

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 47-7520

Exam Date: see narrative

1. Current Owner: GLEN D DEPEW
RT 2 BOX 115A
WENDELL ID 83355
(208)536-2741
- And/Or
- RAY G DEPEW
2825 S 850 E
HAGERMAN ID 83332-5615
(208)837-9182

2. Accompanied by: see narrative

3. **SOURCE****TRIBUTARY**

GROUND WATER

B. OVERLAP REVIEW

1. Other water rights with the same place of use: No other heating rights other than licensed right 47-7451B which appears to be for Lot 2 (excluding west ½) from a separate well according to microfilm documents. Several of the lots have irrigation rights out of Salmon Falls Creek and their own private domestic wells.
2. Other water rights with the same point of diversion: No other rights out of this particular well. IDWR records indicate that rights 47-17374, 47-17375, 47-17376, 47-17464, 47-17465, and permit 47-17497 are diverted within the NWSE of Section 30. However, all of these rights are actually diverted from other wells.

C. DIVERSION AND DELIVERY SYSTEM1. **LOCATION OF POINT(S) OF DIVERSION:**

GROUND WATER NW1/4SE1/4 Sec. 30, Twp 08S, Rge 14E, B.M.
TWIN FALLS County

Method of Determination: GIS, aerial photography, and existing IDWR spatial data point.

2.

PLACE OF USE: HEATING

Tw	Rge	Sec	NE				NW				SW				SE				Totals
08S	14E	30	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
					X										X	X			

Method of Determination: IDWR records, GIS, aerial photography, and conversations with lot owners

3. ☒ Delivery System Diagram Attached (required). Indicate all major components and distances between components. Indicate weir size/pipe as applicable.
- ☒ Map Attached Showing Location(s) of point(s) of diversion and place(s) of use (required). Scale must be 1:24,000 or greater.
- ☒ Aerial Photo Attached (required for irrigation of 10+ acres).
- ☒ Photo of Diversion and System Attached

D. FLOW MEASUREMENTS

As part of an illegal water use complaint investigation, Allen Merritt and I measured the total flow from the 47-7520 well on January 8, 1999. The measurement was taken utilizing a Tyme-Flyte by Polysonics ultrasonic meter (serial # 149744). The total flow from the well was measured at 286 gpm, or 0.64 cfs.

E. FLOW CALCULATIONS

 Additional Computation Sheets Attached

The attached estimated flow calculations for heating use for the various buildings (homes, garages, shops, and greenhouses) indicate that the buildings on the developed lots could reasonably use approximately 0.28 cfs for heating use.

Field observations &/or conversation with lot owners indicated that four of the developed lots have, or will have pools, &/or hot tubs. The following lots are given credit for pools &/or hot tubs:

- Lot 2 - Excluding West ½ (a 724 ft² swimming pool)
- Lot 3 - SE 2.2 acres (79 ft² pool approximately 2 feet deep)
- Lot 12 - NE 2.71 acres (306 ft² pool approximately 4 feet deep)
- Lot 14- Parcel 1 (owner indicated that they would be installing a pool similar to the pool located on Lot 12 - NE 2.71 acres. Note that this lot has a recently constructed home and is still under development.)

Flow into one of these pools (located on Lot 12 - NE 2.71 acres) was able to be measured during the May 17, 2013 follow up exam. This flow was measured at approximately 7.5 gpm, or 0.02 cfs. Assuming four pools on developed lots at 0.02 cfs each yields an additional 0.08 cfs for pools, &/or hot tub use.

Total estimated flow on developed lots = building flow + pool &/or hot tub flow = 0.28 cfs + 0.08 cfs = 0.36 cfs

However, permit is for heating use on twelve developed parcels and flow calculation estimates are based on seven developed parcels. Therefore...

Total estimated heating flow is 0.36 cfs x (12/7) = 0.62 cfs (Note that this value is very close to the January 8, 1999 measurement of 0.64 cfs mentioned above). **Recommend measured amount of 0.64 cfs.**

F. VOLUME CALCULATIONS

 Additional Computation Sheets Attached

The attached estimated volume calculations for heating use for the various buildings (homes, garages, shops, and greenhouses) indicate that the buildings on the developed lots could reasonably use approximately 31.4 ac-ft for heating use annually.

Assuming the four pools mentioned above divert and use water 180 days out of the year...

0.08 cfs x 1.9835 ac-ft per cfs per day x 180 days = 28.6 ac-ft per year

Total estimated volume on developed lots = building volume+ pool &/or hot tub volume = 31.4 ac-ft + 28.6 ac-ft = 60.0 ac-ft

However, permit is for heating use on twelve developed parcels and flow calculation estimates are based on seven developed parcels. Therefore...

Total estimated heating volume is 60.0 ac-ft x (12/7) = 102.9 acre-feet per year

Recommend estimated amount of 102.9 acre-feet per year

G. NARRATIVE/REMARKS/COMMENTS

Application for Permit 47-7520 was filed on April 25, 1979 in the name of Ray and/or Glen DePew for the development of up to 2.0 cfs of groundwater for heating use. Permit 47-7520 was approved on June 25, 1979 with a proof of beneficial use due date of June 1, 1984. Various amendments and extensions of time were granted and proof of beneficial use was eventually filed on May 16 1989. These amendments eventually resulted in the water permit being assigned to Lots 2, 3, 11, 12, and 14 of Salmon River Ranches # 1 Subdivision. An IDWR order (signed February 11, 1987) indicated that the permit is for "twelve (12) home sites" and that "the project shall be considered complete when the water delivery system is constructed and stubbed into every lot". IDWR originally performed a licensing exam on December 2, 1992. In 1998, conversations between the permit holders and IDWR state office personnel were held relating to the draft license based on the December 2, 1992 field exam and the inadequate amounts on the proposed license. As a result of these discussions, IDWR agreed to conduct an additional field exam and reassess the development and reconsider the amount of water that should be licensed. Various conversations have been held with various lot owners over the years regarding their extent of development, or lack thereof, and the potential licensing ramifications. In addition, on January 8, 1999, as part of an illegal water use complaint investigation (Rathke NOV), the total flow from the 47-7520 well was measured and determined to be 286 gpm, or 0.64 cfs.

The place of use for right 47-7520 is located on twelve Parcels within Lots 2, 3, 11, 12 and 14 of Salmon River Ranches #1 Subdivision. These twelve parcels are further described as follows:

Lot 2 - Excluding West ½
 Lot 2 - West ½
 Lot 3 - SE 2.2 acres
 Lot 3 - Excluding SE 2.2 acres
 Lot 11 - Excluding SE 2.55 acres
 Lot 11 - SE 2.55 acres
 Lot 12 - NE 2.71 acres
 Lot 12 - Excluding NE 2.71 acres
 Lot 14- Parcel 1
 Lot 14 - Parcel 2
 Lot 14 - Parcel 3
 Lot 14 - Parcel 4

All twelve of these parcels have never been fully developed so determination of actual water use on the twelve parcels is not really possible. However, recent conversations with IDWR state office personnel provided direction that water use on the developed portion of the 12 parcels can be estimated and then "pro-rated" onto the remaining undeveloped lots. For example, if half of the lots are developed, the water use for the developed lots can be estimated, and then the estimated use could be doubled to cover all of the lots.

Earlier this spring, I visited the Twin Falls County Assessor's office and reviewed assessor's reports for the twelve parcels listed above. From examination of these reports, information relating to the various building sizes, type and extent of development, etc. was obtained. While reviewing this information, it was noted that it appeared that the assessor's office reports assigned additional value to these twelve lots based on the lots having access to hot water, including undeveloped lots. On May 17, 2013, I visited the subdivision and had an opportunity to verify the development, or lack thereof, on the twelve lots. During the visit, I was able to meet with various lot owners and discuss the 47-7520 system and the licensing process. A summary of the assessor's office and field visit information regarding the heating development is attached. Using this information, various calculations were performed to estimate the heating needs pursuant to current IDWR guidance (Application Processing Memo #23 (amended) and 3/25/1988 IDWR Memo from Rick Sterling to Terry Blau). Information for these calculations was obtained from a variety of sources (1992 field exam report, assessor's office data, 2013 field observations, etc.). These estimates indicated that it is reasonable to allow for the 1999 measured amount of 0.64 cfs with an allowable annual diversion volume of 102.9 acre-feet for heating use.

One item that needs noted is that it appears that licensed water right 47-7451B allows for heating use on one of the twelve lots (Lot 2 - Excluding West ½). This heating use is for the same buildings and pool used in the 47-7520 estimates, but the right is for use of water from a different well. Therefore, it is recommended that a condition be implemented on the 47-7520 license limiting it when combined with 47-7451B to an annual volume of 102.9 acre-feet (amount licensed under 47-7520).

