temp (degrees F)	Previous Day's Temp (degrees F)	Max	Min	Avg
10/01/2009	0000	0.4	2.0	0.0	20.5	32.4	32.4	19.8	27.0
10/02/2009	0000	0.5	0.0	0.1	27.9	36.1	36.1	19.2	27.5
10/03/2009	0000	0.5	0.0	0.1	29.7	37.0	37.0	26.2	31.3
10/04/2009	0000	0.6	4.0	0.2	32.0	36.5	36.5	28.6	32.0
10/05/2009	0000	2.0	12.0	1.6	26.6	32.2	32.2	26.4	30.2
10/06/2009	0000	2.4	15.0	2.1	22.8	31.1	31.1	22.5	26.6
10/07/2009	0000	2.4	14.0	2.2	30.0	34.9	34.9	21.7	28.4
10/08/2009	0000	2.4	11.0	2.3	27.5	41.5	41.5	27.1	32.0
10/09/2009	0000	2.3	11.0	2.3	28.6	37.6	37.6	22.8	28.6
10/10/2009	0000	2.3	10.0	2.3	21.0	36.0	36.0	21.0	28.0
10/11/2009	0000	2.2	6.0	2.3	21.2	31.1	31.1	19.0	23.9
10/12/2009	0000	2.2	9.0	2.3	21.6	31.3	31.3	17.6	22.8
10/13/2009	0000	2.2	7.0	2.3	37.2	41.2	41.2	21.6	33.6
10/14/2009	0000	3.2	16.0	3.3	33.8	41.9	41.9	32.0	36.1
10/15/2009	0000	3.7	14.0	3.8	34.2	37.4	37.4	33.6	34.9
10/16/2009	0000	3.6	14.0	3.9	35.4	41.9	41.9	32.7	36.0
10/17/2009	0000	3.5	13.0	3.9	41.0	50.2	50.2	35.4	41.7
10/18/2009	0000	3.4	12.0	3.9	44.6	51.1	51.1	41.0	45.0
10/19/2009	0000	3.2	10.0	3.9	36.3	54.9	54.9	36.3	45.3
10/20/2009	0000	3.2	10.0	4.4	32.5	36.9	32.0	34.5	34.5
10/21/2009	0000	3.1	9.0	4.4	30.9	40.1	30.7	34.7	34.7
10/22/2009	0000	3.1	9.0	4.4	34.2	41.5	30.4	34.5	36.5
10/23/2009	0000	3.0	9.0	4.4	35.8	41.2	33.6	36.5	37.0
10/24/2009	0000	2.8	9.0	4.4	33.8	43.7	32.5	37.0	37.0
10/25/2009	0000	2.8	9.0	4.4	25.2	36.7	24.8	31.6	31.6
10/26/2009	0000	2.8	9.0	4.4	32.7	34.9	21.4	28.8	28.8
10/27/2009	0000	2.8	9.0	4.4	24.1	40.6	24.1	34.0	34.0
10/28/2009	0000	3.1	9.0	4.6	17.8	24.6	16.5	20.3	20.3
10/29/2009	0000	3.1	11.0	4.6	16.5	25.0	16.3	20.1	20.1
10/30/2009	0000	3.2	8.0	4.7	34.0	35.1	15.4	24.3	24.3
10/31/2009	0000	3.2	11.0	4.7	34.2	38.8	30.7	34.7	34.7
11/01/2009	0000	3.2	8.0	4.7	34.3	43.2	32.5	36.5	36.5
11/02/2009	0000	3.2	9.0	4.7	34.0	41.0	32.2	35.6	35.6
11/03/2009	0000	3.2	9.0	4.7	32.2	43.2	30.0	35.1	35.1
11/04/2009	0000	3.2	10.0	4.7	37.0	43.7	30.4	36.7	36.7
11/05/2009	0000	3.2	9.0	4.7	43.2	47.7	37.0	42.3	42.3
11/06/2009	0000	3.2	8.0	4.7	39.0	47.5	39.0	42.6	42.6
11/07/2009	0000	3.4	10.0	4.9	26.4	39.2	25.5	31.8	31.8
11/08/2009	0000	3.5	10.0	5.0	24.3	30.7	21.6	26.1	26.1
11/09/2009	0000	3.5	8.0	5.0	24.8	30.0	19.9	24.8	24.8
11/10/2009	0000	3.6	12.0	5.1	32.2	34.9	24.8	30.0	30.0
11/11/2009	0000	3.6	11.0	5.1	30.4	35.4	26.6	30.7	30.7
11/12/2009	0000	4.3	14.0	5.8	29.3	32.5	29.1	31.3	31.3
11/13/2009	0000	4.3	16.0	5.8	14.4	29.3	14.4	21.6	21.6
11/14/2009	0000	4.4	19.0	5.9	15.6	25.7	12.6	16.5	16.5
11/15/2009	0000	4.4	19.0	5.9	12.7	18.9	12.2	15.3	15.3
11/16/2009	0000	4.6	19.0	6.1	26.6	28.4	11.7	20.5	20.5
11/17/2009	0000	4.6	19.0	6.2	29.3	36.3	23.5	28.6	28.6

Snowfall 10/13-10/14

Snowfall 10/4-10/5

(As of: Wed Dec 30 08:11:37 PST 2009)

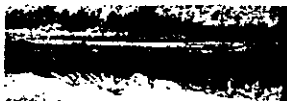
Basin: Big Wood (HUC 17040219) Elevation: 8420.00

DOLLARHIDE SUMMIT SNOTEL Data Report - Daily Readings

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National Water and Climate Center



