

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 65-13912

Exam Date: 10/3/2011

1. Current Owner: CAROL LYNN MAC GREGOR
1109 WARM SPRINGS AVE (mailing address)
BOISE ID 83712
(208) 386-9494
610 CABARTON RD
CASCADE ID 83611 (physical address)
2. Accompanied by: Carol Mac Gregor, Darwin, Joan, and Leonard Pancheri (protestants)

3. **SOURCE** **TRIBUTARY**
SPRING MOORES CREEK

B. OVERLAP REVIEW (see attached overlap analysis spreadsheet)

1. Other water rights with the same place of use: 65-1972, 65-1973, 65-1988, and 65-13913 (permit)
2. Other water rights with the same point of diversion: 65-1972 and 65-1973 (same diversion system)

C. DIVERSION AND DELIVERY SYSTEM**1. LOCATION OF POINT(S) OF DIVERSION:**

SPRING NE 1/4SE 1/4NE 1/4 Sec. 13, Twp 13N, Rge 03E, B.M. VALLEY County

Method of Determination: field inspection PD elevation = 4781' per Google Earth

2. PLACE OF USE: HEATING

TR Sec	NE			NW			SW			SE			
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	Totals
13N03E13				X									

Method of Determination: field inspection POU elevation = 4783' per Google Earth

3. x Delivery System Diagram Attached (required). Indicate all major components and distances between components. Indicate weir size/pipe as applicable.
- x Map Attached Showing Location(s) of point(s) of diversion and place(s) of use (required).
- x Photo of Diversion and System Attached

4.

<u>Well or Diversion</u> <u>ID No.*</u>	<u>Motor Make</u>	<u>Hp</u>	<u>Motor Serial No.</u>	<u>Pump Make</u>	<u>Pump Serial No. or Discharge</u> <u>Size</u>
Tag A0016945	Sta-Rite	1.5	#c48c2ec11c3	3450 RPM 1 Phase	(see attached spec sheet)

D. FLOW MEASUREMENTS

1.

<u>Measurement</u> <u>Equipment</u>	<u>Type</u>	<u>Make</u>	<u>Model No.</u>	<u>Serial No.</u>	<u>Size</u>	<u>Calib. Date</u>
Niagra	Flow meter					2009

2. Measurements: A timed measurement was taken at the flow meter. It took four minutes for the flow meter to go from (19195x100) to (19196x100) or 25 gpm. 25 gpm convert to cfs:
 $25 \text{ gpm} / 448.8 = 0.0557$ or 0.06 cfs

I measured the spring at the point of diversion and found 119.8°

E. FLOW CALCULATIONS See attached pump curve and friction loss calc

Measured Method: The system has been measured at 0.06 cfs based on the flow meter reading that I took while at the site. Additionally, the permit holder had hired Musgrove Engineering in order to meet condition of approval #10. On July 9, 2008, Musgrove found that the geothermal water diverted under right 65-1972, 65-1973 and permit 65-13912 is 27 gpm (0.06 cfs) for heating a single-residence home and one private hot tub. Musgrove back-calculated this figure based on BTUs that are required by the system. Not only is the system able to deliver 0.06 cfs but this is exactly how much water is required to meet beneficial use. A third and fourth way to check the diversion rate is to look at the hp equation and the pump curve (see attached curve and hp justification):

F. VOLUME CALCULATIONS (final calculations to be done by Michele Edl)

1. Volume Calculations for Irrigation: NA

2. Volume Calculations for Other Uses: The following calculations are rough estimates

Heating of Home: range estimated at 2.7-3.2 af (see attached worksheet)

Heating of hot tubs:

Rectangular tub inside the house → 2.5' wide x 5.5' long x 3' deep = $41.25 \text{ ft}^3 \times 7.47 = 308$ gallons

Round tub outside the house → 9.5' diameter and 3' depth

4.75' radius $3.14 \times 4.75^2 \times 3' = 212.7 \text{ ft}^3 \times 7.47 = 1588$ gallons

of days per year the tubs are used = estimated at 60 days/year between renters and personal use

