

MEMORANDUM

TO: Water Right File – 63-33400
FROM: Patrick Kelly – Water Resource Agent
DATE: October 16, 2015
SUBJECT: Field exam review

This water right permit was approved on September 29, 2010 for aesthetic storage and irrigation uses from ground water sources. The field exam was completed by Mr. David Shaw of ERO Resources Corp on September 22, 2015. The field exam was submitted with the Proof of Beneficial Use form to Western Region October 1, 2015. The original proofs requested and received October 13, 2015.

I have reviewed the field exam that was submitted and find the document complete and accurate. The field exam found a total pond capacity which exceeded the limits of the permit and an irrigation use with lesser acres. After reviewing the field exam, I recommend a storage volume of 42 af, an irrigation diversion rate of 0.83 cfs and an irrigation volume of 185.4 af.

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

Application for Permit 63-31515 was submitted with transfer 70024 regarding decreed WR 63-32614 in 2002. Permit 63-33400 was issued in 2010 which includes the irrigation component and additional storage to account for evaporation losses. The transfer has since been withdrawn and 63-32614 has been assigned to mitigation regarding the consumptive uses of both permits.

Ownership: Both permits 63-31515 and 63-33400 are in the name of Rivers End Neighborhood Assn Inc. Ada County taxlot data shows Rivers End as current owners of sub common areas. IDSOS records finds Rivers End Neighborhood Assn Inc in good standing under filing number C14184.

Source, POU, POD: The source is groundwater as these are excavated ponds below the water table which naturally fill. The place of use for all ponds are identified within the permitted POU based on PLSS maps over aerial photography using ArcMap. The POD's for each pond was made based on each ponds centroid in regards to the QQ. There are a total of 17 ponds in the subdivision and 17 POD's recorded on the field exam report. 63-33400 has 18 POD's to reflect the irrigation pumps in Pond 8. The POD legal descriptions match where each specific pond is labeled on the field exam map. Accuracy of the permit was confirmed using the same methods described above.

The irrigation diversion is recorded in "Pond 8". This matches the permitted POD description. A map submitted by the field examiner shows a shape of irrigated land totaling 41.2 acres within the 91.7 PPU (sub property). Mr. Shaw used Google Earth and then converted the kmz file to a shape file. Google Earth has been known to have better imagery resolution than what is sometimes available through NAIP. The permit was issued with a PPU, however because the irrigated land is known, and will not change between irrigation seasons, the license is being recommended with a 42.0 acre POU.

Diversion rate and Volume: 63-33400 authorized a diversion rate of 1.34 cfs for irrigation use. The field exam reports a flow meter is installed on the system but no measurements from the device were included in the report. Water distribution is controlled by individual lot owners and a

landscaping company for common areas at different hours of the day. The field examiner suggested a diversion rate of 0.90 cfs which provides slightly more than the inch per acres standard to account for a majority of irrigation occurring at night. While this may be accurate, this does not appear to justify increasing the diversion rate above standard, and I recommend a diversion rate of $42 \text{ acres} * 0.02 \text{ cfs/acre} = \mathbf{0.84 \text{ cfs}}$.

Volume Calculations for Irrigation:

$$V_{I.R.} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) = 42 * 4.5 = 189.0 \text{ af}$$

$$V_{D.R.} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation season}) \times 1.9835 = 0.84 * 260 * 1.9835 = 433.2 \text{ af}$$

$$V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} = 189.0 \text{ af}$$

Mr. Shaw measured the depths of nine ponds using a sounding board. A range of average depths between 10.3 ft. and 15.3 ft. for a total average depth of 13.6 ft. was found. This data is acceptable since it represents a method further advanced than any available to IDWR. The average depth was multiplied by the surface area of all 17 ponds (12 square acres) calculates a total pond capacity of 163.2 af. Following IDWR Admin Memo #67, evaporation losses totaled 21.2 af. This information suggests a total pond system requires 184.4 af.

There is no irrigation storage or irrigation from storage associated with 63-33400. Aquifer properties of Eagle Island were provided by Aaron Marshall with the application for permit describes a hydraulic conductivity of 1,080 ft²/day. This suggests that the 0.84 cfs for irrigation use may be pulled directly from the source, and no storage component should be added.