Date	Time (PST)	Snow Water Equivalent (Inches)	Snow Depth (Inches)	Year-to-Date Precipitation (Inches)	Current Temp (degrees F)	Previous Day's Temp (degrees F)		
						Max	Min	Avg
11/18/2009	0000	4.6	18.0	6.2	33.3	39.2	29.1	32.9
11/19/2009	0000	4.6	18.0	6.2	22.3	33.3	20.7	27.5
11/20/2009	0000	4.6	17.0	6.2	27.9	34.5	21.6	27.0
11/21/2009	0000	4.6	17.0	6.2	23.9	31.6	23.9	28.4
11/22/2009	0000	4.6	18.0	6.2	15.4	23.9	10.9	17.4
11/23/2009	0000	5.1	21.0	6.7	14.5	22.1	12.7	16.3
11/24/2009	0000	5.1	20.0	6.7	26.6	26.6	12.4	19.2
11/25/2009	0000	5.1	22.0	6.7	31.8	32.5	24.8	29.5
11/26/2009	0000	5.1	21.0	6.7	33.4	39.9	31.3	34.5
11/27/2009	0000	5.1	21.0	6.7	31.3	39.6	30.6	34.2
11/28/2009	0000	5.1	20.0	6.7	28.0	36.3	26.2	31.5
11/29/2009	0000	5.1	20.0	6.7	26.1	29.1	23.7	26.1
11/30/2009	0000	5.1	20.0	6.7	31.8	34.3	23.7	29.3
12/01/2009	0000	5.1	19.0	6.7	28.8	38.3	27.0	32.7
12/02/2009	0000	5.1	20.0	6.7	11.3	28.8	11.3	23.5
12/03/2009	0000	5.1	20.0	6.7	8.4	21.9	8.4	14.5
12/04/2009	0000	5.1	20.0	6.7	21.2	22.3	6.3	14.2
12/05/2009	0000	5.1	20.0	6.7	12.2	26.8	12.2	20.8
12/06/2009	0000	5.1	20.0	6.7	-0.4	12.4	-0.4	7.0
12/07/2009	0000	5.1	16.0	6.7	0.0	4.6	-3.3	0.3
12/08/2009	0000	5.1	20.0	6.7	-1.7	5.5	-2.0	1.4
12/09/2009	0000	5.1	21.0	6.7	-8.3	6.3	-8.3	-0.9
12/10/2009	0000	5.1	21.0	6.7	0.3	2.7	-9.0	-2.6
12/11/2009	0000	5.1	21.0	6.7	8.4	12.4	0.1	6.6
12/12/2009	0000	5.2	20.0	6.8	17.2	22.6	7.7	17.4
12/13/2009	0000	5.5	20.0	7.0	20.5	25.9	17.1	21.4
12/14/2009	0000	5.8	25.0	7.2	17.8	26.2	17.8	21.4
12/15/2009	0000	5.9	26.0	7.3	17.2	20.8	12.9	17.1
12/16/2009	0000	6.2	26.0	7.6	23.7	25.2	17.2	22.5
12/17/2009	0000	6.4	27.0	7.8	26.8	30.7	22.8	27.0
12/18/2009	0000	6.5	27.0	7.8	23.4	30.7	21.9	25.9
12/19/2009	0000	6.5	27.0	7.8	26.4	31.8	22.5	25.9
12/20/2009	0000	6.6	21.0	7.9	31.5	33.4	24.4	29.3
12/21/2009	0000	6.7	25.0	8.0	28.4	35.2	27.9	31.5
12/22/2009	0000	6.8	26.0	8.1	25.2	30.7	25.2	27.9
12/23/2009	0000	7.2	31.0	8.5	21.6	26.4	21.0	23.7
12/24/2009	0000	7.2	30.0	8.5	13.3	24.6	12.6	17.6
12/25/2009	0000	7.2	30.0	8.5	16.3	25.2	12.9	19.0
12/26/2009	0000	7.2	29.0	8.5	18.0	23.4	16.0	18.7
12/27/2009	0000	7.2	29.0	8.5	18.1	27.9	16.5	19.8
12/28/2009	0000	7.2	28.0	8.5	17.1	22.6	14.4	18.3
12/29/2009	0000	7.2	28.0	8.5	19.6	23.0	15.3	18.7
12/30/2009	0000	7.2	25.0	8.5	16.5	22.8	16.0	19.4

Provisional data, subject to revision

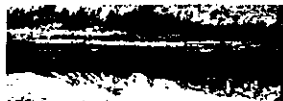
*Precip(YTD) = Precipitation from October 1 to current date.

*-99.9 indicates invalid data received.

*M = Missing data for the selected day.

*A blank field indicates a missing sensor or problems with the sensor.

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HYNDMAN SNOTEL Data Report - Daily Readings

Basin: Big Wood (HUC 17040219) Elevation: 7440.00

(As of: Wed Dec 30 08:13:06 PST 2009)

Date	Time (PST)	Snow Water (inches)	Snow Depth (inches)	Year-to-Date Precipitation (inches)	Current Temp (degrees F)	Previous Day's Temp (degrees F)	Avg
10/01/2009	0000	0.0	0.0	0.0	23.7	23.7	32.4
10/02/2009	0000	0.0	0.0	0.1	25.7	44.2	18.5
10/03/2009	0000	0.0	0.0	0.1	26.6	46.9	24.1
10/04/2009	0000	0.1	1.0	0.3	34.9	45.3	25.2
10/05/2009	0000	0.6	5.0	1.0	28.8	38.5	28.4
10/06/2009	0000	0.6	5.0	1.3	19.9	34.7	19.8
10/07/2009	0000	0.5	3.0	1.3	25.3	46.4	18.7
10/08/2009	0000	0.4	2.0	1.3	26.6	52.3	23.2
10/09/2009	0000	0.2	1.0	1.3	29.8	48.6	20.5
10/10/2009	0000	0.0	0.0	1.3	20.3	46.6	20.3
10/11/2009	0000	0.0	0.0	1.3	18.9	40.8	16.5
10/12/2009	0000	0.0	0.0	1.3	17.8	40.8	16.0
10/13/2009	0000	0.0	0.0	1.4	37.2	50.4	17.8
10/14/2009	0000	0.6	4.0	2.0	34.2	51.6	31.3
10/15/2009	0000	0.7	2.0	2.8	34.3	42.4	34.2
10/16/2009	0000	0.2	1.0	2.8	32.0	51.4	31.6
10/17/2009	0000	0.0	0.0	2.8	34.7	56.1	30.4
10/18/2009	0000	0.0	0.0	2.9	36.9	56.1	32.7
10/19/2009	0000	0.0	0.0	2.9	39.4	58.3	36.7
10/20/2009	0000	0.0	0.0	3.7	32.0	43.2	32.0
10/21/2009	0000	0.0	0.0	3.7	30.2	45.3	30.2
10/22/2009	0000	0.0	0.0	3.7	30.9	50.0	28.2
10/23/2009	0000	0.0	0.0	3.7	31.5	50.7	30.4
10/24/2009	0000	0.0	0.0	3.7	34.2	51.8	30.2
10/25/2009	0000	0.0	0.0	3.7	25.0	46.8	25.0
10/26/2009	0000	0.0	0.0	3.7	31.1	41.7	19.2
10/27/2009	0000	0.2	1.0	3.8	27.7	44.1	27.7
10/28/2009	0000	0.3	1.0	3.9	22.1	33.1	18.9
10/29/2009	0000	0.3	1.0	3.9	15.4	34.5	15.3
10/30/2009	0000	0.3	1.0	3.9	26.4	35.1	13.6
10/31/2009	0000	0.3	1.0	3.9	29.7	50.9	26.4
11/01/2009	0000	0.3	1.0	3.9	32.9	45.9	29.3
11/02/2009	0000	0.3	1.0	3.9	26.6	48.9	26.6
11/03/2009	0000	0.3	1.0	3.9	29.1	45.9	22.8
11/04/2009	0000	0.4	1.0	3.9	30.2	50.7	26.1
11/05/2009	0000	0.4	1.0	3.9	33.3	50.7	29.5
11/06/2009	0000	0.4	1.0	3.9	34.5	54.7	32.2
11/07/2009	0000	0.5	1.0	4.0	26.8	36.5	26.8
11/08/2009	0000	0.5	1.0	4.0	24.3	43.2	23.0
11/09/2009	0000	0.5	1.0	4.0	21.7	38.1	19.6
11/10/2009	0000	0.5	1.0	4.0	28.2	42.8	20.5
11/11/2009	0000	0.5	1.0	4.1	29.8	42.6	28.2
11/12/2009	0000	0.9	5.0	4.5	32.7	35.8	29.5
11/13/2009	0000	0.9	6.0	4.5	12.7	34.0	10.4
11/14/2009	0000	0.9	5.0	4.5	19.2	27.5	7.0
11/15/2009	0000	0.9	6.0	4.5	7.5	28.4	6.3
11/16/2009	0000	0.9	5.0	4.5	15.6	31.8	6.4
11/17/2009	0000	1.0	5.0	4.6	23.9	38.5	15.3
11/18/2009	0000	1.0	4.0	4.6	25.9	43.0	22.5
11/19/2009	0000	1.0	4.0	4.6	27.9	43.0	22.5