60 days x 308 gallons = 0.06 or 0.1 af for the indoor rectangular tub

1588 gallons (continually refreshed when in use) for outdoor circular tub

60 days, 24 hours per day = 1440 hours or 86,400 minutes x 27gpm (diversion rate) = 2,332,800 or 7.2 af

Total estimated volume = 10.5 af for heating use based on usage (3.2af + 0.1af + 7.2af)

Can diversion rate accommodate 10.5 af? NO

0.06 cfs x 1.9835 x 60 days = 7.1 af Recommended volume will be limited to 7.1 af total

G. NARRATIVE/REMARKS/COMMENTS

System: The spring infiltrates to an area that was back-filled with gravel (collection area) with perforated pipes where a 2" intake pipe transports water to the 1.5hp Sta-Rite pump. A 2" discharge to a 2" poly pipe runs to the house where the pipe is reduced down to 1¼". To meet condition #9 listed on the permit, a 2" pipe was installed that runs from the pump to a T where water can come from the well that is authorized under permit 65-13913 or the spring water authorized under this permit. From there the pipe runs to the neighbors' collection tank.

According to the permit holder, the house is rented out 4-5 x/year for a few days at a time and during the winter the garage is rented out which is heated. The thermostat in the house is always set to 72°. In addition to rental activity, the permit holder does use the spa(s) for personal use. She estimates that the house/spa(s) are being used 60 days per year. There is a Munchkin back-up heating system that provides an alternate source in the event the geothermal heating system fails. The temperature of the water coming into the house is 119°, which is mixed with cold water to cool the water to 105° before entering the hot tubs. There are two hot tubs, one outside that is circular and a rectangular tub in the house. Heat controls are located inside the house and when the spa(s) are in use the hot water is continually running.

Non-standard conditions of approval and how they were met:

1. Any initial use of low-temperature geothermal water for commercial purposes must derive a benefit from the heat of the water prior to the water being used for a commercial purpose for which the heat of the water has no value. **This condition is no longer applicable since this right was not developed for commercial use. Heating is the only use that was developed.**
2. Prior to construction of diversion works for the surface low-temperature geothermal water from Belvidere Hot Springs, the right holder must submit plans and specifications for the spring diversion to the Department, and the Department must approve the plans and specifications. The plans and specifications must provide for direct water delivery to water rights no. 65-12891 and no. 65-13332, at no cost to the holder of those rights, to replace reductions in the quantity or temperature of water historically diverted under water rights nos. 65-12891 and 65-13332 caused by diversions under permit no. 65-13912. **Plans and specifications have been submitted and approved by the Department on 9/29/10. On 10/8/10, the permit holder met with me and Mat Weaver to reconcile the permit conditions and found that the "direct delivery of water" had not yet been completed. The permit holder did not feel it necessary since she is no longer developing a commercial use and tried to amend her permit to change the use to heating only and remove this condition. The recipients (Pancheris) of the direct delivery water protested the amendment. The permit holder then withdrew her amendment and had the pipe installed before she filed proof. While this condition required the approval of her plans and specs PRIOR to construction, the permit holder has now met all aspects of this condition otherwise and has not caused any injury to the Pancheris--I'm sure they would have notified me at the field exam if they were. Note that the pipe runs from the permit holder's property to a collection tank in the Pancheris pump house. I didn't get a picture of the pipe going into the collection tank but both parties, the permit holder and the Pancheris, agree that the pipe has been installed in a satisfactory manner—the pipe feeds directly to their collection tank.**
3. Prior to diversion of water under this right, the right holder shall install and maintain a measuring device and lockable controlling works of a type acceptable to the Department as part of the diverting works. **A measuring device has been installed and is in good order. The power box can be locked shut which can serve as the lockable device since the pump cannot operate without power.**
4. Prior to construction of the diversion works and delivery system and the diversion of water under this right, the right holder shall submit detailed designs to the Department for approval for use of low-temperature geothermal water in heating the spa buildings and associated hot water soaking pools or swimming pools. The designs must be based on computations using recognized engineering methodologies that determine the temperatures and quantities of water necessary to provide the low-temperature geothermal water for heating the spa buildings and to maintain sufficient temperature and pass through of hot water to the proposed pools. **See IDWR engineer Mat Weaver's letter dated 9/29/10. This condition has been met according to Mat's assessment.**