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

H. RECOMMENDATIONS**1. Recommended Amounts**

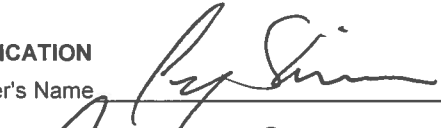
<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>DIVERSION RATE</u>	<u>ANNUAL VOLUME</u>
HEATING	01/01 to 12/31	0.640 CFS	102.90 AF
	<u>Totals:</u>	0.640 CFS	102.90 AF

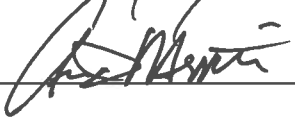
2. Recommended Amendments

___ Change P.D. as reflected above ___ Add P.D. as reflected above ☒ None

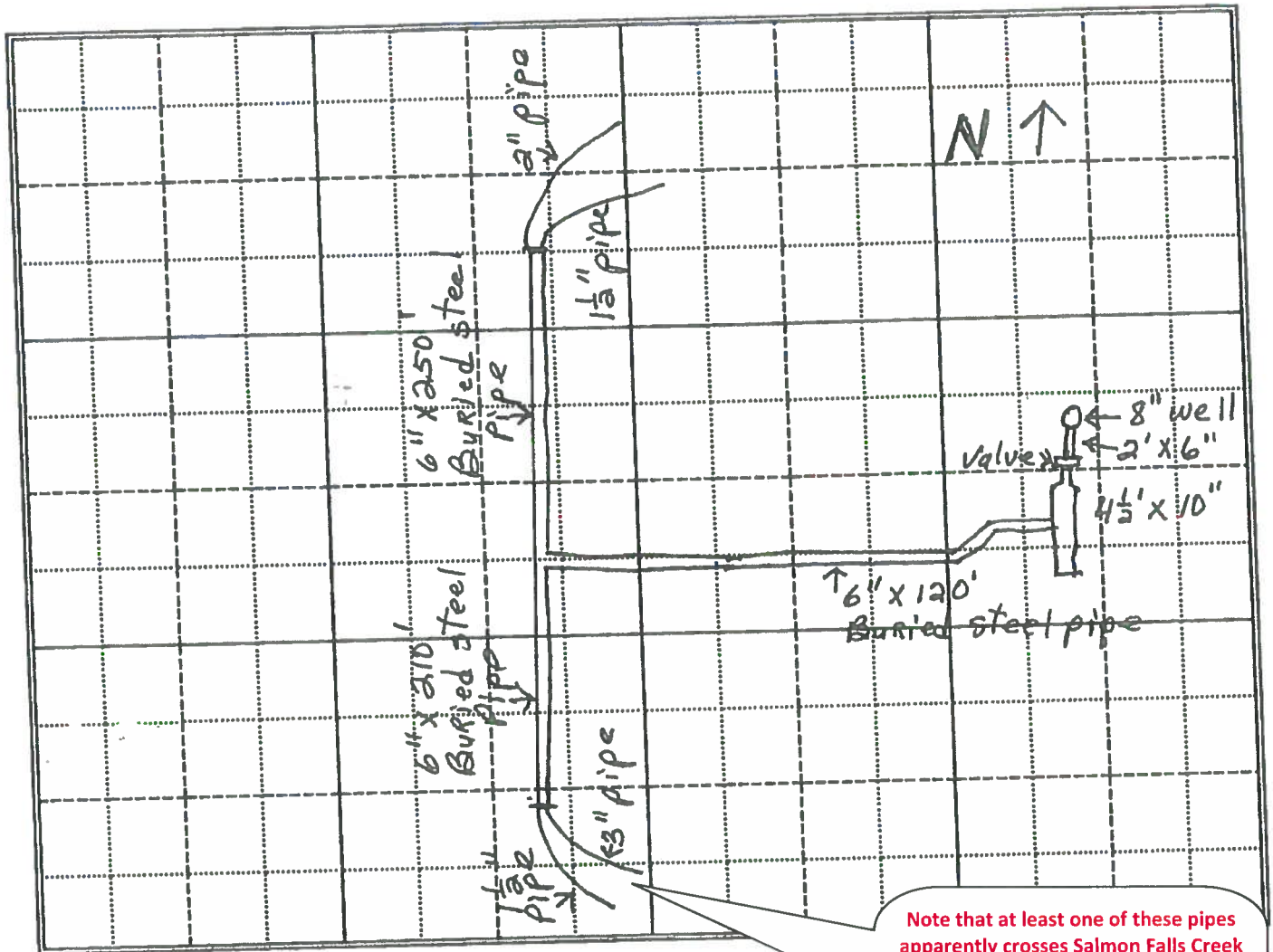
___ Change P.U. as reflected above ___ Add P.U. as reflected above ___ Other

I. AUTHENTICATION

Field Examiner's Name  Date 5/28/13

Reviewer  Date 6/27/13

47-7520 System Diagram
(Drawing taken from 12/2/1992 Beneficial Use Report)

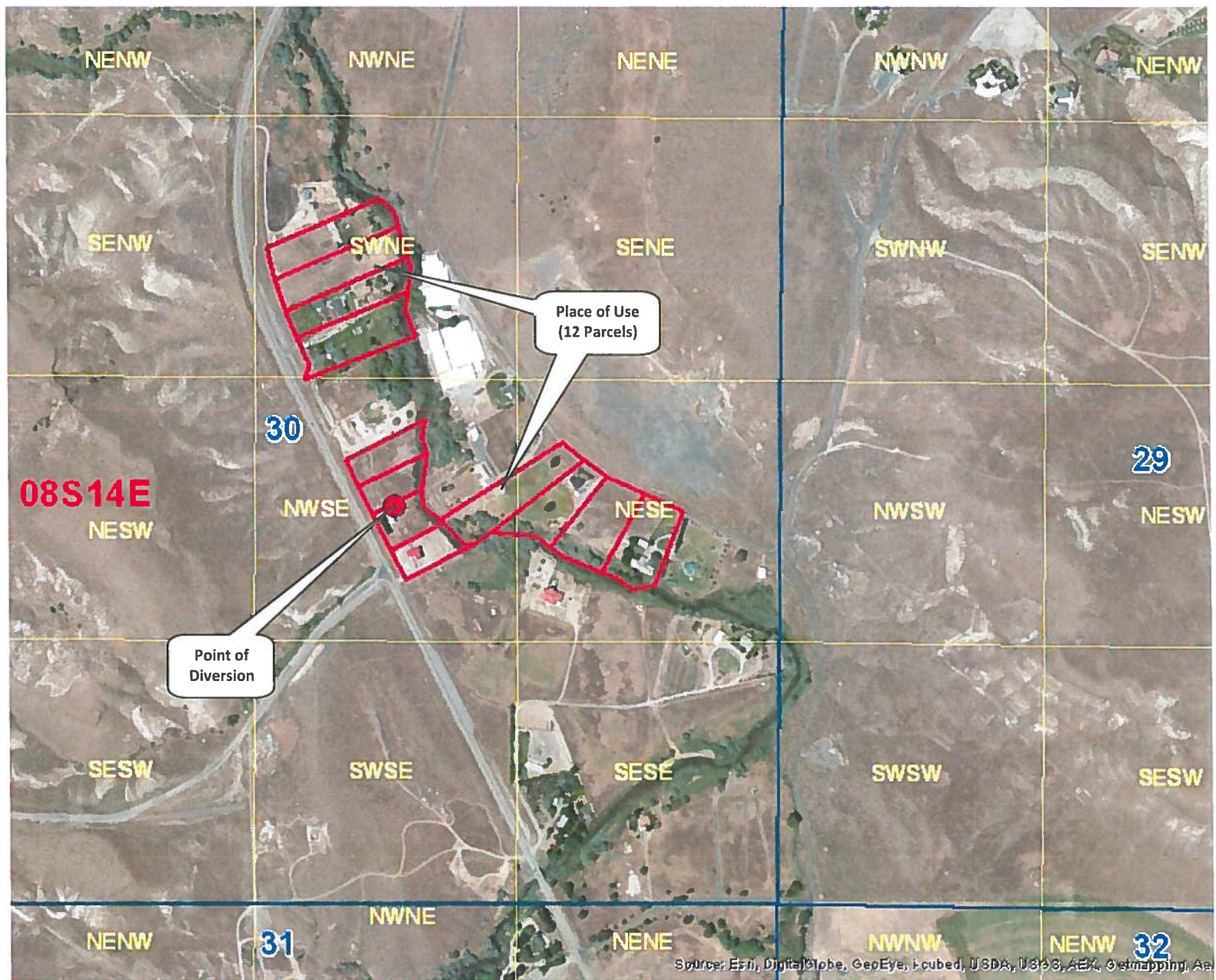


Scale: T - Not to scale

Note that at least one of these pipes apparently crosses Salmon Falls Creek to serve the parcels on Lots 2 and 3. Two creek crossings are visible on aerial photography and it was reported that one crossing serves the two parcels on Lot 2 and the other crossing serves the two parcels on Lot 3.