[Snowfall 10/13-10/14

[Snowfall 10/4-10/5

Date	Time (PST)	Snow Water Equivalent (inches)	Snow Depth (inches)	Year-to-Date Precipitation (inches)	Current Temp (degrees F)	Previous Day's Temp (degrees F)		
						Max	Min	Avg
11/19/2009	0000	1.0	5.0	4.6	16.3	41.7	16.0	28.2
11/20/2009	0000	1.0	4.0	4.6	22.5	33.3	14.2	21.9
11/21/2009	0000	1.0	5.0	4.6	27.7	40.8	21.0	30.4
11/22/2009	0000	1.0	5.0	4.6	14.2	30.6	8.4	20.5
11/23/2009	0000	1.2	7.0	4.8	8.6	28.8	7.0	14.5
11/24/2009	0000	1.2	6.0	4.8	15.1	28.2	7.0	14.5
11/25/2009	0000	1.2	6.0	4.8	24.6	35.1	14.7	24.1
11/26/2009	0000	1.2	6.0	4.8	23.0	39.0	21.0	26.4
11/27/2009	0000	1.2	5.0	4.8	27.0	41.9	22.5	27.9
11/28/2009	0000	1.2	5.0	4.8	29.8	41.9	26.2	31.5
11/29/2009	0000	1.2	5.0	4.8	17.6	36.1	17.6	27.3
11/30/2009	0000	1.2	6.0	4.8	21.6	38.3	17.2	24.1
12/01/2009	0000	1.2	5.0	4.8	22.5	36.3	19.6	24.8
12/02/2009	0000	1.2	5.0	4.8	7.3	34.7	7.3	20.8
12/03/2009	0000	1.1	6.0	4.8	0.9	22.8	0.9	8.1
12/04/2009	0000	1.2	6.0	4.9	9.3	18.7	-3.5	5.4
12/05/2009	0000	1.2	6.0	4.9	7.9	26.8	7.9	15.6
12/06/2009	0000	1.2	6.0	4.9	2.5	16.9	1.4	9.9
12/07/2009	0000	1.2	6.0	4.9	0.0	12.9	0.0	5.7
12/08/2009	0000	1.2	6.0	4.9	-4.5	12.2	-4.5	3.6
12/09/2009	0000	1.2	7.0	4.9	-8.3	13.1	-8.3	-2.7
12/10/2009	0000	1.2	7.0	5.0	-6.3	12.6	-11.4	-2.7
12/11/2009	0000	1.2	7.0	5.0	0.9	16.9	-8.7	0.3
12/12/2009	0000	1.3	7.0	5.1	16.7	22.5	0.3	10.4
12/13/2009	0000	1.6	9.0	5.4	23.5	29.8	16.7	23.0
12/14/2009	0000	1.6	8.0	5.4	19.0	33.8	16.2	23.5
12/15/2009	0000	1.6	9.0	5.4	17.1	28.8	7.5	15.4
12/16/2009	0000	1.8	11.0	5.6	26.1	31.5	15.3	24.4
12/17/2009	0000	1.8	9.0	5.6	23.7	34.5	22.1	28.4
12/18/2009	0000	1.8	9.0	5.6	16.9	37.0	16.5	23.7
12/19/2009	0000	1.8	10.0	5.6	17.2	30.7	15.8	21.2
12/20/2009	0000	1.8	10.0	5.6	24.4	36.7	15.4	25.2
12/21/2009	0000	2.0	10.0	5.8	29.7	41.4	23.4	30.0
12/22/2009	0000	2.0	11.0	5.8	28.9	35.6	27.0	30.2
12/23/2009	0000	2.2	14.0	6.0	14.0	31.1	13.1	24.6
12/24/2009	0000	2.2	14.0	6.0	2.7	25.2	1.9	12.0
12/25/2009	0000	2.2	13.0	6.0	18.0	30.4	-0.8	13.6
12/26/2009	0000	2.2	13.0	6.0	8.1	25.5	7.0	14.2
12/27/2009	0000	2.2	13.0	6.0	8.6	24.1	7.0	11.1
12/28/2009	0000	2.2	13.0	6.0	8.8	25.3	4.3	10.2
12/29/2009	0000	2.2	13.0	6.1	13.5	25.7	6.3	12.9
12/30/2009	0000	2.3	12.0	6.1	17.8	27.9	11.7	18.9

Provisional data, subject to revision

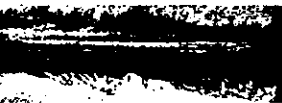
*Precip(YTD) = Precipitation from October 1 to current date.

*-99.9 indicates invalid data received.

*M = Missing data for the selected day.

*A blank field indicates a missing sensor or problems with the sensor.

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CHOCOLATE GULCH SNOTEL Data Report - Daily Readings

Basin: Big Wood (HUC 17040219) Elevation: 6440.00

(As of: Wed Dec 30 08:14:07 PST 2009)