5. Prior to the diversion and use of water under this approval, the right holder shall comply with applicable water quality permitting requirements administered by the Department of Environmental Quality or the Department of Agriculture. **Commercial use was not developed, so this condition is no longer applicable.**
6. Use of water under this right shall be non-consumptive. **This condition has been met. The overflow from the outdoor pool is piped to Moore's Creek north of the house and south of the hot springs. When the water is drained from the pool it is piped to Moore's Creek through the same pipes. In addition, water that goes throughout the heating system in the house is discharges back to the creek as detailed in Musgrove's schematic of the system.**

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

H. RECOMMENDATIONS

1. Recommended Amounts

<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>DIVERSION RATE</u>	<u>ANNUAL VOLUME</u>
HEATING	01/01 to 12/31	0.06 CFS	7.1 AF
			6.5
	<u>Totals:</u>	0.06 CFS	7.1 AF
			6.5

*Amended
to 6.5 afw
per staff
Michele Edits
recommendation
CP
1/5/12*

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 Cherie Palmer Date 11/29/11

Overlap Analysis for 65-13912

Basin	Sequence	Process	Basis	Status	Priority Date	Rate	Source List	Water Use List	Current Owner	Volume
65	1972	Water Right	Decreed	Active	5/1/1901	0.04	SPRING	DOMESTIC	MAC GREGOR, CAROL LYNN	1.2
65	1973	Water Right	Decreed	Active	5/1/1901	0.01	SPRING	DOMESTIC	MAC GREGOR, CAROL LYNN	1.2
65	1988	Water Right	Decreed	Active	5/1/1950	0.04	GROUND WATER	DOMESTIC	MAC GREGOR, CAROL LYNN	1.2
65	13912	Water Right	License	Active	8/2/1999	0.06	SPRING	HEATING	MAC GREGOR, CAROL LYNN	7.1
65	13913	Water Permit		Active	8/2/1999	2.00	GROUND WATER	COMMERCIAL, HEATING	MAC GREGOR, CAROL LYNN	*
*this right hasn't been developed yet, permit holder submitted an extension to file proof until 2016										
Totals										
Spring Rights for Domestic Use = 0.05 cfs and 2.4 af										
Ground Water Rights for Domestic Use = 0.04 cfs and 1.2 af										
Springs Rights for Heating Use = 0.06 cfs and 7.1 af										



Pictures



Photos show the installation of the 2" pipe as required by condition of permit #9.

Permit holder provided the pictures @ the field visit.



