

[illegible]

Method of Determination: Dam and pond area visible on imagery. Information provided by permit holder.

Change in POU? ☐ Y ☒ X ☐ N Amendment Required? ☐ Y ☒ X ☐ N

☐ 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 |
|------------------------------------------|------------|----|------------------|-----------|-----------------------------------|
|                                          |            |    |                  |           |                                   |

\*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:  $\leq$  \_\_\_\_\_  $>$

#### E. FLOW CALCULATIONS

☐ Additional Computation Sheets Attached

Measured Method:

Instream Diversion, no flow measurement required.

Permit allowed =  $\leq$ .

License  $\leq$ .

#### 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:

Based on memorandum and associated pond spreadsheet written by Dan Nelson on Nov. 25, 2013 in association with licensing review of 55-13850, the storage requirement for this pond is 10.3 AF. 1.0 AF is covered by 55-13850. This leaves 9.3 AF needed.

- Permit allows 9.3 afa
- License recommend for 9.3 afa

**G. PURPOSE OF USE**Irrigation ☐ N # Stock 319 cattle        Domestic # of Homes       

Other: Wildlife

Change in Purpose of Use? ☐ Y ☒ X ☐ N

Method of Determination: Information provided by permit holder.

If Yes: From Use        To Use        Amount        CFS        AFA       **H. NARRATIVE/REMARKS/COMMENTS****Deer Creek Pond #9885****No Water District****No Fish and Game, Auto-shutoff, Lockable Device, or Measuring Device condition****This is the same pond also covered by 55-13850. This permit is for additional storage developed above 55-13850.**Have conditions of permit approval been met? ☒ X 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 Storage    | 01/01 to 12/31       | 0.0 CFS               | 9.3 AFA              |
| Wildlife Storage      | 01/01 to 12/31       | 0.0 CFS               | 9.3 AFA              |
| <u>Totals:</u>        |                      | 0.0 CFS               | 9.3 AFA              |

**2. Recommended Amendments**☐ Change P.D. as reflected above ☐ Add P.D. as reflected above ☒ X None☐ Change P.U. as reflected above ☐ Add P.U. as reflected above ☒ X None

Other:

**J. AUTHENTICATION**Field Examiner's Name Danielle Turner Date 01-07-15Reviewer Daniel D. Miller Date 1-8-15



## MEMORANDUM

TO: Danielle Favreau

FROM: Daniel Nelson – Staff Hydrologist

DATE: November 25, 2013, 2013

SUBJECT: Licensing Review of Water Right 55-13850

I was asked to run the Department's Pond Spreadsheet on this pond. The Bureau of Land Management (BLM) representative informed us that the pond has an average depth of 8 feet and our GIS information shows the pond at 1 acres of surface area. With this information the pond capacity is 8 acre feet, and the evaporation for this pond is 2.3 acre feet for a total of 10.3 acre feet of total storage requirement. This is an onstream pond, so no seepage amounts were calculated into the equations.

A new permit will need to be filed by the Bureau of Land Management for the remainder of the storage for this pond, or they will not be able to storage more than the 1 acre feet of water allowed by the permit. The pond surface area is 1 acres, so they are allowed to fill the pond to a maximum depth of 1 foot (1 acre feet / 1 acres = 1 foot).

## TOTAL STORAGE

|             |            |
|-------------|------------|
| FILE NUMBER | 55-13850   |
| REVIEWER    | Dan Nelson |
| DATE        | 11/25/2013 |