Date	Time (PST)	Snow Water Equivalent (inches)	Snow Depth (inches)	Year-to-Date Precipitation (inches)	Current Temp (degrees F)	Previous Day's Temp (degrees F)	Max	Min	Avg
10/01/2009	0000	0.0	0.0	0.0	27.9	27.9	44.2	21.0	36.3
10/02/2009	0000	0.0	0.0	0.0	27.1	48.7	48.7	21.0	33.6
10/03/2009	0000	0.0	0.0	0.0	27.1	48.6	24.3	24.3	34.9
10/04/2009	0000	0.0	0.0	0.1	37.0	48.0	24.3	35.6	35.1
10/05/2009	0000	0.0	0.0	0.9	31.6	38.8	31.6	35.1	33.1
10/06/2009	0000	0.0	0.0	1.1	27.3	38.1	27.3	33.1	30.4
10/07/2009	0000	0.0	0.0	1.1	26.6	44.1	19.0	30.4	33.4
10/08/2009	0000	0.0	0.0	1.1	29.5	45.3	23.5	33.4	33.4
10/09/2009	0000	0.0	0.0	1.1	33.1	46.4	24.4	35.4	35.4
10/10/2009	0000	0.0	0.0	1.1	24.8	49.5	24.8	36.9	36.9
10/11/2009	0000	0.0	0.0	1.1	24.1	41.2	17.6	29.8	28.6
10/12/2009	0000	0.0	0.0	1.1	19.4	43.2	16.5	28.6	35.2
10/13/2009	0000	0.0	0.0	1.1	34.9	49.3	19.0	35.2	39.7
10/14/2009	0000	0.0	0.0	1.8	34.2	53.8	29.5	39.7	38.7
10/15/2009	0000	0.0	0.0	2.3	35.2	48.2	34.0	38.7	39.7
10/16/2009	0000	0.0	0.0	2.4	32.2	55.0	32.2	39.7	41.7
10/17/2009	0000	0.0	0.0	2.4	34.3	65.1	30.0	41.7	43.3
10/18/2009	0000	0.0	0.0	2.4	36.0	63.3	31.8	43.3	47.3
10/19/2009	0000	0.0	0.0	2.5	43.2	63.7	34.7	47.3	40.5
10/20/2009	0000	0.0	0.0	3.1	33.4	48.2	32.5	40.5	38.7
10/21/2009	0000	0.0	0.0	3.1	29.7	50.7	29.7	38.7	36.3
10/22/2009	0000	0.0	0.0	3.1	31.1	49.1	26.8	36.3	39.7
10/23/2009	0000	0.0	0.0	3.1	32.9	56.7	30.6	42.6	40.5
10/24/2009	0000	0.0	0.0	3.1	37.9	56.3	30.9	42.6	40.5
10/25/2009	0000	0.0	0.0	3.1	25.5	48.6	25.5	40.5	31.3
10/26/2009	0000	0.0	0.0	3.1	32.5	45.9	19.8	31.3	37.8
10/27/2009	0000	0.0	0.0	3.1	30.4	48.6	30.4	37.8	29.7
10/28/2009	0000	0.0	0.0	3.1	27.9	37.2	23.9	29.7	28.9
10/29/2009	0000	0.0	0.0	3.1	17.6	39.0	17.6	28.9	25.9
10/30/2009	0000	0.0	0.0	3.1	27.1	37.0	12.2	25.9	37.4
10/31/2009	0000	0.0	0.0	3.2	31.3	52.5	23.9	38.1	36.7
11/01/2009	0000	0.0	0.0	3.2	32.9	53.8	27.9	38.1	32.7
11/02/2009	0000	0.0	0.0	3.2	26.2	54.0	26.2	36.7	34.0
11/03/2009	0000	0.0	0.0	3.2	26.6	50.2	21.0	32.7	36.7
11/04/2009	0000	0.0	0.0	3.2	27.9	52.2	22.6	34.0	30.6
11/05/2009	0000	0.0	0.0	3.2	30.2	60.8	25.2	36.7	35.2
11/06/2009	0000	0.0	0.0	3.2	30.0	55.9	27.7	38.5	35.8
11/07/2009	0000	0.0	0.0	3.2	29.3	45.5	28.9	35.8	30.6
11/08/2009	0000	0.0	0.0	3.2	23.9	42.8	23.5	30.6	27.9
11/09/2009	0000	0.0	0.0	3.2	19.8	41.7	19.8	27.9	28.9
11/10/2009	0000	0.0	0.0	3.2	28.2	45.7	18.0	28.9	35.2
11/11/2009	0000	0.0	0.0	3.2	27.9	46.0	27.5	35.2	33.3
11/12/2009	0000	0.5	2.0	3.7	34.2	38.5	27.9	33.3	27.9
11/13/2009	0000	0.5	3.0	3.7	14.2	34.3	14.2	27.9	18.5
11/14/2009	0000	0.5	2.0	3.7	21.9	30.9	6.8	18.5	21.2
11/15/2009	0000	0.6	4.0	3.8	7.0	31.8	7.0	21.2	15.1
11/16/2009	0000	0.6	4.0	3.8	13.1	32.4	3.6	15.1	22.1
11/17/2009	0000	0.7	3.0	3.9	20.3	37.0	12.0	22.1	

Rain

Rain

Date	Time (PST)	Snow Water Equivalent (inches)	Snow Depth (inches)	Year-to-Date Precipitation (inches)	Current Temp (degrees F)	Previous Day's Temp (degrees F)
11/18/2009	0000	0.7	3.0	3.9	21.9	41.9
11/19/2009	0000	0.7	3.0	3.9	15.6	41.9
11/20/2009	0000	0.7	3.0	3.9	20.1	36.3
11/21/2009	0000	0.7	2.0	3.9	31.1	38.7
11/22/2009	0000	0.7	4.0	3.9	15.3	31.1
11/23/2009	0000	1.1	9.0	4.2	15.6	29.7
11/24/2009	0000	1.1	8.0	4.2	12.7	30.2
11/25/2009	0000	1.1	7.0	4.2	23.0	34.7
11/26/2009	0000	1.1	6.0	4.2	22.1	36.7
11/27/2009	0000	1.1	6.0	4.2	23.9	41.0
11/28/2009	0000	1.1	6.0	4.2	27.9	41.7
11/29/2009	0000	1.1	6.0	4.2	17.6	39.0
11/30/2009	0000	1.1	6.0	4.2	19.6	38.1
12/01/2009	0000	1.1	6.0	4.2	19.0	36.1
12/02/2009	0000	1.1	7.0	4.2	12.2	37.9
12/03/2009	0000	1.1	7.0	4.2	1.8	26.2
12/04/2009	0000	1.1	6.0	4.2	3.4	19.2
12/05/2009	0000	1.1	7.0	4.2	8.4	24.1
12/06/2009	0000	1.1	6.0	4.2	-1.3	21.6
12/07/2009	0000	1.1	7.0	4.2	2.5	17.2
12/08/2009	0000	1.2	7.0	4.3	-4.7	15.8
12/09/2009	0000	1.2	7.0	4.3	-9.9	14.9
12/10/2009	0000	1.2	7.0	4.3	-7.1	15.4
12/11/2009	0000	1.2	7.0	4.3	-5.1	15.3
12/12/2009	0000	1.2	6.0	4.3	13.3	22.1
12/13/2009	0000	1.3	9.0	4.4	23.9	28.8
12/14/2009	0000	1.3	9.0	4.4	20.1	34.7
12/15/2009	0000	1.3	9.0	4.4	12.4	30.7
12/16/2009	0000	1.6	9.0	4.7	26.6	31.1
12/17/2009	0000	1.6	10.0	4.7	30.0	36.1
12/18/2009	0000	1.6	10.0	4.7	17.4	35.6
12/19/2009	0000	1.6	10.0	4.7	15.4	29.7
12/20/2009	0000	1.7	10.0	4.8	24.1	34.2
12/21/2009	0000	1.8	11.0	4.9	30.7	39.6
12/22/2009	0000	1.9	12.0	5.0	30.9	36.0
12/23/2009	0000	2.2	15.0	5.3	16.0	33.1
12/24/2009	0000	2.2	16.0	5.3	4.1	23.2
12/25/2009	0000	2.2	14.0	5.3	15.4	23.9
12/26/2009	0000	2.2	14.0	5.3	7.9	24.4
12/27/2009	0000	2.2	14.0	5.3	6.4	20.1
12/28/2009	0000	2.2	14.0	5.3	7.7	22.1
12/29/2009	0000	2.2	14.0	5.3	13.5	23.5
12/30/2009	0000	2.2	13.0	5.3	18.7	27.0
12/31/2009	0000	2.2	13.0	5.3	18.7	27.0

Provisional data, subject to revision

*Precip(YTD) = Precipitation from October 1 to current date.

*-99.9 indicates invalid data received.