Pictures on this page
taken by permit holder
before the FE



2" pipe
From Macgregor's to Pancheris



Power Box inside pump house

Lockable
device



Flow Meter within pump house



Facing North



Backflow



Pump
inside the
pump house



Place of Use
Facing
South-western



Outdoor
hot tub



Indoor
hot tub

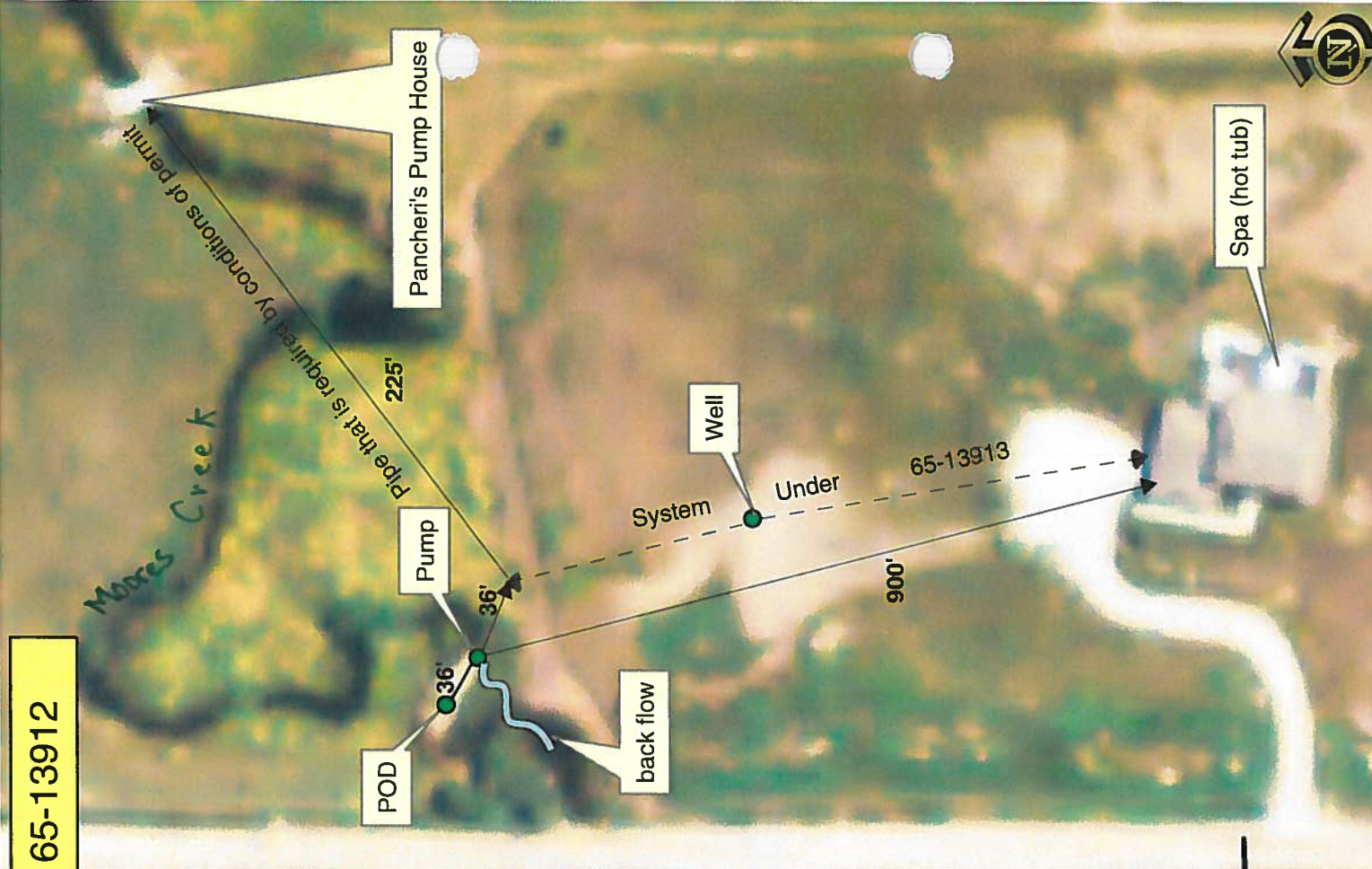
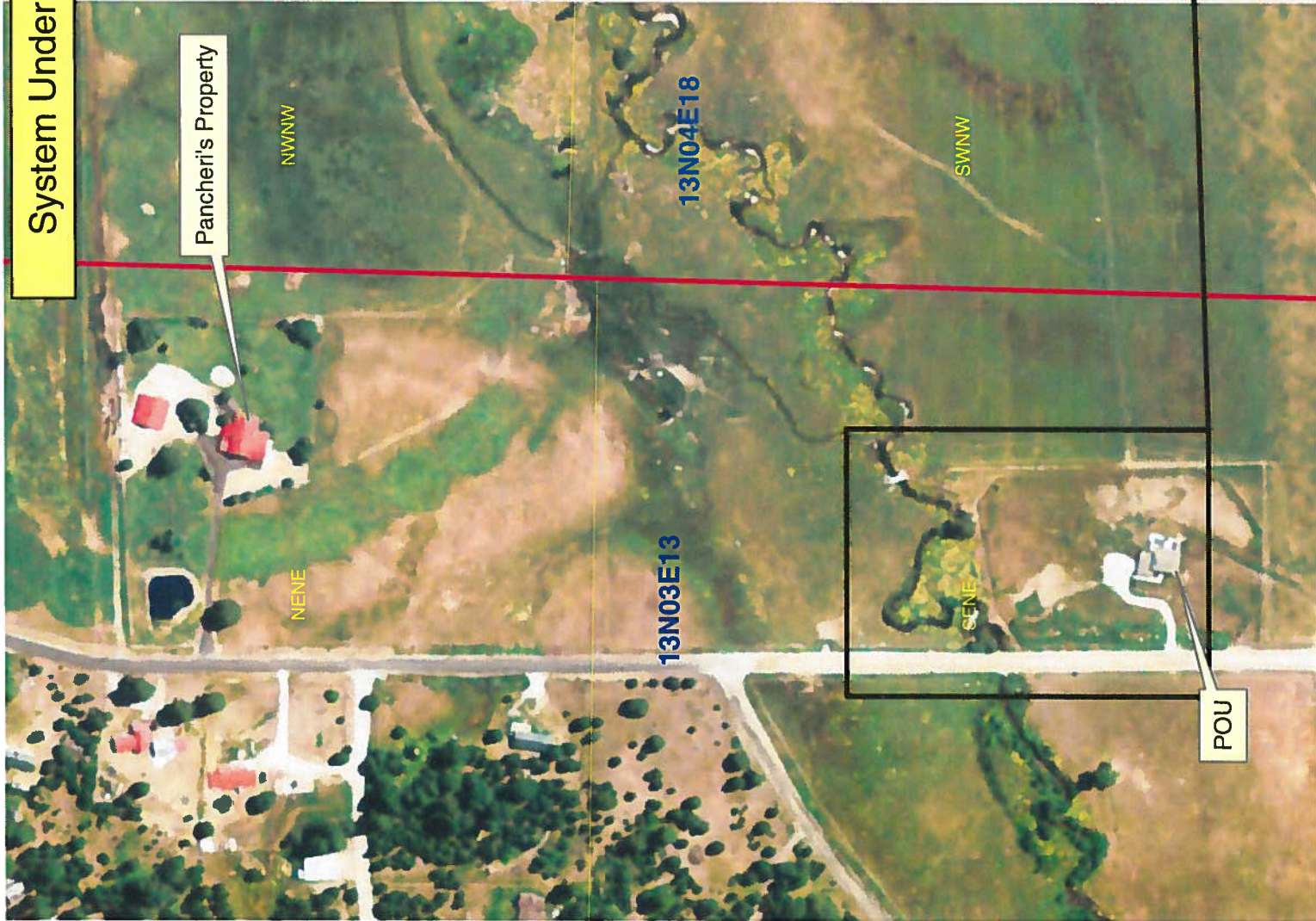