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<br>(In Acres)      | 1 | "Surface Area" is automatically carried over from the "Seepage Loss Sheet"                                                                                                                                                                                                                  |
| Average Pond Depth<br>(In feet) | 8 | "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 |
| Pond Capacity<br>(In acre feet) | 8 | you know the capacity, divide the capacity by surface area and enter the average pond depth in the space above.                                                                                                                                                                             |

|                                                                                                                |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Volume Needed<br>Above Initial Fill to<br>Fulfill From Storage<br>Needs- "Multiple<br>Fills"<br>(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).<br><b>PLEASE NOTE:</b> You must have a " <u>From Storage</u> " component exceeding the initial fill on the permit to include a volume in this space. |
| Estimated Seepage<br>Loss (In acre feet)                                                                       | 0.00 | The "Estimated Seepage Loss" is automatically carried over from the Seepage Loss Sheet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Estimated<br>Evaporation Loss<br>(In acre feet)                                                                | 2.34 | The "Estimated Evaporation Loss" is automatically carried over from the Evaporation Loss Sheet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Total Volume<br>Required<br>(In acre feet)                                                                     | 10.3 | "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<br>(In cfs)                                              | 1.00 | The "Flow Rate" into the Pond depicts the actual flow either measured or estimated into the pond.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Highest Daily<br>Evaporation Rate<br>From Evaporation<br>Tab.<br>(In mm/day) | 4.59 | This number is automatically selected by picking the highest recorded number in the "Precipitation Deficit Table".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Maximum Required<br>Daily Maintenance<br>Volume (In<br>acre feet per day)    | 0.02 | "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<br>Maintenance Flow<br>(In 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<br>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<br>the Pond at 13,000<br>gallons per day               | 322  | 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 |

# Evaporation Loss Calculation

|             |            |
|-------------|------------|
| FILE NUMBER | 55-13850   |
| REVIEWER    | Dan Nelson |
| DATE        | 11/25/2013 |

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 <sub>d</sub> = Precipitation deficit                                       |
| P <sub>d</sub> =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 Kimberley 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: Twin Falls 2 NNE (NWS -- 109294)

| Month     | mm/day <sup>1</sup> | Days per month | mm/Month |
|-----------|---------------------|----------------|----------|
| Jan       | 0.00                | 31             | 0.00     |
| Feb       | 0.30                | 28             | 8.40     |
| March     | 1.09                | 31             | 33.79    |
| April     | 2.07                | 30             | 62.10    |
| May       | 2.69                | 31             | 83.39    |
| June      | 3.71                | 30             | 111.30   |
| July      | 4.59                | 31             | 142.29   |
| August    | 4.00                | 31             | 124.00   |
| September | 3.04                | 30             | 91.20    |
| October   | 1.71                | 31             | 53.01    |
| November  | 0.16                | 30             | 4.80     |
| 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 . . ."

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

Total mm/year = 714.28

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

( 714.28 ÷ 304.8 ) X 1.00 = 2.3 AFA

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

## SEEPAGE CALCULATIONS

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

|             |            |
|-------------|------------|
| FILE NUMBER | 55-13850   |
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|                      |
|----------------------|
| User Input           |
| Calculated value     |
| Formula Explanations |

### INPUTS

|                            |
|----------------------------|
| SQ. FT. Calculator         |
| Pond Surface area in acres |
| 1                          |

|                             |       |
|-----------------------------|-------|
| POND SURFACE AREA (SQ. FT.) | 43560 |
|-----------------------------|-------|

|                                 |        |
|---------------------------------|--------|
| SUGGESTED SEEPAGE RATE (FT/DAY) | 0.0000 |
|---------------------------------|--------|

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 | 0 | GPD |
|----------------|---|-----|

|                          |     |     |
|--------------------------|-----|-----|
| TOTAL SEEPAGE LOSS (AFA) | 0.0 | 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.

# ET Idaho 2012 -- Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho

Please send suggestions for improving this site to robison at kimberly dot uidaho dot edu Copyright 2012, University of Idaho.

## Reynolds (NWS -- 107648)

Statistics based on thirty year normal spans 1975 to 2010 years

For a different land cover or crop click on the above link.