*M = Missing data for the selected day.

*A blank field indicates a missing sensor or problems with the sensor.

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Month of October, 2009

Monthly Summary

Heating Degree Days (base 65)
Cooling Degree Days (base 65)
Growing Degree Days (base 50)



2008

Monday

Wednesday

Friday

*** Next Month ***

2010*

October 2009

2

11

13

Actual: 53 / 32
Precip: 0.00

Average: 66 | 37

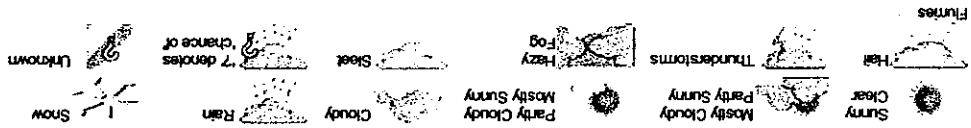
Average: 66 | 38

Average: 65 | 37

Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday	
4	Actual: 48 30 Precip: 0.00 Average: 64 37	5	Actual: 37 30 Precip: 0.00 Average: 63 36	6	Actual: 42 26 Precip: 0.00 Average: 63 36	7	Actual: 48 28 Precip: 0.00 Average: 62 35	8	Actual: 48 30 Precip: 0.00 Average: 61 35	9	Actual: 53 30 Precip: 0.00 Average: 61 34	10	Actual: 44 24 Precip: 0.00 Average: 60 34
11	Actual: 44 23 Precip: 0.00 Average: 60 33	12	Actual: 53 26 Precip: 0.00 Average: 60 33	13	Actual: 57 37 Precip: 0.00 Average: 59 33	14	Actual: 55 37 Precip: 0.00 Average: 59 32	15	Actual: 59 37 Precip: 0.00 Average: 58 32	16	Actual: 62 35 Precip: 0.00 Average: 57 32	17	Actual: 66 39 Precip: 0.00 Average: 57 32
18	Actual: 66 44 Precip: 0.00 Average: 57 31	19	Actual: 57 42 Precip: 0.00 Average: 56 31	20	Actual: 51 37 Precip: 0.00 Average: 55 31	21	Actual: 50 33 Precip: 0.00 Average: 54 31	22	Actual: 55 35 Precip: 0.00 Average: 54 30	23	Actual: 59 37 Precip: 0.00 Average: 53 30	24	Actual: 53 35 Precip: 0.00 Average: 52 29
25	Actual: 46 28 Precip: 0.00 Average: 51 29	26	Actual: 48 35 Precip: 0.00 Average: 50 28	27	Actual: 39 30 Precip: 0.00 Average: 50 27	28	Actual: 41 28 Precip: 0.00 Average: 49 27	29	Actual: 37 21 Precip: 0.00 Average: 49 26	30	Actual: 57 24 Precip: 0.00 Average: 48 26	31	Actual: 57 32 Precip: 0.00 Average: 48 25
Precip: -		Precip: -		Precip: -		Precip: -		Precip: -		Precip: -		Precip: -	

« Previous Month * 2008 2010 » Next Month »

Calendar Key:



Print This Calendar

Daily Observations

2009	Temp. (°F)	Dew Point (°F)	Humidity (%)	Sea Level Pressure (in)	Visibility (mi)	Wind (mph)	Gust Speed (mph)	Precip (in)	Events			
1	50	39	28	30.21	30.19	10	10	12	9	16	0.00	
2	51	40	30	30.21	30.14	10	10	13	7	18	0.00	
3	53	42	32	29.94	29.78	20	11	10	14	8	30	0.00
4	48	39	30	29.73	29.55	20	6	1	15	12	28	0.00
5	37	34	30	30.16	29.90	15	4	0	8	1	-	0.00
6	42	34	26	30.22	30.17	10	10	10	13	7	18	0.00
7	48	38	28	30.11	30.06	20	10	10	13	5	16	0.00
8	48	39	30	30.09	29.99	10	10	10	12	5	18	0.00
9	53	42	30	30.08	30.04	10	10	10	15	6	26	0.00
10	44	34	24	30.11	30.06	10	10	10	10	6	16	0.00
11	44	34	23	29.87	29.72	20	10	10	17	2	23	0.00
12	53	40	26	29.79	29.66	20	10	10	16	11	-	0.00
13	57	47	37	29.75	29.66	20	9	2	12	6	-	0.00
14	55	46	37	30.12	29.90	20	10	2	9	8	-	0.00
15	59	48	37	30.35	30.16	20	11	10	12	8	17	0.00
16	62	48	35	30.41	30.35	10	10	10	13	10	-	0.00
17	66	52	39	30.38	30.29	20	11	10	14	10	20	0.00
18	66	55	44	30.10	30.06	20	11	10	14	8	16	0.00
19	57	50	42	29.89	29.88	20	11	3	10	7	-	0.00
20	51	44	37	29.97	29.89	20	12	10	10	5	-	0.00
					</							

2009	Temp. (°F)	Dew Point (°F)	Humidity (%)	Sea Level Pressure (in)	Visiblity (mi)	Wind (mph)	Gust Speed (mph)	Precip (in)	Events
21	50	42	33	37	34	28	87	77	53
22	55	45	35	41	34	32	87	76	54
23	59	48	37	37	32	32	81	66	41
24	63	44	35	37	29	3	93	64	14
25	46	37	28	27	18	16	70	53	34
26	48	42	35	32	26	21	75	59	34
27	39	34	30	28	23	7	81	55	26
28	41	36	28	27	12	9	61	40	26
29	37	29	21	30	14	10	100	63	41
30	57	40	24	36	24	21	86	74	36
31	57	44	32	37	30	27	87	72	41

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USBR Pacific Northwest Region
Hydromet System Data Access

Although the Bureau of Reclamation makes efforts to maintain the accuracy of data found in the Hydromet system databases, the data is largely unverified and should be considered preliminary and subject to change. Data and services are provided with the express understanding that the United States Government makes no warranties, expressed or implied, concerning the accuracy, completeness, usability or suitability for any particular purpose of the information or data obtained by access to this computer system, and the United States shall be under no liability whatsoever to any individual or group entity by reason of any use made thereof.