Overlap Review: No active storage rights exist on property. Permit 63-31515 is being processed concurrently with 63-33400. Irrigation right 63-32613 accounts for neighboring property to the NE and does not overlap mitigating right 63-32614.

Mitigation: 63-32614 was offered for mitigation to cover consumptive use losses of evaporation and irrigation uses. This was outlined in the narrative for Permit 63-33400 for both rights in a 1 – 1 swap. 63-32614 was decreed in 2007 for 1.56 cfs, 355.5 af on a total of 79 acres. The volume of 355.5 af was authorized based on the 4.5 af per acre standard. The total consumptive use of 63-32614 is then 276.5 af (79 ac * 3.5 af/ac); Since Permit 63-31515 was filed for pond capacity, mitigation will not be require. Permit 63-33400 will require mitigation for 21.2 af from pond evaporation and 144.2 af for irrigation consumptive uses. The total system consumptive use of 186.2 af is less than the mitigation provided making this a sufficient mitigation plan.

Summary: 63-31515 was filed to provide a capacity of 49.5 af. 63-33400 was filed to account for the evaporation losses associated with the ponds and irrigation use. Both permits combined carry a total storage volume worth 91.5 af. At the time permit 63-33400 was filed, evaporation losses were assumed at the consumptive loss standard multiplied by surface area of the ponds. (3.5 af/ac * 12 ac = 42.0 af) which totals the storage volume of 63-33400. Since then, Department Admin Memo #67 allows a more accurate evaporation estimate of 21.2 af. Conditions on the permit outline a capacity of 49.5 af. Moving forward, my recommendation is to license with conditions 219 & 220 limiting the system to 49.5 af as was originally intended when applied for, 21.2 af for evap, totally a diversion of 70.7 af.

Correspondence from Mr. Shaw suggested that an Application for Permit would be filed to make up any difference found by the Department. An Application for Permit for 113.7 af will be required to account for the missing aesthetic storage use.

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	63-31515
REVIEWER	Patrick Kelly
DATE	10/15/2015

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: Boise 7 N (NWS -- 101017)

Month	mm/day ¹	Days per month	mm/Month
Jan	-1.34	31	0.00
Feb	-0.72	28	0.00
March	-0.29	31	0.00
April	1.09	30	32.70
May	1.77	31	54.87
June	3.33	30	99.90
July	4.41	31	136.71
August	3.81	31	118.11
September	2.28	30	68.40
October	0.89	31	27.59
November	-1.27	30	0.00
December	-1.76	31	0.00

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.

Total mm/year = 538.28

$$((538.28 \text{ mm/yr}) \div (\text{convert to feet})) \times (\text{Surface area of pond, in acres}) = \text{Evaporation Loss in Acre Feet}$$

$$((538.28) \div 304.8) \times 12.00 = 21.2 \text{ AFA}$$

Total Storage Calculations

FILE NUMBER	63-31515
REVIEWER	Patrick Kelly
DATE	10/15/2015

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.)	12	"Surface Area" is automatically carried over from the "Seepage Loss" sheet.
Average Pond Depth (FT.)	13.6	"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)	163.2	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)	0.0	The "Estimated Seepage Loss" is automatically carried over from the "Seepage Loss" sheet.
Estimated Evaporation Loss (AF)	21.2	The "Estimated Evaporation Loss" is automatically carried over from the "Evaporation Loss" sheet.
Total Volume Required (AF)	184.4	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)	1.00	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)	4.41	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)	0.17	"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)	0.09	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	90	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 approximately 6 months (180 days) or more, 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	-1220	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 approximately 6 months (180 days) or more, 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.

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	63-31515
REVIEWER	Patrick Kelly
DATE	10/15/2015

User Input
Calculated value
Formula Explanations

INPUTS

Pond Surface Area (AC.)	12	AC.
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Pond Surface Area (SQ. FT.)	522720	SQ. FT.
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My Soil Classification is	Water Table	
Suggested Seepage Rate (FT./DAY)	0.0000	FT./DAY

Formula: (Surface Area X Seepage Rate) X 7.48 = Gallons Per Day Loss
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Convert to GPD	0	GPD
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Total Seepage Loss (AFA)	0.0	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.