47-7520 Point of Diversion and Place of Use Map

Esri Imagery



47-7520 Place of Use Map (With Parcel Identification Labeled)



Place of Use consists of twelve parcels. These twelve parcels are further described as follows:

Lot 2 - Excluding West ½
Lot 3 - Excluding SE 2.2 acres
Lot 12 - NE 2.71 acres
Lot 14 - Parcel 2

Lot 2 - West ½
Lot 11 - Excluding SE 2.55 acres
Lot 12 - Excluding NE 2.71 acres
Lot 14 - Parcel 3

Lot 3 - SE 2.2 acres
Lot 11 – SE 2.55 acres
Lot 14- Parcel 1
Lot 14 – Parcel 4

47-7520 Point of Diversion Photos

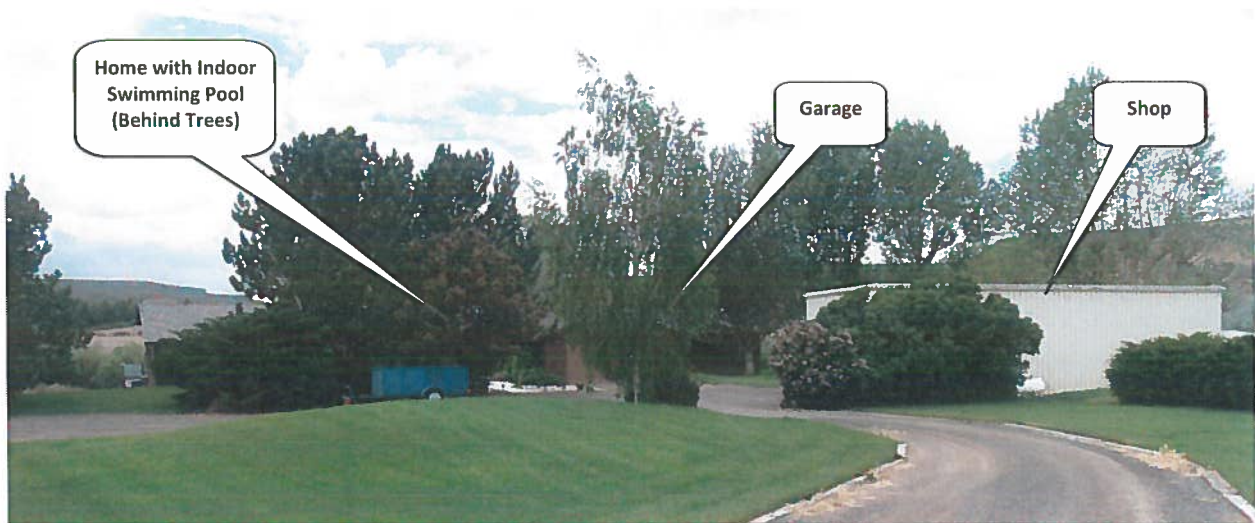


LEFT: View on December 2, 1992 of the well that serves as the point of diversion for right 47-7520.



LEFT: View on January 8, 1999 of the 47-7520 well (right edge of photo) and plumbing system. Note that the plumbing system had been modified when this picture was taken. Also note that the well is now located inside a small building (compared to 1992 photo above)

47-7520 Place of Use Photos

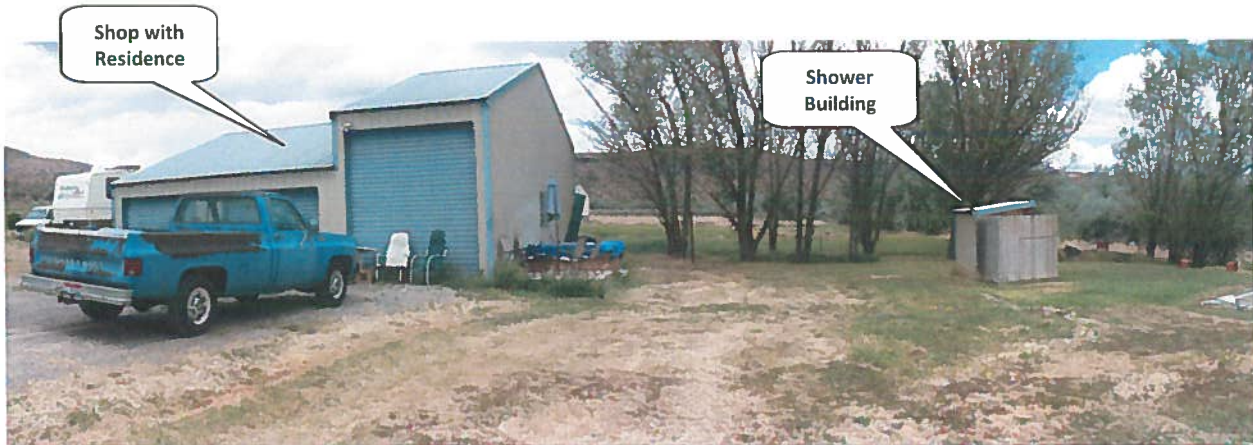


ABOVE: View of a portion of the development on Lot 2 - Excluding West ½. Water diverted from the 47-7520 well is used to heat a home, garage, shop, and a large indoor swimming pool on this lot. The greenhouse on this property was tore down in 1990 (after proof of beneficial use was filed for 47-7520)

BELOW: View of the heating use development on Lot 3 - SE 2.2 acres. Water diverted from the 47-7520 well is used to heat a home, garage, and hot tub pool.

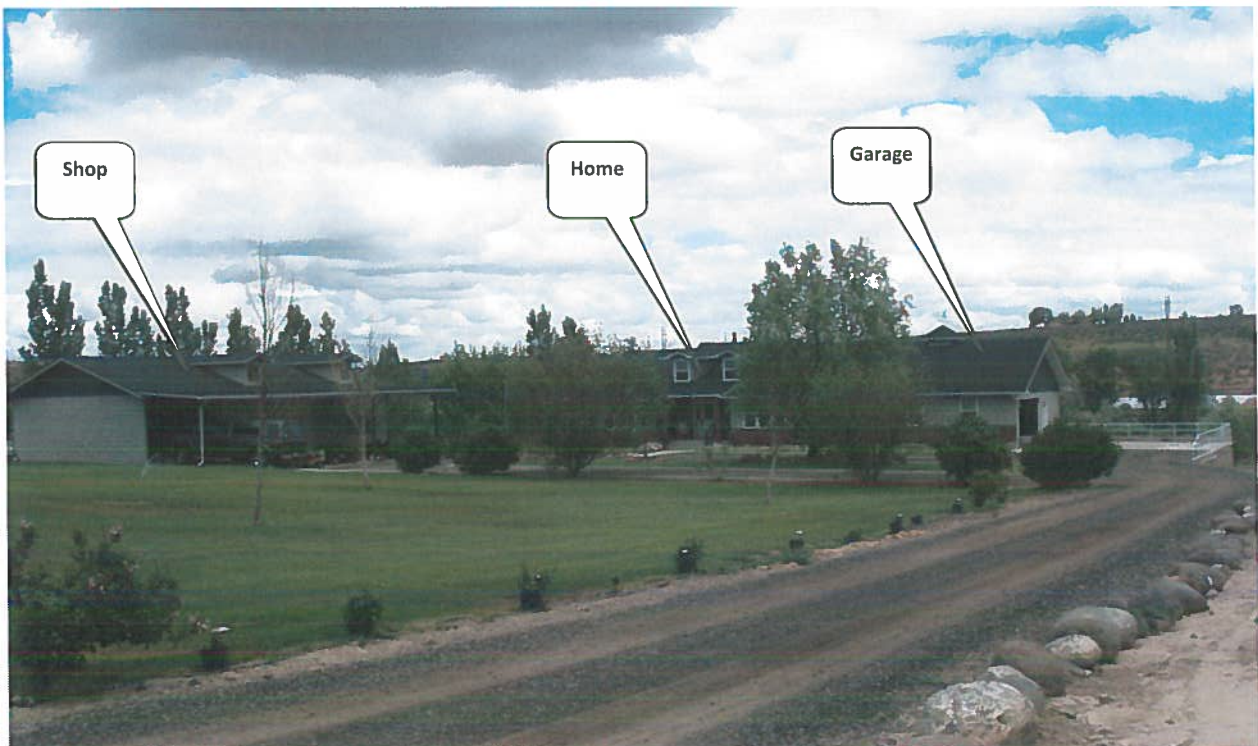


47-7520 Place of Use Photos



ABOVE: View of the development on Lot 11 – Excluding SE 2.55 acres. Development on this parcel includes a shop with a residence and a small building with a shower.

BELOW: View of the development on Lot 12 – NE 2.71 acres. Water diverted from the 47-7520 well is used to heat a home, garage, shop, hot tub pool, and a greenhouse.



47-7520 Place of Use Photos

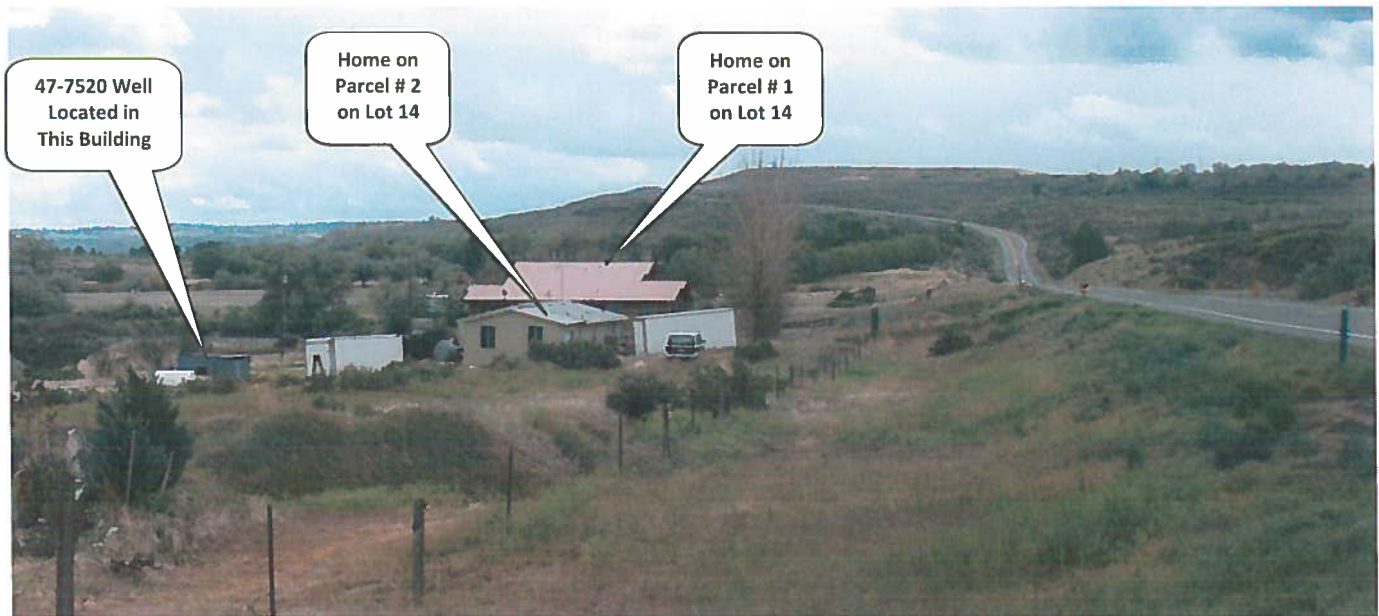


ABOVE: View of hot tub/pool and greenhouse on Lot 12 – NE 2.71 acres. Discharge into the hot tub/pool was measured at approximately 7.5 gpm.