BEGIN DATA
PLICI = P1660

DATE	MN	MX	MM	PP	SP
10/01/2009	21.74	51.48	37.38	0.00	-0.01
10/02/2009	23.17	56.66	39.01	0.00	-0.01
10/03/2009	28.01	56.43	42.85	0.01	0.13
10/04/2009	30.89	49.11	36.51	1.00	0.16
10/05/2009	29.97	42.82	34.21	0.18	-0.01
10/06/2009	24.72	46.14	34.24	0.09	-0.01
10/07/2009	24.60	50.04	36.54	0.00	0.02
10/08/2009	29.20	50.21	40.12	0.00	0.02
10/09/2009	27.13	54.81	40.87	0.01	0.01
10/10/2009	18.26	44.72	34.56	0.01	0.04
10/11/2009	23.12	46.23	33.47	0.01	0.04
10/12/2009	18.72	53.69	38.37	0.00	0.14
10/13/2009	36.47	62.39	49.08	0.39	0.19
10/14/2009	39.23	60.34	48.56	0.14	0.14
10/15/2009	36.30	62.17	49.31	0.00	0.10
10/16/2009	35.68	65.06	48.69	0.00	0.06
10/17/2009	36.11	68.08	50.72	0.00	0.13
10/18/2009	41.87	72.80	54.10	0.00	0.18
10/19/2009	34.41	55.18	47.09	0.58	0.05
10/20/2009	32.70	51.20	41.32	0.01	0.06
10/21/2009	31.65	52.32	41.89	0.00	0.07
10/22/2009	34.03	55.92	43.85	0.00	0.06
10/23/2009	33.43	59.66	45.68	0.02	0.13
10/24/2009	35.88	54.68	46.26	0.00	0.06
10/25/2009	24.78	48.27	36.29	0.00	0.05
10/26/2009	31.59	53.27	41.42	0.00	0.06
10/27/2009	24.78	43.64	33.42	0.00	0.01
10/28/2009	23.87	46.14	34.33	0.00	-0.03
10/29/2009	18.21	37.86	27.66	0.01	0.05
10/30/2009	22.86	58.03	37.75	0.01	0.10
10/31/2009	27.81	60.16	43.19	0.00	0.15

PP = 24-hr precip
SP = snow water content from snow pillow
(PLICI is the only station to have this)

Appendix C
Heat Loss, Flow Rate, & Volume Calculations

SUN VALLEY LAND & MINERALS
OPEN POND HEAT LOSS CALCULATION - PEAK FLOW REQUIREMENT
 Permit 37-8205
 OIT Geohat Center Tools
 CGB 10/14/09 As-Built Conditions

Parameter	Value	Units	Assumptions / Remarks
1. Resource temp	124.7	F	Measured mixed temperature 10/13/09
2. Length	370	ft	Pond length avg
3. Width	138	ft	Pond width avg
4. Water temp in pond	85	F	Pleasant temperature for bathing/swimming
5. Wind velocity	4.1	mph	Average January wind speed at Hailey
6. Air temp	-1.7	F	80% exceedance minimum temp at Hailey
7. Cover thickness	0	in	No pond cover
8. Cover "K"	0.4	btu in/hr sqft F	Value irrelevant since thickness = 0
9. Relative humidity	65	%	Average January humidity at Boise
10. Calculated water vap pres	0.589	psia	
1. Evaporative Loss	4528828	btu/hr	
2. Convective Loss	4031412	btu/hr	
3. Radiant Loss	3644396	btu/hr	
4. Conductive Loss	146067	btu/hr	
5. Total Loss	12350704	btu/hr	
6. Required flow rate	622.2	gpm	
1. Evaporative Loss	88.7	btu/hr sqft	
2. Convective Loss	79.0	btu/hr sqft	
3. Radiant Loss	71.4	btu/hr sqft	
4. Conductive Loss	2.9	btu/hr sqft	
5. Total Loss	241.9	btu/hr sqft	

ha	0.910662	0	0.020	51060	85	0.910662	U
x/k							
p. press							
area							
surf temp							
Pond surface area	51060 ft2	1.17 acres					

SUN VALLEY LAND & MINERALS
ROADWAY SNOW MELTING WITH GEOTHERMAL WATER - PEAK FLOW REQUIREMENT
Permit 37-8205
As-built condition as of 10/13/09

Lund, John W. (2000). Pavement Snow Melting. Geo-Heat Center Bulletin. Assumes direct-use hydronic method, buried pipelines

FIRST USE OF WELL DISCHARGE

DESIGN CONDITION

Parameter	Value Units
Total area	38,922 ft ²
Rate of snowfall water equiv. per hr	0.17 inch/hr
Air temperature	-1.7 F
Wind speed	4.1 mph
Water film temperature	33 F
Ratio of snow-free area to total	1
Resource temperature	124.7 F
Effluent temperature	70 F
Road pavement heat loss	20%

CALCULATIONS

Vapor pressure of air	0.06 in Hg
Heat of vaporization at film temp	1075.5 Btu/lb
Sensible heat	14.8954 Btu/hr/ft ²
Heat of fusion	126.82 Btu/hr/ft ²
Heat of evaporation	18.67041 Btu/hr/ft ²
Heat transfer (conv. & radiation)	54.35665 Btu/hr/ft ²
Unit heat required at road surface	214.7 Btu/hr/ft ²
Unit heat required from pipes	268.4 Btu/hr/ft ²
Total heat required	10447757 Btu/hr
Flow rate required	382 gpm

RESIDENTIAL SPACE HEATING/COOLING REQUIREMENTS FOR COLD OR GEOTHERMAL SOURCES

Worksheet created by Cindy Hodges, 11/93.

Project: SUN VALLEY LAND & MINERALS

Data entered by: C. G. Brockway

Exam Date: 10/13/09 House 888 sq ft

File No: 37-8205 House 0 sq ft

Computations for: Heating Employee house 0 sq ft

Bathhouse 507 sq ft

Other 0 sq ft

REQUIRED DATA: Total 1395 sq ft

Area of livable floor space, ft2 (A) 1395

2 story? (N=1, Y=2) 1

House efficiency factor (e) * 1.11

Inside design temperature (Ti) 72

Average outside temperature (To) ** -1.7

Source temperature, degrees F (S) 124.7

Heating/cooling days per season (D) 273

Hous/day system operates (H) 24

CALCULATED DATA:

DESIGN HEAT LOAD (BTU/hr required)

Formula: $E = [e \times (Ti - To)] A$

Applies factor of 0.8 for two-story dwelling

E = 114,121 BTU/hour

TEMPERATURE DROP ACROSS SYSTEM

Formula: $Ts = 0.3 \times [S - Ti]$

Ts = 15.81 degrees F

FLOW RATE REQUIRED (at given source temperature)

Formula: $Q = E / (500 \times Ts) \times 448.8$

Q = 0.032 cfs
14.4 gpm

DIVERTED VOLUME OVER SEASON

Formula: $Vdiv = Q \times D \times H / 24 \times 1.9835$

Vdiv = 17.4 AFA

** Suggested average outside temperatures:

WINTER

4 deg F Boise

6 deg F Grand View

-8 deg F Cascade

SUMMER

80 deg F Boise

90 deg F Grand View

70 deg F Cascade

* e values are as follows:

0.28 Best energy efficiency - extra insulation, caulked and weathersripped, with storm windows and doors

0.44 Better energy efficiency - standard insulation, caulked and weathersripped, 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)

**SUN VALLEY LAND & MINERALS
OPEN POND HEAT LOSS - MONTHLY & ANNUAL VOLUME REQUIREMENT**

**Permit 37-8205
OIT Geohat Center Tools
CGB 10/14/09 As-Built Conditions**

**Average climatic conditions
Resource temperature 124.7 F
Target pond temperature 85 F**

Month	No. Days	Wind Speed (1)	Air Temp (2)	Relative Humid (3)	Average flow requirement (4)	Volume (ac-ft)
January	31	4.1	19.3	74	524.6	71.9
February	28	4.6	24.1	68	536.6	66.4
March	31	5.9	31.0	58	585.9	80.3
April	30	6.7	42.6	52	559.1	74.1
May	31	7.6	51.7	49	537.6	73.7
June	30	7.7	58.8	47	485.2	64.3
July	31	8.1	67.5	38	439.1	60.2
August	31	7.9	66.0	38	444.2	60.9
September	30	7.5	56.7	45	497.5	66.0
October	31	6.4	46.5	52	515.0	70.6
November	30	4.5	33.0	67	481.9	63.9
December	31	3.9	22.3	74	495.1	67.8
TOTAL						819.9

