

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
IN-OFFICE REVIEW/BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 55-7397

Exam Date: 10/17/2014

1. Does this qualify for an in-office field exam (IDAPA 035.02.r)? ☒ Yes ☐ No
- Irrigation of 5 acres or less
 - Storage of up to 14.6 AF for stockwater purposes only
 - Any use other than irrigation or storage, if the combined diversion rate is 0.24 cfs or less
 - Other < >
2. Current Owner: Name: Kenneth Mac Kenzie
Owner of Record Correct? ☒ Yes ☐ No
Address of Record Correct? ☒ Yes ☐ No
If No: Address
3. Beneficial Use Fees have been paid: ☐ Yes ☐ No Receipt No: No proof fee required per review in 1991.
4. SOURCE TRIBUTARY
Sinks
Method of Determination: Applicant submitted an aerial photo map that outlined POD & POU.
Change in Source: ☐ Yes ☒ No

B. OVERLAP REVIEW

1. Other water rights with the same place of use: Overlap? ☐ Yes ☒ No

Water Right No.	Source	Purpose of Use	Basis

Comments: No POU overlap. 55-2107 is an irrigation water right owned by Mr. Mac Kenzie within the SWNW QQ.

2. Other water rights with the same point of diversion: Overlap? ☐ Yes ☒ No

Water Right No.	Source	Purpose of Use	Basis

Comments: No POD overlap.

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

Source	Govt. Lot	¼	¼	¼	Sec.	Twp.	Rge.		County
Springs		NE	NW	SW	3	08S	04W		Owyhee
Springs		SE	SE	NW	9	08S	04W		Owyhee

Method of Determination: POD description above reflects a more accurate location. Mapping technologies have improved since 1991 that allows this determination to be made. No amendment will be required for these cases.

Change in POD? ☐ Yes ☒ No

Amendment Required? ☐ Yes ☒ No

2. **PLACE OF USE:** Use: Domestic, Stockwater, Stockwater Storage, Stockwater from Storage & Diversion to Storage

TWP	RGE	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
08S	04W	3									D								
08S	04W	3										S							
08S	04W	9								S									

Method of Determination: Map of property submitted by land owner identifies POU. Improved mapping capabilities shows the actual domestic POU in the NE SW QQ. No amendment will be required for these cases.

Change in POU? ☐ Yes ☒ No Amendment Required? ☐ Yes ☒ No

☐ Delivery System Diagram Attached (required). Indicate all major components and distances between components. Indicate weir size/pipe as applicable.

☒ 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
Unk.	Unk	Unk	Unk	Unk	Unk

*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: In-office field exam so flow measurements not taken.

E. FLOW CALCULATIONS

☒ Additional Computation Sheets Attached

Measured Method:

- In stream pond storage flow is dependent on the available flow of water.
- Administrative Memo #3 recommends a diversion rate of 0.05 cfs for 100-200 stock. Application identifies stockwater use for 165 range cattle.
- Domestic use for the cabin is recommended for minimal use at 0.01 cfs

Measurement = ---

Permit allowed = 0.09 cfs

License recommend for 0.06 cfs.

F. VOLUME CALCULATIONS

1. Volume Calculations for Irrigation:

$$V_{I.R.} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) = \underline{\hspace{2cm}}$$

$$V_{D.R.} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation season}) \times 1.9835 = \underline{\hspace{2cm}}$$

$$V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} = \underline{\hspace{2cm}}$$

2. Volume Calculations for Other Uses:

See pond calculation sheet attached for storage volume measurements.

Stockwater = $165 \text{ h} * 12 \text{ g/hd} * 365 \text{ d/yr} * 3.0689\text{E-6 af/g} = 2.2 \text{ af/yr}$

Domestic = Administrator Memo #22 suggests a volume of 0.6 af when irrigation is not included.