BELOW: View of development on Lot 12 – Excluding NE 2.71 acres. The home and shop, excluding the garage, are heated.

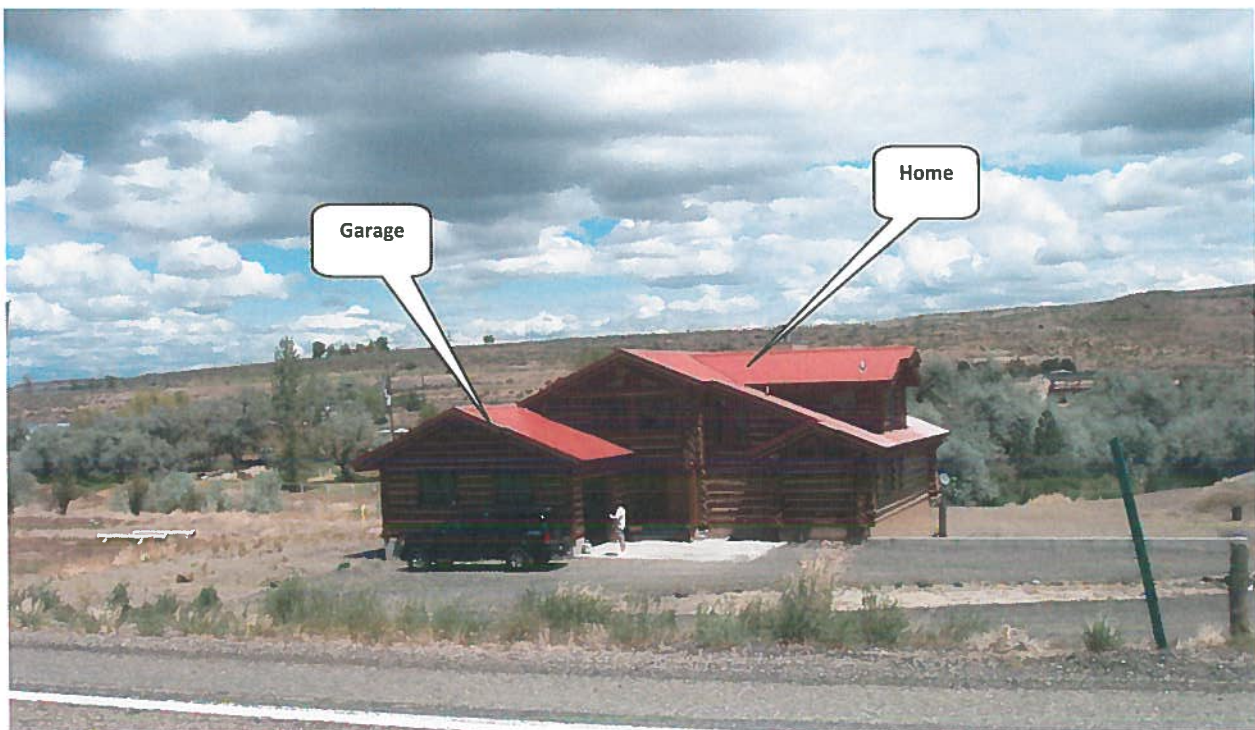


47-7520 Place of Use Photos



ABOVE: View looking towards Lot 14 (parcels 1, 2, 3, and 4). Parcel # 2 has a mobile home and happens to be where the 47-7520 well is located.

BELOW: View of recently constructed home and garage on Parcel # 1 of Lot 14. Note that landscaping has not yet been developed on this particular lot. The owner of this lot indicated that he plans to put in a hot tub/pool similar to the one located on Lot 12 – NE 2.71 acres.



SUMMARY OF DEVELOPMENT FOR 47-7520
AS OF 5/17/2013 (INFO FROM TFCO ASSESSORS & FIELD VISIT)
LOT 2 EXC W $\frac{1}{2}$ - CHARLES & DOROTHY HILL

2 story - 3,761 ft² home POOL

~~724~~ 724 ft² garage

1500 ft² shop

1,674 ft² greenhouse

tore down in 1990
proof filed in 1989

LOT 2 W $\frac{1}{2}$ - CHARLES & DOROTHY HILL

NOT DEVELOPED BUT STUBBED IN

LOT 3 SE Portion - WILLIAM LLOYD

2 story 2,465 ft² home

hot tub

600 ft² garage

LOT 3 EXC SE portion - WILLIAM LLOYD

NOT DEVELOPED BUT STUBBED IN

LOT 11 EXC SE Portion - LESLIE MACFEE

1296 ft² shop with residence + small shed with
shower

LOT 11 SE Portion - LESLIE MACFEE

NOT DEVELOPED BUT STUBBED IN

LOT 12 NE Portion - CALVIN & RUTH DYER

2 story 2743 ft² home

17' x 18' pool

647 ft² garage

1280 ft² shop

400 ft² greenhouse

LOT 12 EXC NE Portion - Paul & Nancy Zimmerman

2 story 3731 ft² home

800 ft² shop

Mr. Zimmerman indicated
22x23 garage not heated

LOT 14 Parcel 4 - Jeff Hines

NOT DEVELOPED BUT STUBBED IN

LOT 14 Parcel 3 - Jeff Hines

NOT DEVELOPED BUT STUBBED IN

LOT 14 Parcel 2 - Jeff Hines

1296 ft² mobile home

LOT 14 Parcel 1 - RON & JACCI DANNENHAVER

2 story 2639 ft² home

528 ft² garage

putting in pool

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: GARAGE ON LOT 14, PARCEL 1 - (DANNENHAVER)

The garge has a total of 528 ft², the efficiency factor was assumed to have a poor *energy efficiency* or 1.11 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the garge is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$e =$ 1.11 BTU/hr ft² °F
 $\Delta t_1 =$ 73 °F
 $A =$ 528 ft²

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{42,784} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$S =$ 158 °F
 $T =$ 70 °F

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$HL = 42,784$ BTU/hr

$DD = 6,376$ °F

$24 = 24$ hrs/day

$C_D = 0.62$

$\Delta t_1 = 73$ °F

$k = 0.9$

$C = 2,720,000$ BTU/AF-°F

$\Delta t_2 = 26.4$ °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{0.9} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: HOME ON LOT #2 EXC W¹/₂ (HILL)

The home has a total of 3761 ft², the efficiency factor was assumed to have an average *energy efficiency* or 0.67 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the home is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$e = 0.67 \text{ BTU/hr ft}^2 \text{ °F}$

$\Delta t_1 = 73 \text{ °F}$

$A = 3,761 \text{ ft}^2$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{147,160} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$S = 158 \text{ °F}$

$T = 70 \text{ °F}$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$$HL = 147,160 \text{ BTU/hr}$$

$$DD = 6,376 \text{ °F}$$

$$24 = 24 \text{ hrs/day}$$

$$C_D = 0.62$$

$$\Delta t_1 = 73 \text{ °F}$$

$$k = 0.9$$

$$C = 2,720,000 \text{ BTU/AF-°F}$$

$$\Delta t_2 = 26.4 \text{ °F}$$

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{3.0} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: GARAGE ON LOT #2 EXC W¹/₂ - (HILL)

The garge has a total of 724 ft², the efficiency factor was assumed to have a poor *energy efficiency* or 1.11 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the garge is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$$e = 1.11 \text{ BTU/hr ft}^2 \text{ } ^\circ\text{F}$$

$$\Delta t_1 = 73 \text{ } ^\circ\text{F}$$

$$A = 724 \text{ ft}^2$$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{58,666} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$S = 158 \text{ } ^\circ\text{F}$$

$$T = 70 \text{ } ^\circ\text{F}$$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ } ^\circ\text{F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$$HL = 58,666 \text{ BTU/hr}$$

$$DD = 6,376 \text{ °F}$$

$$24 = 24 \text{ hrs/day}$$

$$C_D = 0.62$$

$$\Delta t_1 = 73 \text{ °F}$$

$$k = 0.9$$

$$C = 2,720,000 \text{ BTU/AF-°F}$$

$$\Delta t_2 = 26.4 \text{ °F}$$

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{1.2} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: SHOP ON LOT #2 EXC W $\frac{1}{2}$ - (HILL)