- (1) Average monthly wind speed at Hailey airport AWOS [mph]
 (2) Average monthly temperature at Hailey NWS [degrees F]
 (3) Average monthly relative humidity at Hailey airport for 1/1/2007 - 10/13/2009 [%]
 (4) Estimated by OIT Geohat Center tool [gpm]

NUMBER OF DAYS OF SNOWFALL, NOVEMBER - MARCH
 NRCS SNOTEL SITES
 Brockway Engineering 10/16/09

Water Year	No. Days Snow	Hyndman Dollarhide
1982	85	85
1983	90	90
1984	64	64
1985	58	58
1986	76	76
1987	53	53
1988	66	66
1989	70	70
1990	39	55
1991	39	51
1992	46	53
1993	61	46
1994	38	45
1995	64	84
1996	58	71
1997	59	81
1998	40	62
1999	62	75
2000	53	47
2001	35	59
2002	42	59
2003	51	60
2004	46	60
2005	32	47
2006	55	78
2007	41	58
2008	54	71
2009	52	74

STATISTICS:

Mean	49.0	64.2
Std dev	10.1	12.8
Ex prob:	0.5	61
	0.75	74
	0.8	76
	0.9	82
	0.95	85
	63	
	Hyndman	Dollarhide

Appendix D
Supplemental Technical Memoranda



Technical Memorandum

DATE: December 30, 2009
TO: Idaho Department of Water Resources
FROM: Charles G. Brockway, P.E.
SUBJECT: Supplemental Information for Beneficial Use Report on Permit 37-8205: Estimation of Hypothetical Rate and Volume under Original Proposal

Application for permit 37-8205 was filed in March 1985, seeking geothermal groundwater for heating and recreational purposes in a contemplated residential and commercial development. In the original permit application, likely water uses were outlined in general without quantification. Subsequent letters from the applicant's attorneys clarified the uses and provided some degree of quantification of the uses. No actual development plan or specific information about the facilities themselves was ever submitted to IDWR, based on the information in the file.

At the mandate of the Department, the following analysis is being performed in order to estimate the peak diversion requirement and annual volume requirement for the development that was contemplated by the original permittee. Many assumptions and outright guesses must be made in order to make this hypothetical analysis. The assumptions are believed to be reasonable, but the quantities must be considered approximate. Assumptions are described below, and calculation spreadsheets are attached. The analysis assumed first-use water will be used for each component.

A. Basis of evaluation:

1. Original permit application
2. March 25, 1985 letter of addendum and clarification of uses
3. January 18, 1993 letter of clarification of uses

B. Space Heating

- 45 single-family units, each 2,000 s.f. in size, total 90,000 s.f., assume 2-story
- 15 townhouses, each 2,000 s.f. in size, total 230,000 s.f.
- 25,000 s.f. of commercial space, assume similar insulation as the residential units.
- Gym – no size or other information given. Assume weight room, 5 racquetball courts, hot tub areas, saunas, and the indoor pool described below. Estimate 15,000 s.f. total and similar insulation as the residential units.
- R-30 insulation in ceilings, R-16.5 insulation in walls. Use $e = 0.44$ (better efficiency, but not best).

- Assume same climatic conditions and calculation approach as outlined in beneficial use report for 37-8205
 - Monthly heat load analysis using 80% exceedance values for average monthly temperatures to estimate annual volume
- Peak flow requirement: 3.29 cfs
Annual volume requirement: 1,020.4 ac-ft

Alternate plan: The 1993 clarification letter indicates that the 115 townhomes would be replaced with 10 single-family homes and related outbuildings, and private recreational pools. The 1993 letter also posits that a 3,000 s.f. size for the residences is more realistic. The size of backyard pools is unknown but a reasonable estimate would be 30'x50'. For this alternative scenario the water requirement is as follows:

Peak flow requirement (space heating):	1.87 cfs
Peak flow requirement (backyard pools):	0.45 cfs
Total	2.32 cfs
Annual volume requirement (space heating):	581.1 ac-ft
Annual volume requirement (backyard pools):	273.7 ac-ft
Total	854.8 ac-ft

C. Other Heat Uses

- Greenhouses – no size, number, or other information given
 - Assume 5,000 s.f. total.
 - No insulation on walls or ceiling – typical e-value 1.11
 - Assume same climatic conditions and calculation approach as outlined in beneficial use report for 37-8205
 - Monthly heat load analysis using 80% exceedance values for average monthly temperatures to estimate annual volume
- Peak flow requirement: 0.092 cfs
Annual volume requirement: 24.5 ac-ft
- Indoor pool – no size or other information given.
 - There are many possible sizes that may have been contemplated in the original proposal. Standard competition pools are 82 ft x 160 ft, with the water maintained at 77F to 82F year-round. This seems like a reasonable assumption.
 - Assume pool room temperature is 72F and relative humidity is 95%
- Peak flow requirement: 0.030 cfs
Annual volume requirement: 21.8 ac-ft (based on continuous flow)

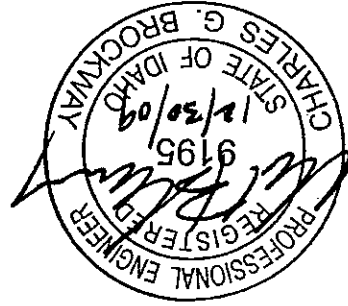
- Snowmelting on sidewalks – no square footage or other information given.
- Assume the sidewalks would have been located in front of the commercial units, gym, and greenhouses. With 25,000 s.f. of commercial space at an average of 1,500 s.f. per unit, there would be about 17 units, each perhaps with a storefront width of 30 feet for a total sidewalk length of about 500 feet. The gym and greenhouses add perhaps another 300 feet. 800 ft x 6 ft width gives 4,800 s.f. of snowmelting.
- Assume same climatic conditions and calculation approach as outlined in beneficial use report for 37-8205
- Assume 151 days per year of system activation (December-March, plus 15 days each in November and April).

Peak flow requirement: 0.10 cfs
Annual volume requirement: 31.4 ac-ft

D. Summary

ORIGINAL PERMIT APPLICATION (3/25/1985 LETTER)
Total diversion rate: 3.47 CFS
Total annual volume: 1083.9 AFA

ALTERNATE SCENARIO (REVISIONS IN 1/18/1993 LETTER)
Total diversion rate: 2.54 CFS
Total annual volume: 932.5 AFA



Technical Memorandum



BROCKWAY
ENGINEERING
P.L.L.C.