You can highlight this table and copy via the clipboard to a Microsoft Excel or OpenOffice spreadsheet to plot or otherwise work with this data.

| Open water - shallow systems (ponds, streams)                  |        |      |      |      |      |      |      |      |      |      |      |      |                             |                                 |
|----------------------------------------------------------------|--------|------|------|------|------|------|------|------|------|------|------|------|-----------------------------|---------------------------------|
| Precipitation Deficit <a href="#">(Click here for a graph)</a> |        |      |      |      |      |      |      |      |      |      |      |      |                             |                                 |
|                                                                | Jan    | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Growing Season <sup>a</sup> | Non Growing Season <sup>b</sup> |
| Mean <sup>j</sup>                                              | mm/day |      |      |      |      |      |      |      |      |      |      |      | mm                          |                                 |
| Monthly <sup>c</sup>                                           | 0.22   | 0.30 | 1.09 | 2.07 | 2.69 | 3.71 | 4.59 | 4.00 | 3.04 | 1.71 | 0.16 | 0.32 | 697                         | 0                               |
| 15-Day Moving Average <sup>d</sup>                             | 0.24   | 0.19 | 1.16 | 2.12 | 2.71 | 3.69 | 4.66 | 3.98 | 2.94 | 1.78 | 0.15 | 0.22 |                             |                                 |
| 7-Day Moving Average <sup>e</sup>                              | 0.24   | 0.25 | 1.13 | 2.07 | 2.69 | 3.67 | 4.64 | 4.01 | 2.99 | 1.73 | 0.13 | 0.26 |                             |                                 |
| 3-Day Moving Average <sup>f</sup>                              | 0.23   | 0.29 | 1.09 | 2.06 | 2.68 | 3.69 | 4.60 | 4.01 | 3.03 | 1.71 | 0.15 | 0.31 |                             |                                 |
| Standard Deviation <sup>k</sup>                                | mm/day |      |      |      |      |      |      |      |      |      |      |      | mm                          |                                 |
| Monthly <sup>c</sup>                                           | 0.71   | 0.53 | 0.99 | 0.80 | 1.81 | 1.01 | 0.68 | 0.69 | 0.61 | 1.06 | 0.68 | 1.29 | 106                         | 0                               |
| 15-Day Moving Average <sup>d</sup>                             | 0.77   | 0.70 | 0.96 | 0.99 | 1.61 | 1.36 | 0.65 | 0.71 | 0.86 | 0.91 | 0.82 | 0.93 |                             |                                 |
| 7-Day Moving Average <sup>e</sup>                              | 1.05   | 1.03 | 1.22 | 1.41 | 2.12 | 1.76 | 0.88 | 0.94 | 1.13 | 1.29 | 1.12 | 1.25 |                             |                                 |
| 3-Day Moving Average <sup>f</sup>                              | 1.39   | 1.41 | 1.72 | 2.03 | 2.68 | 2.26 | 1.30 | 1.31 | 1.54 | 1.74 | 1.51 | 1.77 |                             |                                 |
| 20% Exceedance <sup>l</sup>                                    | mm/day |      |      |      |      |      |      |      |      |      |      |      | mm                          |                                 |
| Monthly <sup>c</sup>                                           | 0.20   | 0.77 | 1.58 | 2.70 | 3.64 | 4.60 | 5.05 | 4.41 | 3.57 | 2.18 | 0.87 | 0.21 | 814                         | 0                               |
| 15-Day Moving Average <sup>d</sup>                             | 0.67   | 1.06 | 2.34 | 3.50 | 4.54 | 5.22 | 5.38 | 4.78 | 3.92 | 2.88 | 1.38 | 0.59 |                             |                                 |
| 7-Day Moving Average <sup>e</sup>                              | 0.88   | 1.65 | 2.82 | 4.40 | 5.13 | 5.69 | 5.73 | 5.10 | 4.36 | 3.25 | 1.81 | 0.80 |                             |                                 |
| 3-Day Moving Average <sup>f</sup>                              | 1.14   | 1.84 | 3.45 | 5.03 | 5.85 | 6.38 | 6.14 | 5.45 | 4.82 | 3.77 | 2.17 | 1.02 |                             |                                 |