

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 77-7192

Exam Date: 7/23/18

1. Current Owner:
LOON CREEK LAND CO LLC C/O JOHN R WILLIAMS
523 W MESA GRANDE LN BOISE ID 83702 (208) 386-0303

2. Accompanied by: John Williams
Phone No: (208) 386-0303
Address: 523 W Mesa Grande Ln Boise ID 83703
Relationship to Permit Holder: Manager

3. **SOURCE:**
LOON CREEK
DEER CREEK

TRIBUTARY:
MIDDLE FORK SALMON RIVER
LOON CREEK

B. OVERLAP REVIEW

1. Other water rights with the same place of use (POU):

WR#	Owner	Source	Use
77-11537	United States of America Acting Through	Unnamed Stream	Administrative
77-14289	United States of America Acting Through	Unnamed Stream	Irrigation
77-14285	Diamond D Ranch Partnership; Loon Creek Land Co LLC	Deer Creek & Trail Creek	Irrigation
77-7080	Diamond D Ranch Inc; Diamond D Ranch Partnership; Loon Creek Land Co LLC	Deere Creek & Loon Creek	Diversion to Storage, Recreation Storage, Power

Notes: Water rights 77-11537, 77-14289 and 77-14285 are for administrative and irrigation purposes so POU overlap is not a concern for water right 77-7192. Water right 77-7080 shares a POU with 77-7192 for power use. This was the original water right issued for hydropower at the property and permit 77-7192 was issued to account for additional flow used at the site for the turbine.

2. Other water rights with the same point-of-diversion (POD):

WR#	Owner	Source	Use
77-7080	Diamond D Ranch Inc; Diamond D Ranch Partnership; Loon Creek Land Co LLC	Deer Creek & Loon Creek	Diversion to Storage, Recreation Storage, Power

Notes: Water right 77-7080 shares a POD for power use.

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

LOON CREEK SE¼SE¼ Sec. 15, Twp 14N, Rge 13E, B.M. CUSTER County

DEER CREEK NE¼SE¼ Sec. 15, Twp 14N, Rge 13E, B.M. CUSTER County

Method of Determination: GPS at the time of the field exam, verification with ArcMap and satellite imagery

2. **PLACE OF USE: POWER**

Twp	Rge	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
14N	13E	15													X				

Method of Determination: Permit place of use, ArcMap and satellite imagery, verification during the field exam

3. **MAPS:**

Delivery System Diagram Attached (required). Indicate all major components and distances between components.

X Indicate weir size/pipe as applicable.

Map Attached Showing Location(s) of point(s) of diversion and place(s) of use (required). Scale must be

X 1:24,000 or greater.

X Aerial Photo Attached (required for irrigation of 10+ acres).

X Photo of Diversion and System Attached

4. POWER GENERATION INFORMATION:

Turbine make	Discharge (cfs)	Generator	Size (W or kW)
James Leffel & Co.	20 cfs (based on attached table)	Kamag Model #N227180000	100 kW

A table was available from the turbine manufacturer, James Leffel & Co, which showed power and flow specifications for various sizes of turbines manufactured by the company in the early 1900s (see attached). Approximately 32 to 37 feet of head was measured during the field exam for 77-7080, so using the table a 23 inch standard turbine would be capable of producing 61-75 Hp of power (approximately 45-56 kW) and 20 cubic feet per second of flow.

D. FLOW MEASUREMENTS

Panometrics Flow Measurement (see attached)

Maximum measured flow: **20.5 cfs**

Average flow: 19.8 cfs

The system adjusts the water flow based on the power needs, so the maximum measured flow should be used for licensing purposes rather than the average flow. The average diversion rate was used to calculate the annual volume.

E. FLOW CALCULATIONS

Theoretical measurement based on head:

Flow = **20.7 cfs**

**Based on 1988 field report for 77-7080 (shared POU for hydropower), see attachment*

**Assumes 37 feet maximum head, generator rated at 100 kW with 65% efficiency*

The permitted rate of diversion for this permit is 12 cfs. A maximum rate of 20.5 cfs was measured at the time of the field exam. Water right 77-7080 authorizes 7 cfs. Although the maximum remaining flow after the 7 cfs authorized by 77-7080 is 13.5 cfs, the license is limited by the maximum permitted flow amount. It is therefore recommended that permit 77-7192 is authorized for the full permitted diversion rate of 12.0 cfs.

F. VOLUME CALCULATIONS

The system is used all year with reduced usage estimated at 16 hours per day during the winter months of November to April. The system runs 24 hours a day during the summer. A few times during the winter, the system may be shut off for 6-8 hours at a time to refill the lake. The following volume is recommended:

	Flow (cfs)	Hours of use per day	Daily flow (cubic feet)	Days of use per season	Annual cf	AFA
Summer	19.8	24	1,710,720	184	314,772,480	7,226
Winter	19.8	16	1,140,480	181	206,426,880	4,739

11,965 Total AFA used by system

- 5,059 AFA authorized by 77-7080

6,906 AFA authorized for 77-7192

The annual volume calculation of 6,906 AFA will be rounded to 6,910 AFA according to Application Processing Memo No. 6.