G. PURPOSE OF USE

Irrigation ☐ Yes ☒ No # Stock 165 Domestic # of Homes 1

Other: Stockwater Storage

Change in Purpose of Use? ☐ Yes ☒ No

Method of Determination: Information in the water right file is consistent with aerial photography of the property.

If Yes: From Use _____ To Use _____ Amount _____ CFS _____ AFA _____

H. NARRATIVE/REMARKS/COMMENTS

Permit 55-7397 authorized the diversion of 0.09 cfs from unnamed springs. An attempt to visit the site was made on June 17, 2014. Additional information was requested from the State and the field exam was completed on October 17, 2014 by WRA Patrick Kelly.

Initial contact was made with Mr. Mac Kenzie on the phone. He told me that he had sold the land to the government and it was possible that the new owners were using the stock water. I put together a Notice of Intent to Void Permit letter on June 3, 2014 and sent a copy to all three parties. Shortly after I received a call from Mr. Mac Kenzie and he informed me that he does in fact still own parts of the property and wished to move forward with licensing his land. On June 18, 2014, I received a call from a Michelle Anderson on behalf of Idaho Dept of Lands. She stated that the State does use the water and is interested in moving forward with the licensing process. Many phone calls were made in an effort to reach out to the Dept of Lands for information on the State's use of water. I was promised information would be provided in a timely fashion with no results. This has caused significant delay in licensing this right. A letter was finally sent to Dean Johnson on October 1, 2014 granting 14 days to provide further information regarding permit 55-7397. No comment was made to the IDWR office, so I am moving on with licensing Mr. Mac Kenzie's property.

A meeting was scheduled with Mr. Mac Kenzie for June 17, 2014 and we attempted to conduct an on-site field exam. After hours of searching for the property, it was determined best that I complete the field exam in-office. Access to the site is best suited for ATV's which the Department has not made available.

Legal description of POU & POD were used to locate the property in the name of Kenneth Mac Kenzie. There were four different sections identified in the permit for diversions and use. Two of the four were found to be in the name of BLM and State of Idaho. Changes in mapping technology has improved since 1989 so the QQ of POD & POU were updated to reflect accurate data. No amendments are required in the cases of improved technologies.

Aerial photography revealed ponds exist on Mr. Mac Kenzie's property. I have included the pond spreadsheet analysis for both sections. Aerial photography was used to measure the surface area in acres. Pond in section 9 has a surface area of 0.06 acres and pond in section 3 measures 0.14 acres for a total of 0.2 acres Average depth of 2.0 ft was used based on 40% of max depth. Application claims a max dam height of 5 ft. Storage ponds are spring water which will vary during different seasons. Evaporation loss was calculated from a UofI research site nearby. Seepage calculations were estimated using soil type maps of the region. Section 9 pond has a smaller surface area and a lower seepage rate based on its sandy clay soil. The total storage for this pond is 0.5 afa. The section 3 pond near the cabin is slightly larger in surface area and has a higher seepage rate. The combined storage capacity of the two ponds only measures 0.4 af. However, the theoretical analysis of the ponds with seepage losses estimates a total volume of 11.2 afa. Mr. Mac Kenzie will have to apply for the additional storage of 8.9 af if these measurements are accurate.

The application for permit states that a domestic line will run from one of the springs to one home. This line was never built and Mr. Mackenzie stated during the field exam that they use a 5 gallon bucket and carry the water from the pond to the home. He does not irrigate any of the land with the domestic use. Because of this, a minimal rate of 0.01 cfs and 0.6 af will be recommended for domestic use on license.

Overlap review identifies Mr. Mac Kenzie owns an irrigation and domestic water right under 55-2107. This does not overlap the domestic use for section 3 under this permit 55-7397. There is no overlap of use.

Stockwater use stated on the application for permit is for 165 range cattle. Administrator Memo #3 recommends a diversion rate of 0.05 cfs. This follows what was permitted. I used the 12 gallons of water per day for the volume calculation. The permit authorized a total diversion 2.3 af for storage purposes. Evidence gathered shows that is being used. Mr. Mac Kenzie will have to apply for another water right to cover what I calculate to be additional appropriations of storage use.