The shop has a total of 1500 ft², the efficiency factor was assumed to have a poor *energy efficiency* or 1.11 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the shop is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$$e = 1.11 \text{ BTU/hr ft}^2 \text{ °F}$$

$$\Delta t_1 = 73 \text{ °F}$$

$$A = 1,500 \text{ ft}^2$$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{121,545} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$S = 158 \text{ °F}$$

$$T = 70 \text{ °F}$$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$$HL = 121,545 \text{ BTU/hr}$$

$$DD = 6,376 \text{ °F}$$

$$24 = 24 \text{ hrs/day}$$

$$C_D = 0.62$$

$$\Delta t_1 = 73 \text{ °F}$$

$$k = 0.9$$

$$C = 2,720,000 \text{ BTU/AF-°F}$$

$$\Delta t_2 = 26.4 \text{ °F}$$

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{2.5} \text{ afa}$$

Volume calculation WR 47-7520 Greenhouse

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

GREENHOUSE ON LOT #2 EXC W 1/2
(HILL)

Explanation of values used in calculations:

Square footage of one greenhouse is 1674 sq/ft. The greenhouse is constructed with single polly and in the calculations the Peak Heating Load was taken from a graph related to single polly construction. The temperature of the geothermal source was measured at 158 °F. The temperature in the greenhouse is expected to be 60 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

S = 158 °F

T = 60 °F

$$\Delta T_s = 0.3(S - T) = \boxed{29.4}^{\circ}\text{F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr (taken from graph)

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

HL = 197,745 BTU/hr

DD = 6,376 °F

24 = 24 hrs/day

C_D = 0.85

Δt_1 = 73 °F

k = 0.9

C = 2,720,000 BTU/AF-°F

Δt_2 = 29.4 °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{4.9} \text{afa}$$

Volume calculation WR 47-7520 Greenhouse

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations:

GREEN HOUSE ON LOT 12 NE PORTION
(DYER)

Square footage of one greenhouse is 400 sq/ft. The greenhouse is constructed with single polly and in the calculations the Peak Heating Load was taken from a graph related to single polly construction. The temperature of the geothermal source was measured at 158 °F. The temperature in the greenhouse is expected to be 60 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

S = 158 °F

T = 60 °F

$$\Delta T_s = 0.3(S - T) = \boxed{29.4}^{\circ}\text{F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr (taken from graph)

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

HL = 47,251 BTU/hr

DD = 6,376 °F

24 = 24 hrs/day

C_D = 0.85

Δt_1 = 73 °F

k = 0.9

C = 2,720,000 BTU/AF-°F

Δt_2 = 29.4 °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{1.2} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: HOME ON LOT #3 SE PORTION (LLOYD)

The home has a total of 2465 ft², the efficiency factor was assumed to have an average *energy efficiency* or 0.67 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the home is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$$\begin{aligned} e &= 0.67 \text{ BTU/hr ft}^2 \text{ °F} \\ \Delta t_1 &= 73 \text{ °F} \\ A &= 2,465 \text{ ft}^2 \end{aligned}$$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{96,451} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$\begin{aligned} S &= 158 \text{ °F} \\ T &= 70 \text{ °F} \end{aligned}$$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$$HL = 96,451 \text{ BTU/hr}$$

$$DD = 6,376 \text{ °F}$$

$$24 = 24 \text{ hrs/day}$$

$$C_D = 0.62$$

$$\Delta t_1 = 73 \text{ °F}$$

$$k = 0.9$$

$$C = 2,720,000 \text{ BTU/AF-°F}$$

$$\Delta t_2 = 26.4 \text{ °F}$$

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{1.9} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: GARAGE ON LOT 3 SE PORTION - (LLOYD)

The garge has a total of 600 ft², the efficiency factor was assumed to have a poor *energy efficiency* or 1.11 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the garge is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$e = 1.11 \text{ BTU/hr ft}^2 \text{ °F}$
 $\Delta t_1 = 73 \text{ °F}$
 $A = 600 \text{ ft}^2$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{48,618} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$S = 158 \text{ °F}$
 $T = 70 \text{ °F}$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$HL = 48,618$ BTU/hr

$DD = 6,376$ °F

$24 = 24$ hrs/day

$C_D = 0.62$

$\Delta t_1 = 73$ °F

$k = 0.9$

$C = 2,720,000$ BTU/AF-°F

$\Delta t_2 = 26.4$ °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{1.0} \text{afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations:

SHOP ON LOT #11 EXC SE PORTION
(MACFEE)

The shop has a total of 1296 ft², the efficiency factor was assumed to have a poor *energy efficiency* or 1.11 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the shop is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$$\begin{aligned} e &= 1.11 \text{ BTU/hr ft}^2 \text{ °F} \\ \Delta t_1 &= 73 \text{ °F} \\ A &= 1,296 \text{ ft}^2 \end{aligned}$$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{105,015} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$\begin{aligned} S &= 158 \text{ °F} \\ T &= 70 \text{ °F} \end{aligned}$$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$HL = 105,015$ BTU/hr

$DD = 6,376$ °F

$24 = 24$ hrs/day

$C_D = 0.62$

$\Delta t_1 = 73$ °F

$k = 0.9$

$C = 2,720,000$ BTU/AF-°F

$\Delta t_2 = 26.4$ °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{2.1} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: *HOME ON LOT # 12 NE PORTION - (DYER)*

The home has a total of 2743 ft², the efficiency factor was assumed to have an average *energy efficiency* or 0.67 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the home is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$e =$ 0.67 BTU/hr ft² °F
 $\Delta t_1 =$ 73 °F
 $A =$ 2,743 ft²

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{107,328} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$S =$ 158 °F
 $T =$ 70 °F

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$HL = 107,328$ BTU/hr

$DD = 6,376$ °F

$24 = 24$ hrs/day

$C_D = 0.62$

$\Delta t_1 = 73$ °F

$k = 0.9$

$C = 2,720,000$ BTU/AF-°F

$\Delta t_2 = 26.4$ °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{2.2} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: *GARAGE ON LOT 12 NE PORTION — DYER*

The garage has a total of 647 ft², the efficiency factor was assumed to have a poor *energy efficiency* or 1.11 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the garage is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$e = 1.11 \text{ BTU/hr ft}^2 \text{ °F}$
 $\Delta t_1 = 73 \text{ °F}$
 $A = 647 \text{ ft}^2$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{52,426} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$S = 158 \text{ °F}$
 $T = 70 \text{ °F}$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$HL = 52,426$ BTU/hr

$DD = 6,376$ °F

$24 = 24$ hrs/day

$C_D = 0.62$

$\Delta t_1 = 73$ °F

$k = 0.9$

$C = 2,720,000$ BTU/AF-°F

$\Delta t_2 = 26.4$ °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{1.1} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: SHOP ON LOT #12 NE PORTION (DYER)

The shop has a total of 1280 ft², the efficiency factor was assumed to have a poor *energy efficiency* or 1.11 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the shop is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$$e = 1.11 \text{ BTU/hr ft}^2 \text{ °F}$$

$$\Delta t_1 = 73 \text{ °F}$$

$$A = 1,280 \text{ ft}^2$$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{103,718} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$S = 158 \text{ °F}$$

$$T = 70 \text{ °F}$$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$$HL = 103,718 \text{ BTU/hr}$$

$$DD = 6,376 \text{ °F}$$

$$24 = 24 \text{ hrs/day}$$

$$C_D = 0.62$$

$$\Delta t_1 = 73 \text{ °F}$$

$$k = 0.9$$

$$C = 2,720,000 \text{ BTU/AF-°F}$$

$$\Delta t_2 = 26.4 \text{ °F}$$

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{2.1} \text{ afa}$$

Volume calculation WR 47-7520 Greenhouse

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations:

GREENHOUSE ON LOT 12 NE PORTION (DYER)

Square footage of one greenhouse is 400 sq/ft. The greenhouse is constructed with single polly and in the calculations the Peak Heating Load was taken from a graph related to single polly construction. The temperature of the geothermal source was measured at 158 °F. The temperature in the greenhouse is expected to be 60 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$S = 158 \text{ }^{\circ}\text{F}$$

$$T = 60 \text{ }^{\circ}\text{F}$$

$$\Delta T_s = 0.3(S - T) = \boxed{29.4}^{\circ}\text{F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr (taken from graph)

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$$HL = 47,251 \text{ BTU/hr}$$

$$DD = 6,376 \text{ }^{\circ}\text{F}$$

$$24 = 24 \text{ hrs/day}$$

$$C_D = 0.85$$

$$\Delta t_1 = 73 \text{ }^{\circ}\text{F}$$

$$k = 0.9$$

$$C = 2,720,000 \text{ BTU/AF-}^{\circ}\text{F}$$

$$\Delta t_2 = 29.4 \text{ }^{\circ}\text{F}$$

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{1.2} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: *HOME ON LOT #12 EXC NE PORTION (Zimmerman)*

The home has a total of 3731 ft², the efficiency factor was assumed to have an average *energy efficiency* or 0.67 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the home is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$$\begin{aligned} e &= 0.67 \text{ BTU/hr ft}^2 \text{ °F} \\ \Delta t_1 &= 73 \text{ °F} \\ A &= 3,731 \text{ ft}^2 \end{aligned}$$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{145,987} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$\begin{aligned} S &= 158 \text{ °F} \\ T &= 70 \text{ °F} \end{aligned}$$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$$HL = 145,987 \text{ BTU/hr}$$

$$DD = 6,376 \text{ °F}$$

$$24 = 24 \text{ hrs/day}$$

$$C_D = 0.62$$

$$\Delta t_1 = 73 \text{ °F}$$

$$k = 0.9$$

$$C = 2,720,000 \text{ BTU/AF-°F}$$

$$\Delta t_2 = 26.4 \text{ °F}$$

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{2.9} \text{ afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations:

SHOP ON LOT # 12 EXC NE PORTION
(Zimmerman)

