

MEMORANDUM

TO: Water Right File 63-31218
FROM: Patrick Kelly; Sr. Water Resource Agent
DATE: July 25, 2016
SUBJECT: Review of Water Right File for Licensing

Proof of beneficial use was submitted on January 17, 2003 for irrigation, domestic, heating and storage uses for 0.14 cfs and 20.0 af. A field exam was completed by Angie Grimm on July 2, 2013.

My review of all documents supplied with the field exam is as follows:

Ownership: A change of ownership was received 4/19/2016 for 63-31218 and 63-31836 filed by the current owners, Chris and Beverly Henretty of 53 Settlers Rd, Boise ID 83716. A conveyance document associated with the 63-31218 POU shows ownership by the Henretty's. 63-31836 is an irrigation right providing mitigation for the consumptive uses associated with the 63-31218 permit. Conditions of 63-31836 required the right to be placed in the WSB on an indefinite lease, and that during the licensing period of 63-31218, mitigation use would be added to the right.

Sale of property has occurred since beneficial use was submitted. At this time, the department has no way of contacting the original owner Mr. James Mahoney. The Henretty's do not own the property where the irrigation right 63-31836 is placed, and they do not have an agreement to secure the right in their name. Until the proper ownership documents can be provided, the mitigation right will remain in Mr. Mahoney's name.

Point of Diversion: GPS points were taken at both well locations during the field exam. An amendment is required to add The NESE legal description to the license. There is no information to suggest a POD overlap.

Place of Use: The 2.0 acre of irrigation authorized by the permit was found. 0.4 acres of irrigated land was measured in the NESE of Sec 32. An amendment is required to add this legal description to the license. Overlap review finds no other water rights exist on the land.

Diversion Rate and Volume: A measurement was not completed during the field visit. A diversion rate from both wells may be obtained from the data collected and reported to the department during the beneficial use period (2002). A maximum diversion rate of 19,734 gpd or 0.03 cfs was measured at the domestic well and 27,125 gpd or 0.04 cfs was measured at the irrigation well. Because these are daily averages, it can be assumed that the irrigation well would reflect a higher instantaneous diversion rate as it may have produced this volume in only an 8 hr period. For this reason, the department standard 0.03 cfs/ac can be recommended.

Volume Calculations for Irrigation:

$$V_{I.R.} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) = 2.0 \times 3.5 = 7.0$$

$$V_{D.R.} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation season}) \times 1.9835 = 0.06 \times 231 \times 1.9835 = 27.5 \text{ af}$$

$$V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} = 7.0 \text{ af}$$

Volume Calculations for Other Uses:

- Storage= surface area * avg depth = 2 ac * 10 ft = 20 af
- Per admin memo 22, domestic volume of 0.6 af per home when irrigation is identified separately. 1.2 af for 2 homes.
- Heating/Cooling admin memo 23 recommends 12.5 af based on information provided by home owner.

Discussion: Conditions of the permit required: *measuring devices to be installed and maintained to allow measurement of the rate and volume of diversion from each of the wells and to allow the volume of water re-injected after use for heating purposes to be measured.* Reports of diversion were submitted to IDWR during the beneficial use period in 2003. Since that time there have been no reported issues regarding local public interest. Because of this, the requirement of measuring devices will not be carried forward to license.

Conditions of the permit limited the total diversion rate to 0.14 cfs, 28.0 af with a total consumptive use of 10.0 af. The diversion rate of both wells sum to 0.09 cfs. Uses on the property total 40.3 af with 4.4 af consumptive use. However, it seems reasonable that the uses described and recommended for license are still within the intent of the permit. Water used for heating purposes is injected back into the 8" well. After review of the backfile, it is my interpretation that the heating volume was not considered with such a condition limiting total use to only 28.0 af. The condition will be modified to reflect the actual use without creating an enlargement of the permit.

A pond spreadsheet was made for the storage pond. Soil data suggests a CH, GP-GC classification. These range from 0.2 to 0.0003 ft/day. A memo from Lori Graves on 8/22/2001 documents a visit conducted on the property. It was discovered during this visit that shallow ground water exists on the property and is drained from the home. An attempt was made to seal the pond completely, however not all of the water could be drained. Bentonite was installed to partially seal the pond. If the pond does not remain full and water levels fluctuate as suggested throughout the file, it is likely that the portions sealed have lost its effect without proper maintenance over the years. As a result, it is reasonable to assume a small amount of seepage is occurring. See the attached spreadsheet for more information.