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

I. RECOMMENDATIONS**1. Recommended Amounts**

<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>DIVERSION RATE</u>	<u>ANNUAL VOLUME</u>
Stockwater	01/01-12/31	0.05 cfs	2.2 af
Stockwater Storage	01/01-12/31		2.3 af
Domestic	01/01-12/31	0.01 cfs	0.6 af
	<u>Totals</u>	0.06 cfs	2.3 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

Other: < >

J. AUTHENTICATION

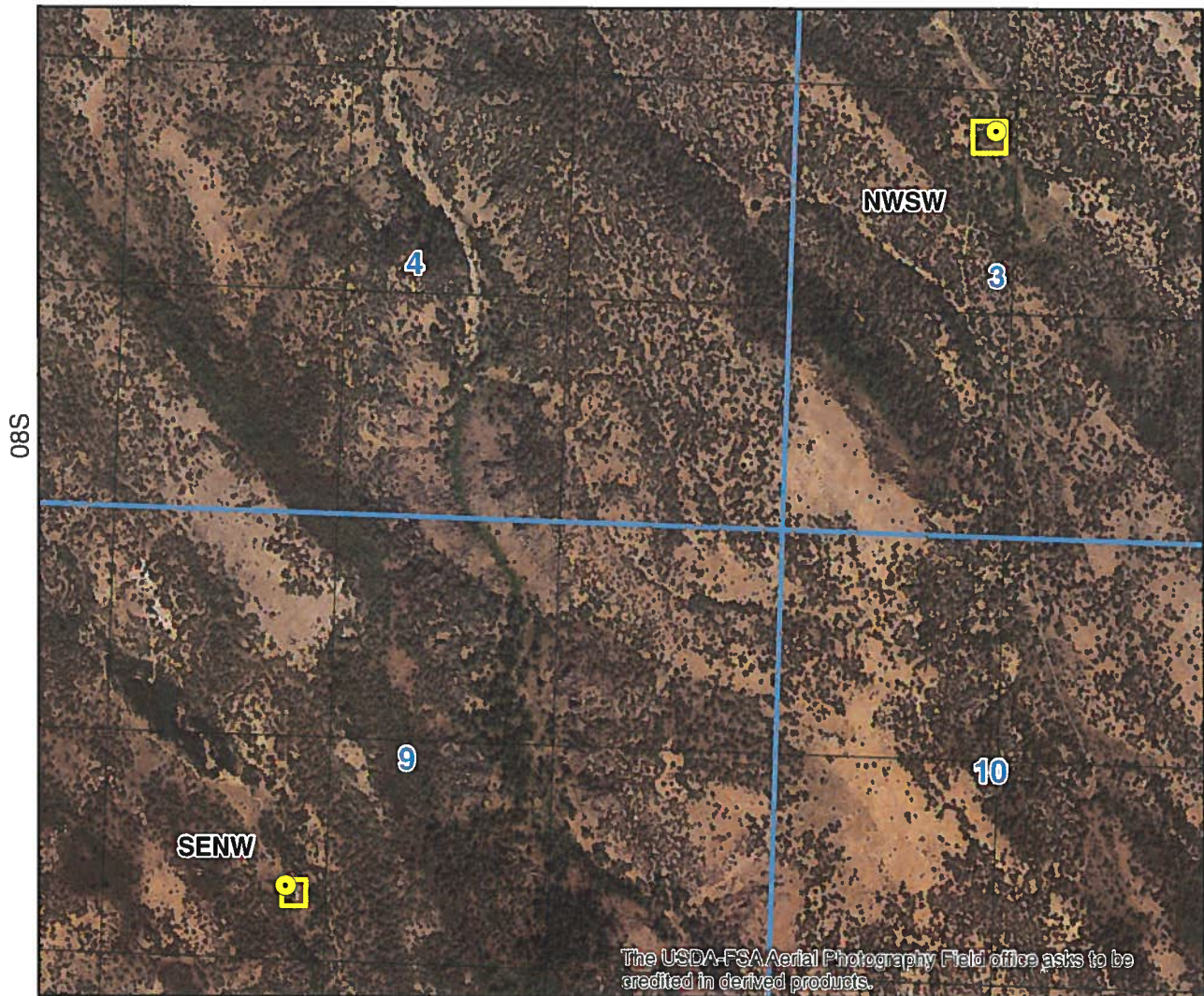
Field Examiner's Name Parvith Velupillai Date 11/6/2014