The shop has a total of 800 ft², the efficiency factor was assumed to have a poor *energy efficiency* or 1.11 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the shop is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$$\begin{aligned} e &= 1.11 \text{ BTU/hr ft}^2 \text{ °F} \\ \Delta t_1 &= 73 \text{ °F} \\ A &= 800 \text{ ft}^2 \end{aligned}$$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{64,824} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$\begin{aligned} S &= 158 \text{ °F} \\ T &= 70 \text{ °F} \end{aligned}$$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$HL = 64,824$ BTU/hr

$DD = 6,376$ °F

$24 = 24$ hrs/day

$C_D = 0.62$

$\Delta t_1 = 73$ °F

$k = 0.9$

$C = 2,720,000$ BTU/AF-°F

$\Delta t_2 = 26.4$ °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{1.3} \text{afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: HOME ON LOT #14, PARCEL 2 (HINES)

The home has a total of 1296 ft², the efficiency factor was assumed to have an average *energy efficiency* or 0.67 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the home is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$e = 0.67 \text{ BTU/hr ft}^2 \text{ °F}$

$\Delta t_1 = 73 \text{ °F}$

$A = 1,296 \text{ ft}^2$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{50,710} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$S = 158 \text{ °F}$

$T = 70 \text{ °F}$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$HL = 50,710$ BTU/hr

$DD = 6,376$ °F

$24 = 24$ hrs/day

$C_D = 0.62$

$\Delta t_1 = 73$ °F

$k = 0.9$

$C = 2,720,000$ BTU/AF-°F

$\Delta t_2 = 26.4$ °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{1.0} \text{afa}$$

Volume calculation WR 47-7520

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations: HOME ON LOT #14, PARCEL 1 (DANNENHAVER)

The home has a total of 2639 ft², the efficiency factor was assumed to have an average *energy efficiency* or 0.67 BTU/hr ft² °F. The Design temperature difference for the area is 73 °F. The temperature of the geothermal source was reported to be 158 °F. The temperature in the home is expected to be 70 °F. The annual heating degree days were taken from the Buhl #2 weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$$\begin{aligned} e &= 0.67 \text{ BTU/hr ft}^2 \text{ °F} \\ \Delta t_1 &= 73 \text{ °F} \\ A &= 2,639 \text{ ft}^2 \end{aligned}$$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{103,259} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$\begin{aligned} S &= 158 \text{ °F} \\ T &= 70 \text{ °F} \end{aligned}$$

$$\Delta T_s = 0.3(S - T) = \boxed{26.4} \text{ °F}$$

Volume Calculation:

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

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

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

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

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

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

$HL = 103,259$ BTU/hr

$DD = 6,376$ °F

$24 = 24$ hrs/day

$C_D = 0.62$

$\Delta t_1 = 73$ °F

$k = 0.9$

$C = 2,720,000$ BTU/AF-°F

$\Delta t_2 = 26.4$ °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{2.1} \text{afa}$$

47-7520 FLOW RATE CALCULATIONS FOR BUILDING
HEATING USE (BASED ON APPLICATION PROCESSING MEMO #23)
(AMENDED)

$$Q = \frac{E}{500 (\Delta T_s)} \text{ in gpm}$$

where $\Delta T_s = 0.3 (s - t)$
 s = source temp = 158° (1992 measurement)
 t = inside temp = 70° or 60° (for greenhouses)
 E = BTU's for house (see volume calcs)

LOT #2 EXC N $\frac{1}{2}$ (HILL)

$$\begin{aligned}\text{HOME} &= \frac{147160}{500 \times .3 (158-70)} = 11.1 \text{ gpm} \Rightarrow 0.03 \text{ cfs} \\ \text{GARAGE} &= \frac{58666}{500 \times .3 (158-70)} = 4.44 \text{ gpm} \Rightarrow 0.01 \text{ cfs} \\ \text{SHOP} &= \frac{121545}{500 \times .3 (158-70)} = 9.21 \text{ gpm} \Rightarrow 0.02 \text{ cfs} \\ \text{GREENHOUSE} &= \frac{197745}{500 \times .3 (158-60)} = 13.45 \text{ gpm} \Rightarrow 0.03 \text{ cfs}\end{aligned}$$

LOT #3 SE PORTION (LLOYD)

$$\begin{aligned}\text{HOME} &= \frac{96451}{500 \times .3 (158-70)} = 7.3 \text{ gpm} \Rightarrow 0.02 \text{ cfs} \\ \text{GARAGE} &= \frac{48618}{500 \times .3 (158-70)} = 3.7 \text{ gpm} \Rightarrow 0.01 \text{ cfs}\end{aligned}$$

LOT #11 EXC SE PORTION (MACFEE)

$$\text{SHOP/APT} = \frac{105015}{500 \times .3 (158-70)} = 8.0 \text{ gpm} \Rightarrow 0.02 \text{ cfs}$$

LOT #12 NE PORTION (DYER)

$$\begin{aligned}\text{HOME} &= \frac{107328}{500 \times .3 (158-70)} = 8.13 \text{ gpm} \Rightarrow 0.02 \text{ cfs} \\ \text{GARAGE} &= \frac{52426}{500 \times .3 (158-70)} = 4.0 \text{ gpm} \Rightarrow 0.01 \text{ cfs} \\ \text{SHOP} &= \frac{103718}{500 \times .3 (158-70)} = 8.0 \text{ gpm} \Rightarrow 0.02 \text{ cfs} \\ \text{GREENHOUSE} &= \frac{47251}{500 \times .3 (158-60)} = 3.21 \text{ gpm} \Rightarrow 0.01 \text{ cfs}\end{aligned}$$

LOT #12 NE PORTION (ZIMMERMAN)

$$\begin{aligned}\text{HOME} &= \frac{145987}{500 \times .3 (158-70)} = 11.1 \text{ gpm} \Rightarrow 0.03 \text{ cfs} \\ \text{SHOP} &= \frac{64824}{500 \times .3 (158-70)} = 4.91 \text{ gpm} \Rightarrow 0.01 \text{ cfs}\end{aligned}$$

LOT #14 PARCEL 2 (HINES)

$$\text{HOME} = \frac{50710}{500 \times .3 (158-70)} = 3.84 \text{ gpm} \Rightarrow 0.01 \text{ cfs}$$

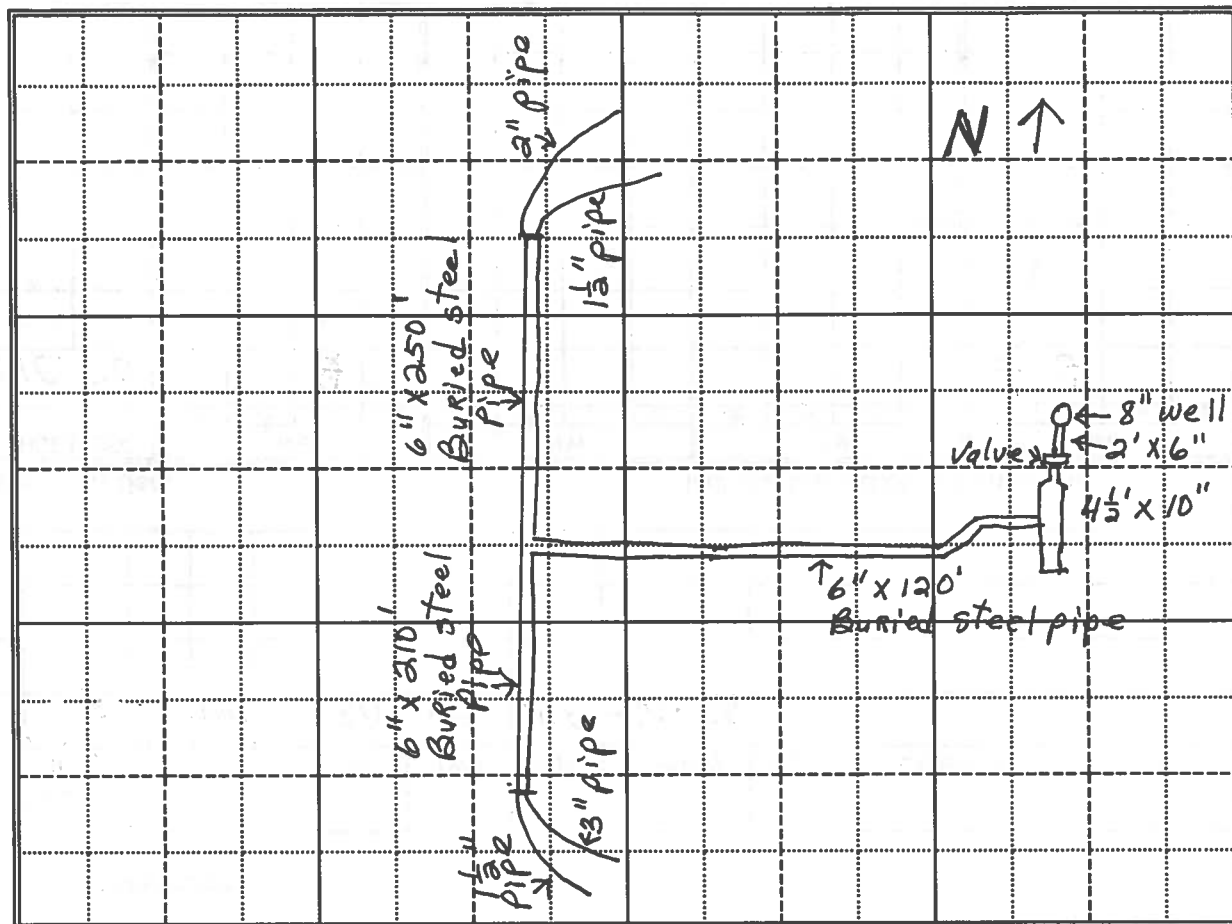
LOT #14 PARCEL 1 (DANNEHAUER)

$$\begin{aligned}\text{HOME} &= \frac{103259}{500 \times .3 (158-70)} = 7.82 \text{ gpm} \Rightarrow 0.02 \text{ cfs} \\ \text{GARAGE} &= \frac{42784}{500 \times .3 (158-70)} = 3.24 \text{ gpm} \Rightarrow 0.01 \text{ cfs}\end{aligned}$$

$$\text{TOTAL} = 0.28 \text{ cfs}$$

[illegible]

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



Scale: 1" = not to scale

☒ 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
NA - Artesian well					

*Code to correspond with No. on map and aerial photo

D. FLOW MEASUREMENTS

1.