Recommended Amounts:

<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>DIVERSION RATE</u>	<u>ANNUAL VOLUME</u>
Irrigation	03/15 – 10/31	0.06 cfs	7.0 af
Domestic	01/01 – 12/31	0.03 cfs	1.2 af
Heating	01/01 – 12/31	0.03 cfs	12.5 af
Diversion to Storage	01/01 – 12/31	0.06 cfs	
Recreation Storage	01/01 – 12/31		19.6 af
Fire Protection Storage	01/01 – 12/31		19.6 af
Aesthetic Storage	01/01 – 12/31		19.6 af
Wildlife Storage	01/01 – 12/31		19.6 af
	<u>Totals</u>	0.09 cfs	40.3 af

Recommended Amendments: An amendment is required to correct the POD legal description.

Changes to the permit will include adding a Diversion to Storage component for 0.06 cfs.

☒ Change P.D. ☐ Add P.D. ☐ None

☒ Change P.U. ☐ Add P.U. ☒ Nature of Use

Seepage Loss Calculations

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total annual seepage losses from a pond.

FILE NUMBER	63-31218
REVIEWER	Patrick Kelly
DATE	4/22/2016

User Input
Calculated value
Formula Explanations

INPUTS

Pond Surface Area (AC.)	1.7	AC.
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Pond Surface Area (SQ. FT.)	74052	SQ. FT.
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My Soil Classification is	CH, GP-GC	
Suggested Seepage Rate (FT./DAY)	0.0003	FT./DAY

Formula: (Surface Area X Seepage Rate) X 7.48 = Gallons Per Day Loss
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Convert to GPD	166	GPD
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Total Seepage Loss (AFA)	0.2	AFA
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Though sand and gravel seepage rates may actually be higher, the maximum allowable rate is 0.2 ft/day, pursuant to Administrative Memo "Seepage Loss Standards for Ponds and Reservoirs."

Suggested Seepage Rates for Different Soil Types:

GW, GP, GM, GC, SW, SP and SM (silty sand, sand silt mixtures and gravel mixtures) = 0.2 ft per day

OL and ML (inorganic silts - very fine sands, silty, or clayey fine sands) = 0.02 ft per day

SC (clayey sands, sand clay mixtures) = 0.007 ft per day

CL (Low to medium plasticity clays) = 0.003 ft per day

MH, OH, PT and CH (high plasticity clays) = 0.0003 ft per day

LINED PONDS (liners can be chemical, fabric, or bentonite) = 0 ft per day

Ponds Intercepting Groundwater (excavated ponds filled by ground water) = 0 ft per day

PLEASE NOTE: The initial basis for the Suggested Seepage Rates in the table above is found on Page 16 of Seepage from Fish Ponds, Bulletin 599, August 1989 Alabama Agricultural Experiment Station, Auburn University, Auburn University Alabama. If you don't know the soil type, please refer to the map provided at <X:\Spatial\Soils\USCS\PondSoils.lyr>. Use "0" if the pond fill relies on the water table.

Evaporation Loss Calculations

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the annual evaporation losses from a pond.

FILE NUMBER	63-31218
REVIEWER	Patrick Kelly
DATE	4/22/2016

User Input
Calculated value
Formula Explanations

The acronyms used on the Kimberly Research Center website are defined below:
P = Precipitation
ET= Evapotranspiration
P _d = Precipitation deficit
P _d =ET-P

USING THIS SPREADSHEET

Use the link below to access the Kimberly Research Center website. This website provides the Precipitation Deficit for a station most representative of the pond under examination. The Precipitation Deficit is the total amount of free water surface evaporation minus the precipitation for a given area, which gives the total amount of evaporative losses incurred by the pond. There are several weather sites that are used throughout the state. IDWR staff can find the nearest site using Arc Map. The shape file containing the sites can be found at <X:/Spatial/Climate/ETIdahostations.shp>.

Instructions:

1. Use the link below to navigate to ET Idaho 2012.
2. Select the station which is most representative to your pond location.
3. Click Submit Query.
4. Under "Land Covers with Evapotranspiration Estimates," select "Open Water - Shallow Systems (ponds, streams)" or "Open Water - small stock ponds" depending on the pond size.
5. Click the link to "Precipitation Deficit."
6. Reference and copy (ctrl + C) the first subheading "Mean" values.
7. Click the "Paste Values from ET Idaho" button. The table will automatically enter a zero (0) for any negative precipitation deficit values.