Reviewer Camela S. Skaggs Date 11/6/2014

State of Idaho
Department of Water Resources
Field Exam Map
55-7397

This map depicts the STOCKWATER, ~~STOCKWATER FROM STORAGE~~, STOCKWATER STORAGE, ~~DIVERSION TO STORAGE~~ place of use boundary for this water right at the time of this approval and is attached to the approval document solely for illustrative purposes.

04W



-  Point of Diversion
-  Place Of Use Boundary
-  Townships
-  PLS Sections
-  Quarter Quarters

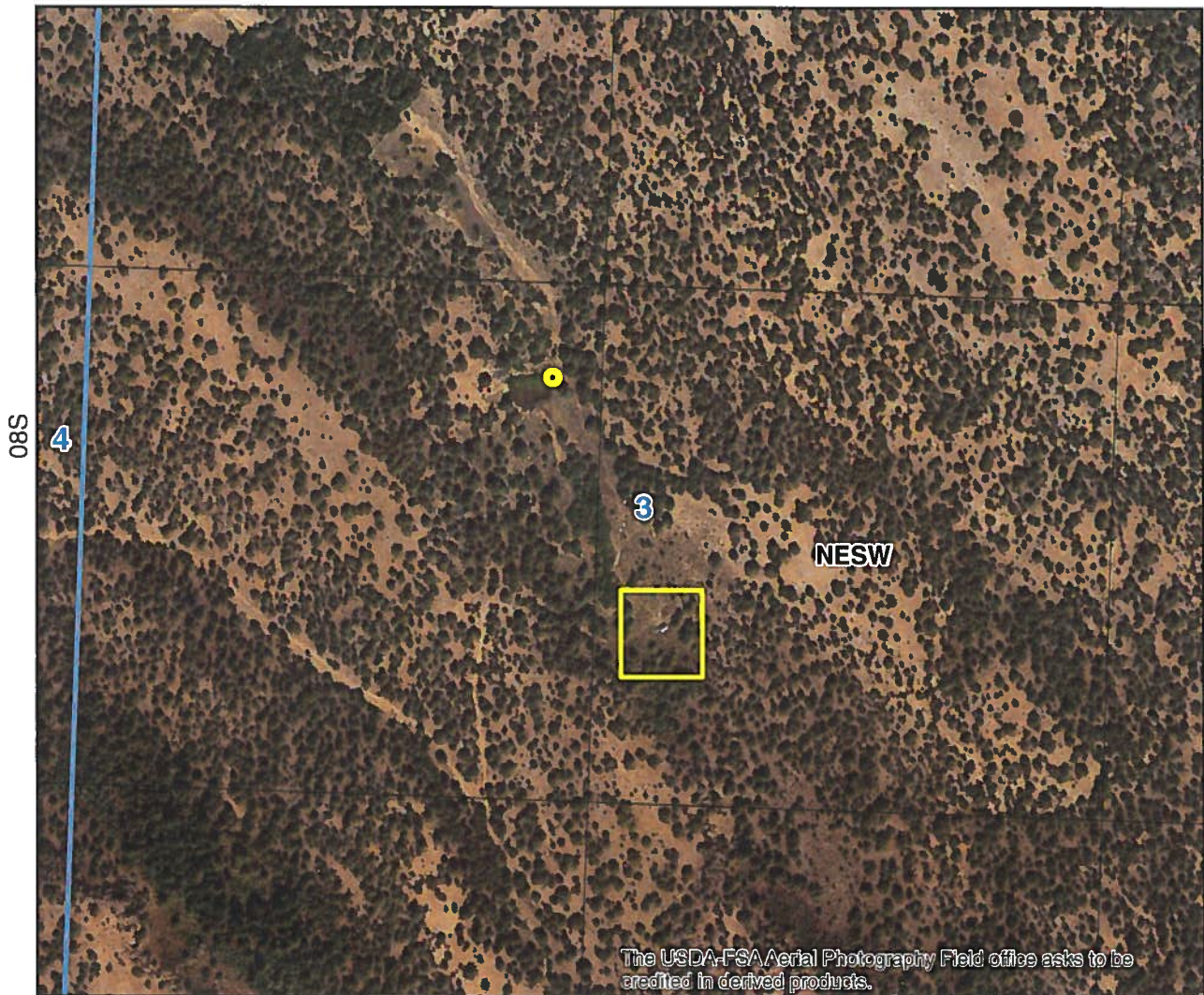
0 0.125 0.25 0.5 Miles



State of Idaho
Department of Water Resources
Field Exam Map
55-7397

This map depicts the DOMESTIC place of use boundary for this water right at the time of this approval and is attached to the approval document solely for illustrative purposes.