DATE: December 30, 2009
TO: Idaho Department of Water Resources
FROM: Charles G. Brockway, P.E.
SUBJECT: Supplemental Information for Beneficial Use Report on Permit 37-8205:
Consumptive Use of Outdoor Heated Pond and Mitigation Requirement

Application for permit 37-8205 was filed in March 1985, seeking geothermal groundwater for heating and recreational purposes in a contemplated residential and commercial development. In the original permit application, likely water uses were outlined in general without a diversion volume or consumptive use quantification. IDWR approved the permit as a non-consumptive, and added the following language as a condition:

Use of water under this right shall be non-consumptive. If use is found to be consumptive in the future, the consumption must be replaced or the user of the water must cease diversion until a plan of replacement is implemented.

Department staff has interpreted this condition to mean that the consumptive use of the heated pond must be estimated, and any consumptive use occurring under permit 37-8205 must be mitigated in order for a license to be granted.

The pond to which the geothermal water is directed is one of several ponds authorized under water rights 37-2446 and 37-4369 from Deer Creek. These rights were the subject of an extensive review by IDWR and transfer approval in 2003, which allowed restructuring of the pond system upstream of the on-stream embankment, and also allowed impoundments to take place off stream. Both the storage impoundment volume and associated consumptive and seepage losses are fully covered by the Deer Creek water rights. Therefore, only the additional evaporative losses which would be induced by the introduction of heated water into the 1.17-acre pond and maintenance of the pond temperature at the target 85°F should require mitigation. An analysis was performed to estimate the evaporative losses from a heated pond. Average monthly climatological conditions as described in the beneficial use exam were used.

Analysis of evaporation from an open water surface is generally approached from the standpoint of either an energy balance or a mass balance. The development of equations for both approaches is complex and is fully explained in references such as Chow, et al. (1988) and Bras (1990). In the energy balance approach, evaporative losses are assumed to be a function of net longwave and shortwave radiation, and advection and storage

effects are neglected. In the mass balance approach, the Dalton Law model is assumed, wherein evaporative losses are proportional to the vapor pressure gradient between the ambient air and the water surface:

$$E = [c + f(u)](e_s - e_a)$$

This is the form most widely used for development of empirical approaches to estimate evaporation, whether from heated or unheated sources. The $f(u)$ term is a function of wind velocity, u , and may take various empirical forms. The constant, c , is needed since evaporation does not equal zero when the wind ceases to blow. The major assumption inherent in the mass-balance approach is that a saturated air zone exists over the water surface, and the temperature of that zone is the water temperature. Thus, the water temperature is used to determine e_s , whereas the ambient air temperature (typically measured at a point 2 meters above the surface) is used to determine e_a . The equation can be used to estimate evaporation for any combination of pond temperature and air temperature.

Many empirical approaches using the above equation form have been developed, under a variety of conditions and assumptions. Hellrich (1982) compiled and evaluated 10 such evaporation equations, standardizing them to wind velocity at 2 meters and converting to SI units. Bras (1990) provides a listing and description of each. Several of these equations were directly derived for heated ponds, i.e. cooling pond applications. Four of the most directly applicable equations were used and the calculations are shown on the attached spreadsheets.

Two cases were examined: 1) Without pond heating, the pond temperature was assumed to vary from 40°F in the wintertime to 60°F in the summertime; and 2) With a heated pond, the temperature was assumed to be constant at 85°F. Under condition 2, the average of the four equations was 35.7 inches/year, which compares favorably with the NOAA evaporation atlas and Allen & Robison (2007) for shallow ponds. Under condition 2, the average of the four equations was 199.1 inches, more than a 5-fold increase. Although this seems quite high, as a check other approaches were cursorily investigated and gave similar results. Scott McClure, P.E. a mechanical engineer versed in thermodynamics and owner of McClure Engineering in Twin Falls, was also consulted and verified that the evaporation calculation was reasonable.

Total consumptive use for the 1.17-acre pond is computed as follows:

Unheated:	3.48 ac-ft/year
Heated:	19.41 ac-ft/year
Difference:	15.93 ac-ft/year

Mitigation Source

Water right 37-22128 is a geothermal right from groundwater, recommended in the SRBA for 40 afa for heating and 24 afa for recreation. This right is unrestricted as to consumptive use, and therefore should be available to provide consumptive mitigation volume. However, the right has been objected to in the SRBA, the objectors claiming that the right should not exist.

References

Chow, V. T., Maidment, D. R., and Mays, L. W. (1988). Applied Hydrology. McGraw-Hill, 572 pp.
Bras, Rafael L. (1990). Hydrology: An Introduction to Hydrologic Science, Addison-Wesley, 643 pp.



Appendix E
Photographs



Well #3



Well #11, looking north



Well #75-1, looking south



Control house (left), Well #75-1 (left of center), and collection box (right)



Flow meter on inlet pipeline to collection box
Portable ultrasonic meter installed for comparison



Variable-frequency controller and 3-phase converter



Pond / Spa, pathway, and terrace



Pond / Spa



Snowmelt Zone 1 (west part)



Snowmelt Zone 1 (east part)



Snowmelt Zone 2



Snowmelt Zone 3A



Snowmelt Zone 3B



Pathway snowmelt zone, also shows inlet to pond / spa



Snowmelt Zones 4A, 4B, 4C



Return to pond for snowmelt Zones 2, 4A, 4B, 4C



Discharge to pond / spa



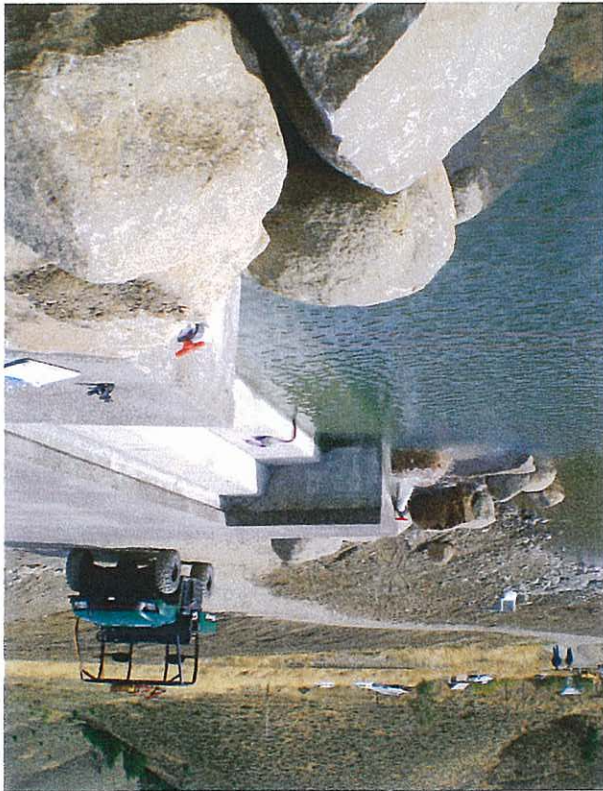
Terrace & steps – access to pond / spa



Pond / spa, terrace, path, and return pipes (looking west)



Main manifold. 4" valves to snowmelt system; 6" valve in mainline to pond.



Valves on either side of terrace allow introduction of hot water directly at the step area.



Example of snowmelt zone header (photo date 9/15/09)



Example of snowmelt/radiating radiator placement (photo date 9/15/09)