Found at: <http://data.kimberly.uidaho.edu/ETIdaho/>

Precipitation Deficit

Station: Idaho City (NWS - 104442)

Month	mm/day ¹	Days per month	mm/Month
Jan	-2.09	31	0.00
Feb	-1.34	28	0.00
March	-0.60	31	0.00
April	0.58	30	17.40
May	1.55	31	48.05
June	2.80	30	84.00
July	3.93	31	121.83
August	3.42	31	106.02
September	1.71	30	51.30
October	0.21	31	6.51
November	-2.12	30	0.00
December	-2.49	31	0.00

Total mm/year = 435.11

PLEASE NOTE: The seasonal average for precipitation deficit should not be used for calculations because precipitation often exceeds evaporation during wetter months of the year. If the pond is kept full, excess precipitation during wetter months does not serve to refill the pond during drier months.

For example, see Sandpoint KSPT (NWS - 108137), the annual precipitation deficit is -106 mm. However, April through September have positive precipitation deficit values. To properly estimate the annual volume of water necessary to refill a pond due to evaporation losses, the table will automatically enter a zero (0) for each month that the precipitation value is reported as a negative value.

As described above, precipitation offsets evaporation in winter months, so the net effect is that wintertime precipitation deficit is usually zero.

$$((\text{mm/yr}) \div (\text{convert to feet})) \times (\text{Surface area of pond, in acres}) = \text{Evaporation Loss in Acre Feet}$$

(435.11 ÷ 304.8) X 1.70 = 2.4 AFA

Total Storage Calculations

FILE NUMBER	63-31218
REVIEWER	Patrick Kelly
DATE	4/22/2016

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total seepage, evaporation and fill capacity required for a pond.

User Input
Calculated value
Formula Explanations

Surface Area (AC.)	1.7	"Surface Area" is automatically carried over from the "Seepage Loss" sheet.
Average Pond Depth (FT.)	10	"Average Pond Depth" depicts the actual depth of the pond either measured or estimated. Note: If you know the maximum depth and not the average depth, the Field Examiner's Handbook suggests multiplying the maximum depth by 0.4 to get the average depth, or you can use any method that seems reasonable to attain average depth.
Pond Capacity (AF)	17	Pond Capacity is calculated by multiplying the Pond Surface Area by the Average Pond Depth. If you know the capacity, divide the capacity by surface area and enter the average pond depth in the space above. Note: If pond capacity is determined using a method shown on the "Pond Capacity" sheet, the user may need to modify the value of "Pond Capacity" (cell B9) manually. Note that if the value is modified manually, the formula will be altered for future use.
Multiple Fill Volume Above Initial Fill to Fulfill From Storage Needs- "Multiple Fills" (AF)	0	The "Multiple Fill Volume Above Initial Fill" is the acre-feet of water required to meet a <i>from storage</i> component if the <i>from storage</i> component exceeds a one time fill. This section should not include the amount of water needed to fill the pond initially or the amount of water needed to maintain the pond level due to evaporation or seepage. For example: if a pond has a capacity of 5 acre feet and 2.5 acre feet of seepage and evaporation, but the pond is used for irrigation that requires 10 acre feet of from storage for the irrigation use, then you would insert 5 acre feet into this location (10 acre feet needed - 5 acre feet from the initial fill = 5 acre feet of additional storage needed). Note: You must have a "From Storage" component exceeding the initial fill on the permit to include a volume in this space.
Estimated Seepage Loss (AF)	0.2	The "Estimated Seepage Loss" is automatically carried over from the "Seepage Loss" sheet.
Estimated Evaporation Loss (AF)	2.4	The "Estimated Evaporation Loss" is automatically carried over from the "Evaporation Loss" sheet.
Total Volume Required (AF)	19.6	The "Total Volume Required" is calculated by adding the Pond Capacity, Multiple Fills, Seepage Loss, and Evaporation Loss amounts to determine the total amount of storage required.