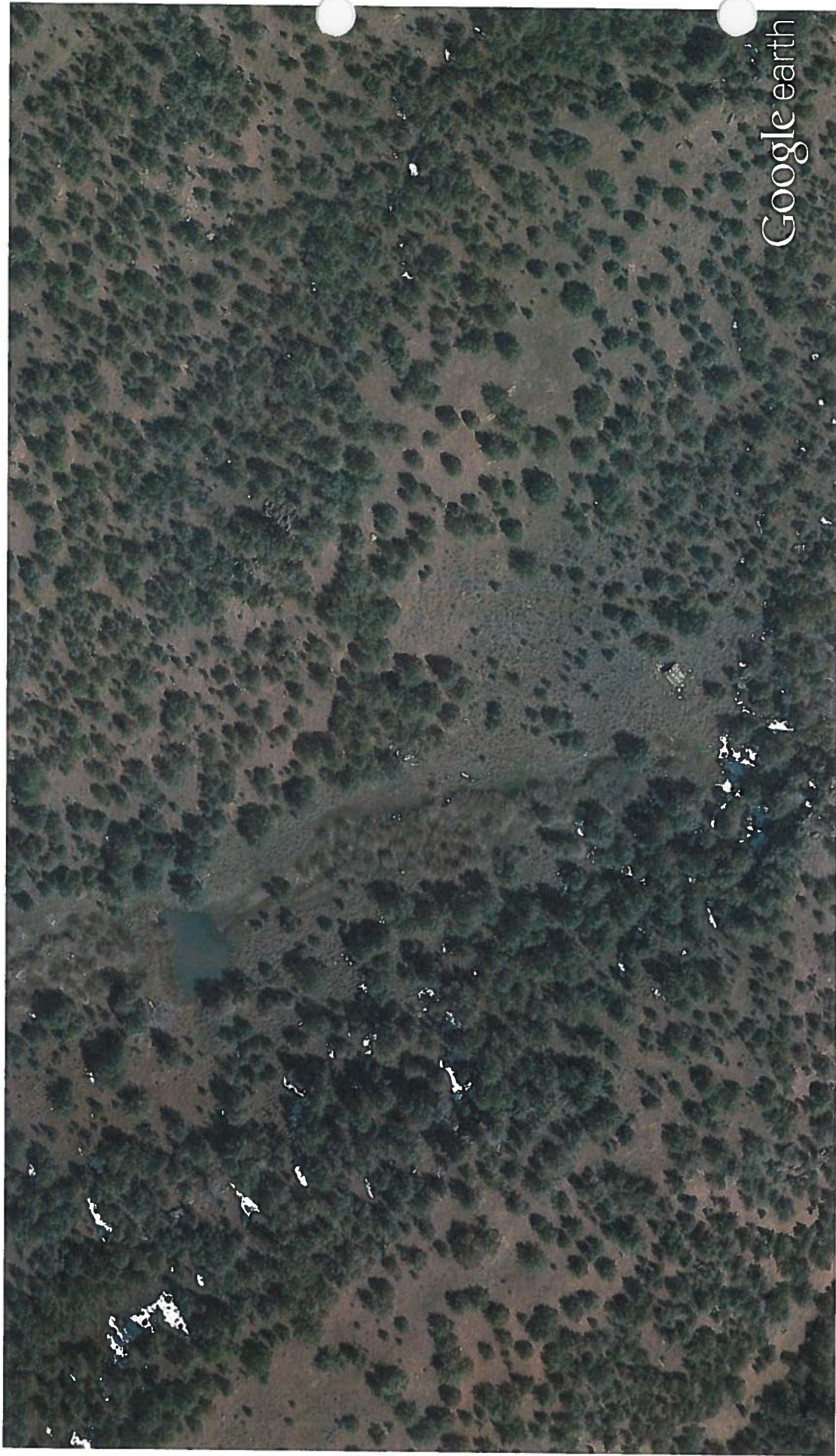
04W



-  Point of Diversion
-  Place Of Use Boundary
-  Townships
-  PLS Sections
-  Quarter Quarters

0 0.05 0.1 0.2 Miles





Google earth

Google earth

feet
meters

1000
300



IMAGE DATE: APRIL 11, 2014

gs 4W sec 3



Google earth

Google earth

feet
meters



8S 4W Sec 9

SEEPAGE CALCULATIONS [section 9]

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

FILE NUMBER	55-7397
REVIEWER	Patrick Kelly
DATE	9/30/2014

User Input
Calculated value
Formula Explanations

INPUTS

SQ. FT. Calculator Pond Surface area in acres
0.064

POND SURFACE AREA (SQ. FT.)	2788
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SUGGESTED SEEPAGE RATE (FT/DAY)	0.0070
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Use the table below to find the "SUGGESTED SEEPAGE RATES".

FORMULA: (Surface Area X Seepage Rate) / 7.48 = Gallons Per Day loss

CONVERT TO GPD	146	GPD
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TOTAL SEEPAGE LOSS (AFA)	0.2	AFA
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SUGGESTED SEEPAGE RATES FOR DIFFERENT SOIL TYPES:
GW, GP, GM, GC, SW, SP and SM (silty sand, sand silt mixtures and gravel mixtures) = 0.20 ft per day
OL and ML (inorganic silts - very fine sands, silty, or clayey fine sands) = 0.016 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 with shallow 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 ponds intersect the water table.