Temp.
@ house

System
controls
w/ house

10/03/2011

**POU/PD Map
and
System Diagram**



Pump Curve and Pump Specs

Pump Specs

Product Name: **JB Centrifugal Pump High Head 1-1/2HP**

Model Number: **JBHF**

Manufacturer: **Sta-rite Water Pumps**

This pump has a heavy-duty cast iron construction with silicon bronze impeller.

- Applications: Water systems and sprinkling for homes, farms and industry
- Drain Port: Provided for easy winterizing
- Easy Serviceability: Includes replaceable wear ring and feature back pull-out design
- Rated for temperatures to 225°F. (UL listed for water temperatures up to 175°F)
- Body and Seal Plate: Close-grained cast iron
- Base: Steel 10 gauge
- Shaft: 416 SS

Maximum Flow	70 gallons/min
TDH (Head) Maximum @ 0GPM	51.95 PSI
Head (TDH) Maximum @ 0GPM	120 FT
HP Standard	1.5 HP
Inlet Connection Type	FNPT
Inlet	1.25 "
Outlet Connection Type	FNPT
Outlet	1 "
Wetted Materials	CI-Bronze
Elastomers	Buna-Nitrile
Voltage	115/230 V
Phase	1
Frequency	60 Hz
Motor	ODP
Motor Amps	19.2/9.6 A
Speed	3450 RPM
Max Operating Temp	225 °F
Viscosity	Water 1.00 cp 31.00 ssu
Max. Volume of Suspended Solids	0 %
Shaft	416SS
Mechanical Seal Face	Carbon-ceramic
Mechanical Seal Type	Single
Warranty	1 Year/s
Applications	Flooded Suction Boiler Feed Dewatering Irrigation
PH High	7 pH
Other	UL listed.
Weight	51 lbs

Flow Rate
Theoretical Analysis
and
Friction Head Loss Calculation

GROUNDWATER FLOW RATE THEORETICAL ANALYSIS

FILE: 65-13912

DATE: 11/23/11

BY: CPalmer

THEORETICAL RATE OF FLOW: $Q = \frac{(8.8) \times (HP) \times (EFF.)}{TDH}$

- Q = Flow rate (CFS)
 HP = Total Brake Horsepower of pumping plant (including booster)
 Eff. = Pumping plant efficiency
 TDH = Total Dynamic Head = [Lift + (PSI x 2.31)] (friction losses added into Lift)
 LIFT = Depth to water in FEET from land surface to pumping water level
 PSI = Pumping pressure measured in PSI near pump (if open discharge assume 0)

1). $Q = \frac{8.8 \times (1.5) \times 0.50}{[(20) + (40 \times 2.31)]} = 0.06$

2). $Q = \frac{8.8 \times (1.5) \times 0.70}{[(20) + (40 \times 2.31)]} = 0.08$

3). $Q = \frac{8.8 \times (1.5) \times 0.70}{[(20) + (50 \times 2.31)]} = 0.$

4). $Q = \frac{8.8 \times (1.5) \times 0.50}{[(20) + (50 \times 2.31)]} = 0.05$

LIFT FROM:

Measurement ☒

Owner ☐

Area Estimate ☐

Well Logs ☐

Booster (Y) ☐ (N) ☒

PSI FROM:

Measurement ☐

Owner ☐

Estimate ☒

Owner Gage ☐

Pump Make, Serial or ID

See field report

REMARKS: Friction losses are significant as there is nearly 900' of piping from PD to POU.
See the "Friction Head Loss Calculator" for more information.

A reasonable figure for back pressure is 40 psi - 50 psi based on the system configuration.

The efficiency seems relatively low based on SP's schematic of the system. 50-70% efficiency was plugged into the calculator to check a few scenarios.

Friction Head Loss Calculator Hazen-Williams Method

[Read Me](#)

$$h_f = \frac{10.44(L)(Q)^{1.85}}{(C)^{1.85} d^{4.8655}}$$

Required Input

L = 900 feet (length of pipe)
Q = 27 gpm (flow rate)
d = 2 inches (inside diameter of pipe)

Select Pipe Material Type

plastic (PVC or ABS)

C = 130 unitless (Hazen-Williams Roughness Coeff.)

Output

$h_f = 17.60$ feet (frictional head loss)

or

$h_f = 7.63$ psi (frictional head loss)

Table 1

Hazen Williams Roughness

Index No.	Material Type	Design Value
1	steel, weld	100
2	concrete	100
3	cement-asl	140
4	vitrified cla	110
5	brick sewer	100
6	cast iron, p	100
7	cast iron, ti	100
8	copper or b	130
9	wood stave	110
10	lead, tin, gl	130
11	plastic (PVC)	130
12	fiberglass	150

*Values taken from Lindeburg (1999) CE Re

Volume Calculations
for
Heating Uses in the Home

Temperature Drop Across system

$$\Delta T_s = (0.3)(S-t)$$

$$S = 119.8$$

$$t = 72$$

$$\Delta T_s = 14.34$$

Find BTU's for Structure

For a two story house the formula becomes:

$$E = [e \cdot \Delta T] 0.08 \cdot A$$

$$E = 83500.03$$

$$e = 0.44$$

$$\Delta T = 84$$

$$A = 2824$$

Volume Calculation for 65-13912 Heating Uses in Home

ΔT_s = Temperature drop across system °F

S = Geothermal source Temperature °F (measured at source)

t = Temperature required by system °F (thermostat setting)