Measurement Equipment	Type	Make	Model No.	Serial No.	Size	Calib. Date

2. Measurements: No measurement was possible due to lack of an access port or other device to measure and the inability to have a full discharge from the well.

E. NARRATIVE/REMARKS/COMMENTS

See Attached

Have conditions of permit approval been met? ☐ yes ☒ no

F. FLOW CALCULATIONS☒ Additional Computation Sheets Attached

Measured Method:

G. VOLUME CALCULATIONS*See Attached*

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 Attached***H. RECOMMENDATIONS**

1. Recommended Amounts

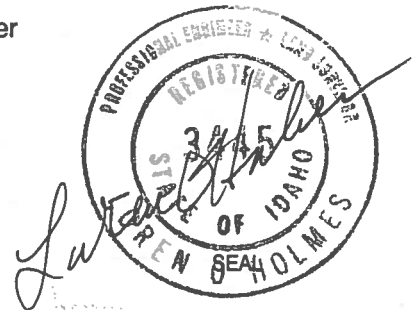
Beneficial Use	Period of Use		Rate of Diversion Q (cfs)	Annual Volume V (afa)
	From	To		
<i>Heating</i>	<i>10-1</i>	<i>5-1</i>	<i>.16 cfs</i>	<i>17.5 afa</i>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Totals:			<i>.16 cfs.</i>	<i>17.5 afa</i>

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. AUTHENTICATIONField Examiner's Name *Mike Schulte* Date *12-8-93*

Reviewer _____ Date _____



47-07520 DEPEW, RAY & GLEN
B/U FIELD REPORT SUPPLEMENT
SUGGESTED CONDITIONS

1. ANY USEAGE UNDER THIS RIGHT SHALL BE ASSOCIATED WITH A DOMESTIC USE.
2. THE RATE OF DIVERSION FOR EACH DOMESTIC USE SHALL BE PROPORTIONATE AND EQUAL AND EACH SHALL NOT EXCEED 7.3 GPM (.016 CFS). THE TOTAL MAXIMUM DIVERSION RATE FROM THE WELL SHALL NOT EXCEED 73 GPM (.16 CFS).
3. THE ANNUAL VOLUME FOR EACH DOMESTIC USE INCLUDING ASSOCIATED DEVELOPMENTS SHALL NOT EXCEED 1.75 ACRE FEET PER ANNUM. THE TOTAL ANNUAL DIVERSION VOLUME FROM THE WELL SHALL NOT EXCEED 17.5 ACRE FEET PER ANNUM.
4. THE PROPORTIONATE SHARES OF THIS RIGHT APPURTENANT TO EACH DOMESTIC HEATING USE SHALL NOT BE COMBINED WITH ANY OTHER PROPORTIONATE SHARE.
5. R07, R08, R56, R57

47-07520 RAY & GLEN DEPEW
NARRATIVE/REMARKS/COMMENTS

The source is an 8" diameter geothermal artesian well. A fitting in the plate on top of the casing contains a valve and pressure guage that were not serviceable at the time of the field exam. Near the top of the casing water discharges to a 6" steel pipe that has a shut off valve about 2' from the well casing. This valve was also not useable. Next to the valve water enters a 4.5' X 10" steel pipe. A 6" steel pipe then diverts water from the 10" pipe and goes underground to the West for about 120' to a "T" junction.

At the "T" water flows in the 6" buried pipe North for about 250' or South for about 210'. At the end of the Northerly pipe a valve allows water to flow into 2" and 1.5" PVC pipes. At the end of the Southerly pipe a valve diverts water to 3" and 1.5" pipes. Several of the these valves and pipe were leaking or not useable at the time of the exam.

No flow measurement port or measuring device has been installed any place in the delivery system to determine the rate of diversion. The owners indicated they have sold shares in this well but the actual useage cannot be determined. There is no practical way to provide a measureable discharge from the well.

Amendments to the permit were approved 3-10-1987 and 1-29-1991. The last amendment provides for heating of homes, greenhouses and swimming pools for 10 homes on 5 subdivision lots. Development of the permit is considered complete when the lots are stubbed in with the water delivery system. Four of the home sites are on the same lot (Lot 14) as the well so stubbing is considered complete for four homes on this lot. The 1.5" to 3" pipes connected to the North and South ends of the 6" buried pipe described above, while marginal, is accepted as meeting the definition of "stubbed in." Therefore, a total of 10 home units as provided in the 1-29-1991 amendment is considered as the completed development of the system.

Since there is no actual measureable useage from the system, the diversion rate and volume recommendations are based on figures calculated for heating a 2500 sq. feet home with a 500 sq. ft garage using a heating system with a "better" efficiency rating and normal insulation. (The formulas and calculations used are on a separate sheet) No additional diversion is considered necessary for greenhouse or swimming pool use. The water temperature was measured at 158 degrees fahrenheit. The temperature drop across the system is estimated to be 26.4 degrees. Consequently, the discharge water, at 131.6 degrees after a house and garage are heated would be adequate to heat domestic greenhouses and too hot to directly use in a domestic swimming pool or hot tub without cooling.

The permit owners indicated they have sold shares in this permit and well. They may have contracted for a total diversion rate in excess of the recommendations in this report due to their misconception that they are entitled to the full 100" specified in the permit.

Therefore, the recommendations in this report will most likely be contested. Ray DePew also claims the department approved their contracts to sell water from the well. He may insist that we are obligated to license a sufficient flow rate to cover all of their contractual flow rates.

47-07520 DEPEW, RAY & GLEN
DIVERSION RATE AND VOLUME CALCULATIONS

THE FOLLOWING CALCULATIONS ASSUME HEATING FOR A 2,500 SQ. FT. HOME WITH A 500 SQ. FT. GARAGE HAVING NORMAL INSULATION (R25 CEILINGS, R13 WALLS, DOUBLE GLAZED WINDOWS WITH DOORS AND WINDOWS WEATHER STRIPPED). THIS WOULD GIVE THE IMPROVEMENTS AN EFFICIENCY RATING OF "BETTER".

* "A" DIVERSION RATE CALCULATIONS

Temperature drop across system:

$$\begin{aligned}\Delta T_s &= (0.3)(158^\circ - 70^\circ) \\ &= .3 \times 88^\circ = 26.4^\circ \text{ F}\end{aligned}$$

Design heat load:

$$\begin{aligned}E &= [e \times \Delta T] A \\ &= [.44 \times 70 \times 3] 3,000 \text{ sq. ft.} \\ &= .44 \times 73 \times 3,000 \text{ sq. ft.} \\ &= 96,360 \text{ BTU/hr}\end{aligned}$$

Flow rate required per home unit:

$$\begin{aligned}W &= \frac{Q}{(500)(\Delta T_s)} \\ &= \frac{96,360 \text{ BTU/hr}}{500 \times 26.4} \\ &= \frac{96,360}{13,200} = 7.3 \text{ gpm per home unit}\end{aligned}$$

Flow rate recommended for 47-07520

$$7.3 \text{ gpm per home unit} \times 10 \text{ homes} = 73 \text{ gpm} = .16 \text{ cfs}$$

* SEE MEMORANDUM LABELED ATTACHMENT "A" FOR DEFINITIONS, VALUES AND TABLES USED IN FORMULAS.

** "B" VOLUME CALCULATIONS

Peak Heating Load in BTU/hr (HL):

$$32 \times 3,000 \text{ sq. ft.} = 96,000 \text{ BTU/hr}$$

Volume used per home unit:

$$V = \frac{HL \times DD \times 24 \times C_d}{\Delta t_1 \times k \times C_{\Delta t_2}}$$

$$V = \frac{96,000 \times 5,970 \times 24 \times .6}{(73) \times (.90) \times (8.33)(26.4)}$$

$$= 571,207.3 \text{ gallons} = 1.75 \text{ afa per home unit}$$

$$1.75 \text{ afa per home unit} \times 10 \text{ homes} = 17.5 \text{ afa total}$$

Season of use:

$$10-1 \text{ to } 5-1 = 212 \text{ days}$$

$$V_{dr} = .16 \text{ cfs} \times 1.9835 \times 212 = 67.3 \text{ afa}$$

$$\text{RECOMMENDED VOLUME} = 17.5 \text{ afa}$$

**** SEE MEMORANDUM LABELED ATTACHMENT "B" FOR DEFININTIONS, VALUES, TABLES AND GRAPHS USED IN FORMULAS**

PHOTO ID. BB20

T. 9 S.

47-07520

(Future)
Salmon River Ranches No 2

Surveyor's Certificate

I, David S. Whitford, a Registered Land Surveyor in the State of Idaho do hereby certify that the foregoing and the accompanying plat is a true and correct copy of the original and that the accompanying plat correctly shows said Salmon River Ranches in the State of Idaho.