Evaporation Loss Calculation

FILE NUMBER	55-7397
REVIEWER	Patrick Kelly
DATE	9/30/2014

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

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

User Input
Calculated value
Formula Explanations

USING THIS SPREADSHEET

To ascertain the evaporation from a pond, you will need to go to the Kimberly Research Center website. The link is found below. This web site provides the Precipitation Deficit for the area where the pond is located. The Precipitation Deficit is the total amount of free pan 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, and the entire state is pretty much covered. 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>.

Found at: <http://www.kimberly.uidaho.edu/ETIdaho/online.php>

Precipitation Deficit

Station: Nampa (NMPI - 108)

Month	mm/day ¹	Days per month	mm/Month
Jan	0.00	31	0.00
Feb	0.48	28	13.44
March	1.41	31	43.71
April	2.57	30	77.10
May	3.32	31	102.92
June	4.46	30	133.80
July	5.41	31	167.71
August	4.71	31	146.01
September	3.60	30	108.00
October	2.10	31	65.10
November	0.34	30	10.20
December	0.00	31	0.00

PLEASE NOTE: We cannot use the season average, because there are several areas in Northern Idaho with a negative Precipitation Deficit. Therefore, we must enter each monthly deficit, and enter in a zero (0) for each negative month. The reason for this is that precipitation can only offset evaporation to the extent of the evaporation.