Flow Rate into Pond (CFS)	0.10	The "Flow Rate into Pond" depicts the actual flow, either measured or estimated, into the pond. For offstream facilities, this will be equivalent to "diversion to storage" rate.
Highest Daily Evaporation Rate From Evaporation Tab. (mm/Day)	3.93	This number is carried over from the "Evaporation Loss" sheet. It is the highest recorded number in the "Precipitation Deficit Table".
Required Daily Maintenance Volume (AF/Day)	0.02	"Required Daily Maintenance Volume" is the maximum volume of water needed on any given day during the year to maintain pond volume. It is calculated by adding the highest daily evaporation loss to the average daily seepage loss in acre feet. The average daily seepage loss is calculated by dividing the "Estimated Seepage Loss" by 365 days. This is acceptable, since the seepage rate shouldn't vary throughout the season unless the pond completely freezes over during the winter months. The highest daily evaporation loss is calculated by dividing the Highest Daily Evaporation Rate by the 304.8 conversion factor and multiplying this number by the pond surface area to attain a combined daily acre feet requirement.
Minimum Maintenance Flow (CFS)	0.01	The "Minimum Maintenance Flow" is the minimum amount of flow required to maintain the level of the pond. This number is determined by dividing the "Maximum Required Daily Maintenance Volume" by 1.9835. This flow can be used to determine if the flow rate into the pond is adequate to maintain the pond level.
Days Required to Fill the Pond	97	The "Days Required to Fill the Pond" is calculated by dividing the "Pond Capacity" by the "Flow Rate" minus "Minimum Maintenance Flow" multiplied by 1.9835. This section will assist you in determining if the flow rate being diverted to the pond is adequate to fill the pond while maintaining the pond level. The length of time to fill the pond will help determine if the flow rate is adequate for the size of pond being proposed. If this number is <i>approximately 6 months (180 days) or more</i> , the reviewer should have a discussion with the applicant to make sure he/she understands that it will take a significant length of time to fill the pond.
Days Required to Fill the Pond at 13,000 Gallons per Day	973	Some water users may want to fill a pond under the 13,000 gallons per day domestic exemption. The "Days Required to Fill the Pond at 13,000 Gallons per Day" is calculated by converting the "Pond Capacity" and the "Required Daily Maintenance Volume" to gallons. The "Pond Capacity" is then divided by 13,000 gallons minus the "Required Daily Maintenance Volume" in gallons to determine the number of days to fill pond. If this number is <i>approximately 6 months (180 days) or more</i> , the reviewer should have a discussion with the applicant to make sure he/she understands that it will take a significant length of time to fill the pond. Negative values indicate that the supply of 13,000 gallons per day is not enough volume to overcome the required daily maintenance volume; the pond will never fill.

RESIDENTIAL SPACE HEATING/COOLING REQUIREMENTS FOR COLD OR GEOTHERMAL SOURCES

Worksheet created by Cindy Hodges, 11/93.

Data entered by: Patrick Kelly
Exam Date: 04/21/16
File No: 63-31218
Computations for: Heating of 1 home

REQUIRED DATA:

Area of livable floor space, ft² (A) 5200
2 story? (N=1, Y=2) 2
House efficiency factor (e) * 0.67
Inside design temperature (Ti) 65
Average outside temperature (To) ** 52.5
Source temperature, degrees F (S) -45
Heating/cooling days per season (D) 365
Hours/day system operates (H) 16

* e values are as follows:

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

** Suggested average outside temperatures:

WINTER
41.3 deg F Boise
deg F Grand View
deg F Cascade

SUMMER
63.7 deg F Boise
deg F Grand View
deg F Cascade

CALCULATED DATA:

DESIGN HEAT LOAD (BTU/hr required)

Formula: $E = [e \times (T_i - T_o)] A$

Applies factor of 0.8 for two-story dwelling

E = 34,840 BTU/hour

TEMPERATURE DROP ACROSS SYSTEM

Formula: $T_s = 0.3 \times [S - T_i]$

Ts = 6 degrees F

FLOW RATE REQUIRED (at given source temperature)

Formula: $Q = E / (500 \times T_s) \times 148.8$

Q = 0.03 cfs

DIVERTED VOLUME OVER SEASON

Formula: $V_{div} = Q \times D \times H / 24 \times 19835$

Vdiv = 12.5 AFA

AVERAGE TEMPERATURE CALCULATION:

4 DEG MIN + 80 DEG HIGH / 2 =

42 DEG AVERAGE YEAR ROUND TEMP.

REQUIRED DATA:

Units

Area of livable floor space	5200	Square Feet
Number of stories	2	
House efficiency factor *	0.67	
Inside design temperature	65	Degrees Fahrenheit
Source temperature	45	Degrees Fahrenheit
Heating/cooling days per season	365	Days
Hours/day system operates	16	Hours
* e values are as follows:		
0.28	Best energy efficiency - extra insulation, caulked and weatherstripped, with storm windows and doors	
0.44	Better energy efficiency - standard insulation, caulked and weatherstripped, with storm windows and/or doors	
0.67	Average residence - standard insulation, no weatherproofing but with storm windows or double panes	
1.11	Poor energy efficiency - minimal insulation, no weatherproofing or storm windows (older homes, shops or greenhouses)	