LICENSE REVIEW CHECKLIST

Permit No. 63-33400 Date 10-15-2015 Reviewer: PK

Change/OK

Name/Address OK

Source OK
Point of Diversion OK

Does change clarify original intended source? If no, void permit
Change – amendment required

F06 (overlap)
X59 (subdivision description)

Place of Use OK

Change – amendment required

X60 (subdivision description)
X27 (ppu acre limit)

Overlaps: Right(s) Permit 63-31513 (additive)
File(s) reviewed _____ Profile reports printed _____

Rate of Diversion Permitted Rate 1.34 cfs
Fee Limit 2.00 cfs Recommended Total Div Rate 0.83 cfs
Measured _____ cfs
Theoretical _____ cfs
 $[41.2 \text{ acres} \cdot 0.02 \frac{\text{cfs}}{\text{ac}} = 0.824 \text{ cfs}]$

Season of Use per new Standards 3-15 to 11-15

Water Uses OK Change – amendment required

Irrigation	<u>0.83</u> cfs	<u>185.4</u> af	Irrigation – overlaps (R58-R61, R62-R65, R66-R69) supp GW (WB7, 260 and 261 or 262) overlap special combined rts (X35) <1 acre (X31) Domestic (X01/WB5/070/071/075) Fish (042) Fire (077) Water Quality (106/R07) Payette (X22/047/27A) Stockwater for US (R37)
Stockwater	_____ cfs	_____ af	
Domestic	_____ cfs	_____ af	
<u>Artificial</u>	_____ cfs	_____ af	
<u>Storage</u>	<u>—</u> cfs	<u>42.0</u> af	
Total	_____ cfs	_____ af	

Volume Determination
0.83 cfs x 1.9835 x 260 days = 428 af (vs) 41.2 acres x 4.5 (FHR) = 185.4 af

Remarks: SEE ATTACHED POND SPREADSHEET.

Additional Conditions	<u>✓</u> Watermaster Control	GW District? <u>N</u>
	<u>✓</u> GW Meas/Meas Device	Critical GWMA? <u>✓</u>
	Other _____	GWMA? <u>✓</u>
	Trust (R55 – remove 051)	Gov Lots? <u>✓</u>
	Non-trust (048)	Wild & Scenic? <u>N</u>

Advance Priority? ✓ yes no If yes, explain why

Adjustment Memo _____

RECEIVED

OCT 01 2015

WATER RESOURCES
WESTERN REGION

October 1, 2015

Nick Miller, Manager
Department of Water Resources Western Region
2735 Airport Way
Boise, ID 83705-5082

RE: Field Examinations for Permits 63-31515 and 63-33400

Dear Nick:

Attached are completed Beneficial Use Field Reports for the above permits in the name of Rivers End Neighborhood Assn Inc. The permits are for aesthetic pond storage and irrigation and pond evaporation respectively.

The application for pond storage was completed by the original engineer for the subdivision and the pond volume was underestimated. We have attempted to estimate the pond volume recognizing the volume is larger than provided by the original permit. Once IDWR has the opportunity to review the volume calculations another application will be prepared for the additional pond volume similar to permit 63-34002 for Banbury Meadows LLC. We did not complete the application preferring to come to agreement on the amount of water needed to be applied for before filing the application.

The permit for irrigation and pond evaporation includes 67 acres of irrigation within a 91.7 acre PPU and 12 acres of ponds. The PPU has not changed but once the hardened areas were removed the actual irrigated area is 41.2 acres and 12 acres of ponds. Slightly more than 0.02 cfs per acre is recommended to account for night-time irrigation. If that recommendation cannot be licensed please let me know how you recommend we accommodate the actual water use that is occurring.

Thank you in advance please let me know if you have questions or recommendations.

Yours truly,



Attachments

cc: Rivers End Neighborhood Assn Inc.

Denver
1842 Clarkson St.
Denver, CO 80218
303.830.1188

Durango
1015 1/2 Main Avenue
Durango, CO 81301
970.422.2136

Hotchkiss
P.O. Box 932
161 South 2nd St.
Hotchkiss, CO 81419
970.872.3020

Idaho
4001 East Main Street
Emmett, ID 83617
208.365.7684

www.eroresources.com

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