Please enter the daily average Precipitation Deficit as shown in the example below.

Although it has sometimes been useful to consider wintertime evaporation to be zero, Allen and Robison (2007, p. 169) noted, "Evaporation during nongrowing (wintertime) periods varies widely"

¹Negative monthly mean values should be entered in the above table as "0".

Total mm/year = 867.99

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

(867.99 ÷ 304.8) X 0.06 = 0.2 AFA

Surface Area of Pond is automatically Carried over from the Seepage Loss Sheet.

TOTAL STORAGE

FILE NUMBER	55-7397
REVIEWER	Patrick Kelly
DATE	9/30/2014

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

Surface Area (in Acres)	0.064	"Surface Area" is automatically carried over from the "Seepage Loss Sheet"
Average Pond Depth (in feet)	2	"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 you know the capacity, divide the capacity by surface area and enter the average pond depth in the space above.
Pond Capacity (in acre feet)	0.128	

Volume Needed Above Initial Fill to Fulfill From Storage Needs- "Multiple Fills" (in acre feet)	0	The "Volume Needed Above Initial Fill" is the acre-feet of water required to meet <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). PLEASE 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 (in acre feet)	0.2	The "Estimated Seepage Loss" is automatically carried over from the Seepage Loss Sheet
Estimated Evaporation Loss (in acre feet)	0.2	The "Estimated Evaporation Loss" is automatically carried over from the Evaporation Loss Sheet
Total Volume Required (in acre feet)	0.5	"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 (in cfs)	0.05	The "Flow Rate" Into the Pond depicts the actual flow either measured or estimated into the pond.
Highest Daily Evaporation Rate From Evaporation Tab. (in mm/day)	5.41	This number is automatically selected by picking the highest recorded number in the "Precipitation Deficit Table".
Maximum Required Daily Maintenance Volume (in acre feet per day)	0.00	"Maximum Required Daily Maintenance Volume" is the maximum volume of water needed on any given day during the year, and 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 (in cfs)	0.00	The "Minimum Maintenance Flow" is the minimum amount of flow required to maintain the level of the pond. This number is determine 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	1	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. This number should be between 1 and 365 days for a project to be successful.
Days Required to Fill the Pond at 13,000 gallons per day	3	The "Days Required to Fill the Pond at 13,000 gallons per day" is calculated converting the "Pond Capacity" and the "Maximum Daily Maintenance Volume" to gallons. The "Pond Capacity" is then divided by 13,000 gallons minus the "Maximum Daily Maintenance Volume" in gallons to determine the number of days to fill pond. This number should be between 1 and 365 if this pond is to described as a domestic use.

User Input
Calculated value
Formula Explanations

SEEPAGE CALCULATIONS [CABIN POND SEC. 3]

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

FILE NUMBER	55-7397
REVIEWER	Patrick Kelly
DATE	9/30/2014

User Input
Calculated value
Formula Explanations

INPUTS

SQ. FT. Calculator Pond Surface area in acres
0.1373

POND SURFACE AREA (SQ. FT.)	5981
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SUGGESTED SEEPAGE RATE (FT/DAY)	0.2000
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Use the table below to find the "SUGGESTED SEEPAGE RATES".

FORMULA: (Surface Area X Seepage Rate) / 7.48 = Gallons Per Day loss

CONVERT TO GPD	8947	GPD
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TOTAL SEEPAGE LOSS (AFA)	10.0	AFA
--------------------------	------	-----

SUGGESTED SEEPAGE RATES FOR DIFFERENT SOIL TYPES:
GW, GP, GM, GC, SW, SP and SM (silty sand, sand silt mixtures and gravel mixtures) = 0.20 ft per day
OL and ML (inorganic silts - very fine sands, silty, or clayey fine sands) = 0.016 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 with shallow 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 ponds intersect the water table.