Notes

1. All side lot lines to have a 7.6 ft. wide utility easement if shown by another lot. All side lot lines to have a 7.6 ft. wide utility easement if shown by the Subdivision to have 18 ft. wide utility easement.
2. Excluded parcel (North of Lot 5) is existing Norway Spruce forest in Block 220, Page 303. The easement description is in error and will be revised.

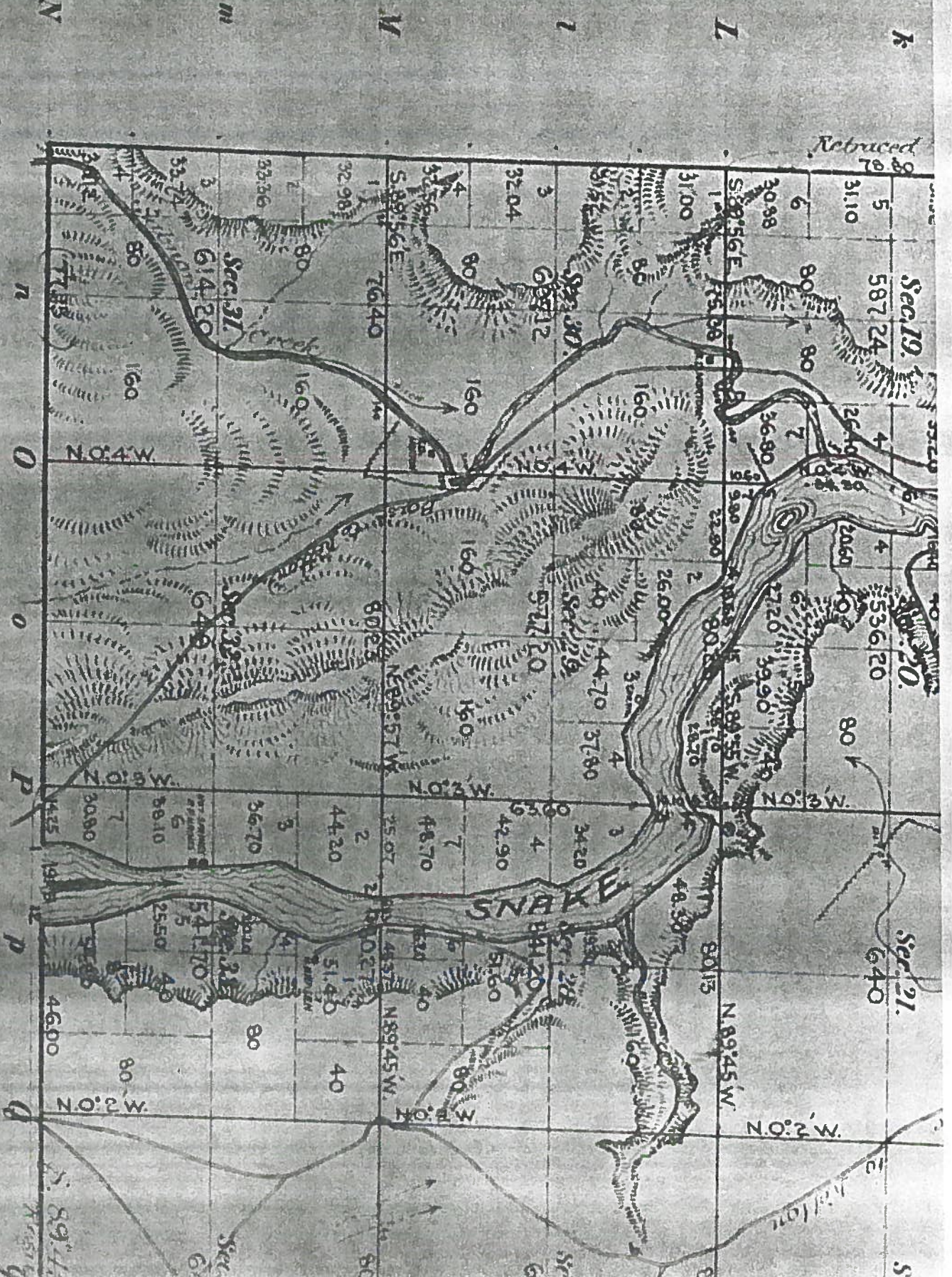
Legend

Chain Length	Feet	Acres	Per Acre
100.00	100.00	2.2957	2.2957
200.00	200.00	4.5914	4.5914
300.00	300.00	6.8871	6.8871
400.00	400.00	9.1828	9.1828
500.00	500.00	11.4785	11.4785
600.00	600.00	13.7742	13.7742
700.00	700.00	16.0699	16.0699
800.00	800.00	18.3656	18.3656
900.00	900.00	20.6613	20.6613
1000.00	1000.00	22.9570	22.9570



Area of water surface 679.66 Acres of Public Land 224977402 Total number of Acres 2282943

Survey Designated	By Whom Surveyed	Date of Contract	Amount of Survey Ac. M.	When Surveyed	Year Declaration
Township lines	C. O. Fort Stevenson & David O. Stevenson	May 6, 1893	11 76 54	August 23-24, 1893	
Subdivisions			59 60 74	Aug 26 - Sept 3, 1893	18°10' E.



DEPARTMENT OF WATER RESOURCES WELL DRILLER'S REPORT

BALLPOINT PEN

State law requires that this report be filed with the Director, Department of Water Resources
within 30 days after the completion or abandonment of the well.

1. WELL OWNER

Name RAY DEERE + Son DepecuAddress WENDELL, IDAHO

Owner's Permit No. _____

7. WATER LEVEL

Static water level _____ feet below land surface.
Flowing? ☒ Yes ☐ No G.P.M. flow 1000 APPROX
Artesian closed-in pressure 96 p.s.i.
Controlled by: ☒ Valve ☐ Cap ☐ Plug
Temperature 16.1 °F. Quality _____

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning) _____

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped

3. PROPOSED USE

☐ Domestic ☐ Irrigation ☐ Test ☐ Municipal
☐ Industrial ☐ Stock ☐ Waste Disposal or Injection
☒ Other HEATING HOMES (specify type)

9. LITHOLOGIC LOG

Hole Diam.	Depth		Material	Water	
	From	To		Yes	No
8"	0	35	CLAY		X
	35	38	GRAVEL + WATER	X	
	38	70	MED HARD GREY LAVA @ CLAY + STRIPS OF RED DECOMPOSED FORMATION		X
	70	110	DECOMPOSED RED FORMATION	X	
	110	135	GREY LAVA @ CLAY		X
	135	140	RED CLAY		X
	140	150	GREY CLAY		X
	150	170	SOLED GREY LAVA		X
	170	175	GREY LAVA + CLAY		X
	175	220	SOLED LAVA		X
	220	335	CLAY - 27.5' MED WATER	X	
	335	420	BLACK ROCK + CLAY MIX	X	
	420	450	HARD BLACK LAVA		X

4. METHOD DRILLED

☒ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness	Diameter	From	To
250 inches	8"	1 feet	90 feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet

Was casing drive shoe used? ☐ Yes ☐ NoWas a packer or seal used? ☐ Yes ☐ NoPerforated? ☐ Yes ☐ NoHow perforated? ☐ Factory ☐ Knife ☐ Torch

Size of perforation _____ inches by _____ inches

Number _____ From _____ To _____

_____ perforations _____ feet _____ feet

_____ perforations _____ feet _____ feet

_____ perforations _____ feet _____ feet

Well screen installed? ☐ Yes ☐ No

Manufacturer's name _____

Type _____ Model No. _____

Diameter _____ Slot size _____ Set from _____ feet to _____ feet

Diameter _____ Slot size _____ Set from _____ feet to _____ feet

Gravel packed? ☐ Yes ☐ No ☐ Size of gravel _____

Placed from _____ feet to _____ feet

Surface seal depth 90 Material used in seal: ☒ Cement grout☐ Puddling clay ☐ Well cuttingsSealing procedure used: ☐ Slurry pit ☐ Temp. surface casing☒ Overbore to seal depthMethod of joining casing: ☐ Threaded ☐ Welded ☐ Solvent

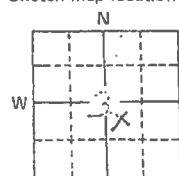
Weld _____

☐ Cemented between strata

Describe access port _____

6. LOCATION OF WELL

Sketch map location must agree with written location.

Subdivision Name SalmonRiver RanchesLot No. 14 Block No. _____County Twin FallsNW 1/4 S.E. 1/4 (Sec. 30) T. 8 N. S.R. 14 E.W.

10.

Work started 4-19-79 finished 4-24-79

DRILLERS CERTIFICATION

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

Firm Name EISING DRILLING Firm No. 31Address P.O. Box 919 T.E. Date 7/24/79Signed by (Firm Official) Amel Elongand
(Operator) Pat Gillespie

RECEIVED

JUN 16 1987

Department of Water Resources
Southern Region Office

RECEIVED

JUN 19 1987

Department of Water Resources

MICROFILMED
OCT 08 1981

47-7520



47-7520

12-2-92

P/D



P/D

47-7520



P1D



Valves and 2" x 1 1/2"
pipes at the end of 6"
buried mainline going
North.

47-7520



Valve and 3"
pipe at South
end of 6" buried
mainline.



Valve and 1 1/2"
pipe at South
end of 6" buried
mainline.