Values for (e) are as follows:

0.3 Best energy efficiency

0.4 Better Energy efficiency

0.7 Average residence

1.1 Poor energy efficiency

E = BTU/hr required

e = House efficiency factor BTU/Hr-sq ft

ΔT = Design temperature difference ($t_i - t_o$)

$$t_i = 72$$

$$t_o = -12$$

A = Area of livable floor space in the house in sq ft

t_i = the inside design temperatures-given by permit holder

t_o = the outside design temperature

Suggested Outside Design Temperatures:

$$\text{Boise} = 4^\circ\text{F}$$

$$\text{Lewiston} = 6^\circ\text{F}$$

$$\text{Pocatello} = -8^\circ\text{F}$$

$$\text{Cascade} = -12^\circ\text{F}$$

Flow Rate Required (Two Story)

$$W = \frac{E}{(500)(\Delta T_s)}$$

$$E = 83500.03$$

$$\Delta T_s = 14.34$$

$$W = 11.6 \text{ GPM}$$

$$\text{Div Rate} = 0.03 \text{ CFS}$$

W = Flow rate in gallons per minute

Q = System heat load in BTU/Hr

ΔT_s = Temperature drop across system °F

$$Q = E$$

Volume Calculation 1:

$$V = \frac{HL \cdot DD \cdot 24 \cdot Cd}{\Delta T_1 \cdot k \cdot C \cdot \Delta T_2}$$

$$V = 2.7 \text{ AF}$$

$$E \text{ or } HL = 83500.03$$

$$DD = 6715$$

$$24 = 24$$

$$Cd = 0.6$$

$$\Delta T_1 = 84$$

$$k = 0.9$$

$$C = 2720000$$

$$\Delta T_2 \text{ or } \Delta T_s = 14.34$$

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = 6715 (NOAA, Average number of degree days 1971-2000)

24 = 24 hrs/day

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

ΔT_1 = Design temperature difference

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

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

$\Delta T_2 = \Delta T_s$ (calculated above) =

OR

Volume Calculation 2: Using Musgrove's Peak Heating Load Calculation

$$V = \frac{HL \cdot DD \cdot 24 \cdot Cd}{\Delta T_1 \cdot k \cdot C \cdot \Delta T_2}$$

$$V = 3.2 \text{ AF}$$

$$E \text{ or } HL = 98872$$

$$DD = 6715$$

$$24 = 24$$

$$Cd = 0.6$$

$$\Delta T_1 = 84$$

$$k = 0.9$$

$$C = 2720000$$

$$\Delta T_2 \text{ or } \Delta T_s = 14.34$$

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr (see the Zone Summary Table in Musgrove's report)

DD = 6715 (NOAA, Average number of degree days 1971-2000)

24 = 24 hrs/day

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

ΔT_1 = Design temperature difference

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

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

$\Delta T_2 = \Delta T_s$ (calculated above) =

Carol MacGregor's
Flow Meter Records
and
Temperature Readings

Meters located on Belvidere Springs (Summer of 2009)