Evaporation Loss Calculation

FILE NUMBER	55-7397
REVIEWER	Patrick Kelly
DATE	9/30/2014

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

The acronyms used on the Kimberly Research Center website are defined below:

P = Precipitation
ET= Evapotranspiration
P _d = Precipitation deficit
P _d =ET-P

User Input
Calculated value
Formula Explanations

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Precipitation Deficit

Station: Nampa (NMPI - 108)

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May	3.32	31	102.92
June	4.46	30	133.80
July	5.41	31	167.71
August	4.71	31	146.01
September	3.60	30	108.00
October	2.10	31	65.10
November	0.34	30	10.20
December	0.00	31	0.00

PLEASE NOTE: We cannot use the season average, because there are several areas in Northern Idaho with a negative Precipitation Deficit. Therefore, we must enter each monthly deficit, and enter in a zero (0) for each negative month. The reason for this is that precipitation can only offset evaporation to the extent of the evaporation.

Please enter the daily average Precipitation Deficit as shown in the example below.

Although it has sometimes been useful to consider wintertime evaporation to be zero, Allen and Robison (2007, p. 169) noted, "Evaporation during nongrowing (wintertime) periods varies widely"

¹Negative monthly mean values should be entered in the above table as "0".

Total mm/year = 867.99

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

$$(867.99 \div 304.8) \times 0.14 = 0.4 \text{ AFA}$$

Surface Area of Pond is automatically Carried over from the Seepage Loss Sheet.

TOTAL STORAGE - NEAR CABIN

FILE NUMBER	55-7397
REVIEWER	Patrick Kelly
DATE	9/30/2014

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

Surface Area (in Acres)	0.1373	"Surface Area" is automatically carried over from the "Seepage Loss Sheet"
Average Pond Depth (in feet)	2	"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 you know the capacity, divide the capacity by surface area and enter the average pond depth in the space above.
Pond Capacity (in acre feet)	0.2746	

Volume Needed Above Initial Fill to Fulfill From Storage Needs- "Multiple Fills" (in acre feet)	0	The "Volume Needed Above Initial Fill" is the acre-feet of water required to meet <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). PLEASE 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 (in acre feet)	10.0	The "Estimated Seepage Loss" is automatically carried over from the Seepage Loss Sheet
Estimated Evaporation Loss (in acre feet)	0.4	The "Estimated Evaporation Loss" is automatically carried over from the Evaporation Loss Sheet
Total Volume Required (in acre feet)	10.7	"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 (in cfs)	0.05	The "Flow Rate" Into the Pond depicts the actual flow either measured or estimated into the pond.
Highest Daily Evaporation Rate From Evaporation Tab. (in mm/day)	5.41	This number is automatically selected by picking the highest recorded number in the "Precipitation Deficit Table".
Maximum Required Daily Maintenance Volume (in acre feet per day)	0.03	"Maximum Required Daily Maintenance Volume" is the maximum volume of water needed on any given day during the year, and 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 (in cfs)	0.02	The "Minimum Maintenance Flow" is the minimum amount of flow required to maintain the level of the pond. This number is determine 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	4	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. This number should be between 1 and 365 days for a project to be successful.
Days Required to Fill the Pond at 13,000 gallons per day	27	The "Days Required to Fill the Pond at 13,000 gallons per day" is calculated converting the "Pond Capacity" and the "Maximum Daily Maintenance Volume" to gallons. The "Pond Capacity" is then divided by 13,000 gallons minus the "Maximum Daily Maintenance Volume" in gallons to determine the number of days to fill pond. This number should be between 1 and 365 if this pond is to be described as a domestic use.

User Input
Calculated value
Formula Explanations