Date	Pancheri Meter	Usage Between Readings in Gallons	Temperature in Celsius	MacGregor Meter	Usage Between Readings in Gallons
6/25/2009	272680	0			0
6/26/2009	274719	2039			0
6/27/2009	275073	354			0
6/28/2009	276130	1057			0
6/29/2009	277075	945			0
6/30/2009	278136	1061			0
7/1/2009	279583	1447	43.5	77322	0
7/2/2009	280419	836			0
7/2/2009	280867	448	42.3	77513	191
7/3/2009	281517	650	41.9	77776	263
7/3/2009	281966	449	44.8	77897	121
7/4/2009	282492	526	42.3	77898	1
7/5/2009	283529	1037			0
7/6/2009	284629	1100			0
7/7/2009	285841	1212			0
7/8/2009	286693	852			0
7/9/2009	287812	1119			0
7/10/2009	288797	985	42.5		0
7/10/2009	288985	188			0
7/11/2009	289727	742	42.5	78002	104
7/12/2009	290746	1019	43.2		0
7/12/2009	291237	491	43.5	78002	0
7/13/2009	291824	587	43		0
7/13/2009	292417	593	43.4		0
7/14/2009	293008	591	43.1	78036	34
7/15/2009	293935	927	42.7		0
7/15/2009	294397	462	43.8	78036	0
7/16/2009	294913	516	42.9		0
7/16/2009	295343	430	43.8	78104	68
7/17/2009	295918	575	43.3		0
7/18/2009	296955	1037	43.3	78175	71
7/19/2009	298021	1066	43.5	78175	0
7/19/2009	298571	550	43.8	78175	0
7/20/2009	299075	504	43.3	78175	0
7/21/2009	300052	977	43.1	78175	0
7/22/2009	300910	858	43.1	78175	0
7/22/2009	301337	427	43.3	78175	0
7/23/2009	301717	380	42.5	78211	36
7/24/2009	302787	1070		78211	0
7/25/2009	303931	1144		78211	0
7/26/2009	304864	933		78211	0
7/27/2009	305816	952		78211	0

7/28/2009	306590	774	44.2	78211	0
7/29/2009	307491	901	43.6	78278	67
7/30/2009	308449	958	43.5	78278	0
7/31/2009	309456	1007	43.5	78306	28
8/1/2009	310404	948	43.4	78306	0
8/2/2009	311286	882	43.4	78306	0
8/3/2009	312119	833	43.6	78322	16
8/4/2009	313027	908	44	78322	0
8/5/2009		0			0
8/6/2009		0			0
8/7/2009		0			0
8/8/2009		0			0
8/9/2009	318329	5302		78322	0
8/10/2009		0			0
8/11/2009		0			0
8/12/2009		0			0
8/13/2009		0			0
8/14/2009		0			0
8/15/2009		0			0
8/16/2009		0			0
8/17/2009		0			0
8/18/2009		0			0
8/19/2009	328182	9853		78339	17
8/20/2009		0			0
8/21/2009		0			0
8/22/2009		0			0
8/23/2009		0			0
8/24/2009		0			0
8/25/2009		0			0
8/26/2009	334642	6460		78339	0
8/27/2009		0			0
8/28/2009		0			0
8/29/2009		0			0
8/30/2009		0			0
8/31/2009		0			0
9/1/2009		0			0
9/2/2009	340689	6047		78367	28
9/3/2009		0			0
9/4/2009		0			0
9/5/2009		0			0
9/6/2009		0			0
9/7/2009		0			0
9/8/2009		0			0
9/9/2009	347702	7013		78367	0
9/10/2009		0			0
9/11/2009		0			0
9/12/2009		0			0

9/13/2009		0		0
9/14/2009		0		0
9/15/2009		0		0
9/16/2009	355041	7339	78367	0
9/17/2009		0		0
9/18/2009		0		0
9/19/2009		0		0
9/20/2009		0		0
9/21/2009		0		0
9/22/2009		0		0
9/23/2009	361982	6941	78367	0
9/24/2009		0		0
9/25/2009		0		0
9/26/2009		0		0
9/27/2009		0		0
9/28/2009		0		0
9/29/2009		0		0
9/30/2009	369461	7479	78516	149
10/1/2009		0		0
10/2/2009		0		0
10/3/2009		0		0
10/4/2009		0		0
10/5/2009		0		0
10/6/2009		0		0
10/7/2009	375468	6007	78516	0
10/8/2009		0		0
10/9/2009		0		0
10/10/2009		0		0
10/11/2009		0		0
10/12/2009		0		0
10/13/2009		0		0
10/14/2009		0		0
10/15/2009		0		0
10/16/2009		0		0
10/17/2009		0		0
10/18/2009		0		0
10/19/2009		0		0
10/20/2009		0		0
10/21/2009	386455	10987	81218	2702
120 days		113775		3896

Measurements were collected by Carol MacGregor pursuant to her 11/4/09 letter.

Note: The high usage season is winter not summer.