G. NARRATIVE

Because this permit shares points of diversion and a place of use with water right 77-7080, the history of water right 77-7080 is directly related to this permit. An application for permit for 77-7080 was filed in 1979 requesting diversion from Loon Creek and Deer Creek for diversion to storage, recreation storage and power. The permit authorized diversion of 7 cfs from Deer Creek and Loon Creek for a levee with a capacity of 25 acre-feet. A field exam for this permit was conducted by IDWR in 1988. The field exam described the system as follows,

"[The] system is a reservoir located at the junction of Deer Creek and Loon Creek. The channel for Deer Creek was altered to catch all of Deer Creek. A rock diversion dam diverts water from Loon Creek into the reservoir. A 22" line carries water north approximately 1,000 feet to the power plant (buried line). A 16" line beside the power line discharges water back into Loon Creek. The reservoir covers 5 acres and has a capacity of 25 acre- feet. Normal operation is to allow excess water to return to Loon Creek via the spillway located close to Loon Creek diversion structure. For power use, head found was 34-37 feet. Generator rated at 100 kW and produces approximately 65 kW. Discharge from the generator returns to Loon Creek through a 100 feet tail race."

A minimum head of 34 feet and a maximum of 37 feet was measured during the 1988 field exam. Based on the generator rating of 100 kW and 65% efficiency, a flow of 20.74 cfs was calculated. Water right 77-7080 was limited to the seven feet that was authorized by the permit. Application for permit 77-7192 was submitted in 1983 to account for additional flow used under the same system as 77-7080. The permit requested 12 cfs for power purposes from Loon Creek and Deer Creek. No actual field exam has been completed for this permit; however, a field report was completed by IDWR in 1998 using the field report from 77-7080. The system is used at full capacity when the guest ranch is in operation from late spring to early fall. During the winter, the hydropower generation is used for a few buildings (a house, shop and barn). The well pump uses full power from the generator during the winter months.

System Description

The POD, POU and the land between are all owned by Loon Creek Land Company LLC and Thomas Demorest. The sources of water for this permit include Deer Creek, tributary to Loon Creek, and Loon Creek, tributary to Middle Fork Salmon River. The site is located downstream of the confluence of Trail Creek and Loon Creek and has points of diversion both on Loon Creek and Deer Creek. Water from Loon Creek is diverted to the southernmost point of a 5 acre, 25 acre-feet reservoir. Deer Creek drains into the reservoir at the northern side. Water is diverted at the northeast corner of the reservoir through approximately 1,000 feet of 22 inch diameter steel penstock. The turbine is manufactured by James Leffel & Company. Water flows into the turbine and out through a discharge in the floor in the small building that houses the turbine and generator. The water returns to Loon Creek. There is no battery bank and flow is automatically adjusted by a governor based on demand. The AC generator has a capacity of 100 kW. It is recommended that this permit is licensed for the full diversion rate of 12.0 cfs and an annual volume of 6,910 AFA.

As previously mentioned, water right 77-7080 was the original water right for this hydropower site and permit 77-7192 was subsequently filed to account for the additional diversion rate. Therefore, water right 77-7080 shares a POD and POU with 77-7192. The license will be conditioned to address this overlap.

Conditions/ Recommendations

- Condition 1 (08A) and 2 (01F) will be removed at the time of licensing as is customary.
- Condition 3 (09E) will be removed as the condition is no longer active.
- Condition 4 (025) and 6 (027) will be retained for the license.
- Condition 5 (17M) will be changed to X42 with a review date of 3/17/98 as 17M is no longer active.
- Condition 7 (028) will be removed as it is no longer active.
- Condition 8 (17K) will be changed to R23 which applies to licenses rather than permits.
- Condition F06 will be added to address the POD overlap

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

H. RECOMMENDATIONS

1. Recommended Amounts

<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>DIVERSION RATE</u>	<u>ANNUAL VOLUME</u>
POWER	01/01 to 12/31	12.0 CFS	6,910 AFA
<u>Totals:</u>		12.0 CFS	6,910 AFA

2. Recommended Amendments

☐ Change POD as reflected above ☐ Add POD as reflected above ☒ None

☐ Change POU as reflected above ☐ Add POU as reflected above ☒ None

I. AUTHENTICATION - Rachael Smith, Water Resource Agent Sr.

Field Examiner's Name Rachael Smith Date 8/8/18

Reviewer David A. Rebs Date 8-8-18

State of Idaho
Department of Water Resources
Attachment to Field Exam
77-7192

This map depicts the POWER place of use boundary
for this water right and is attached solely for illustrative purposes.

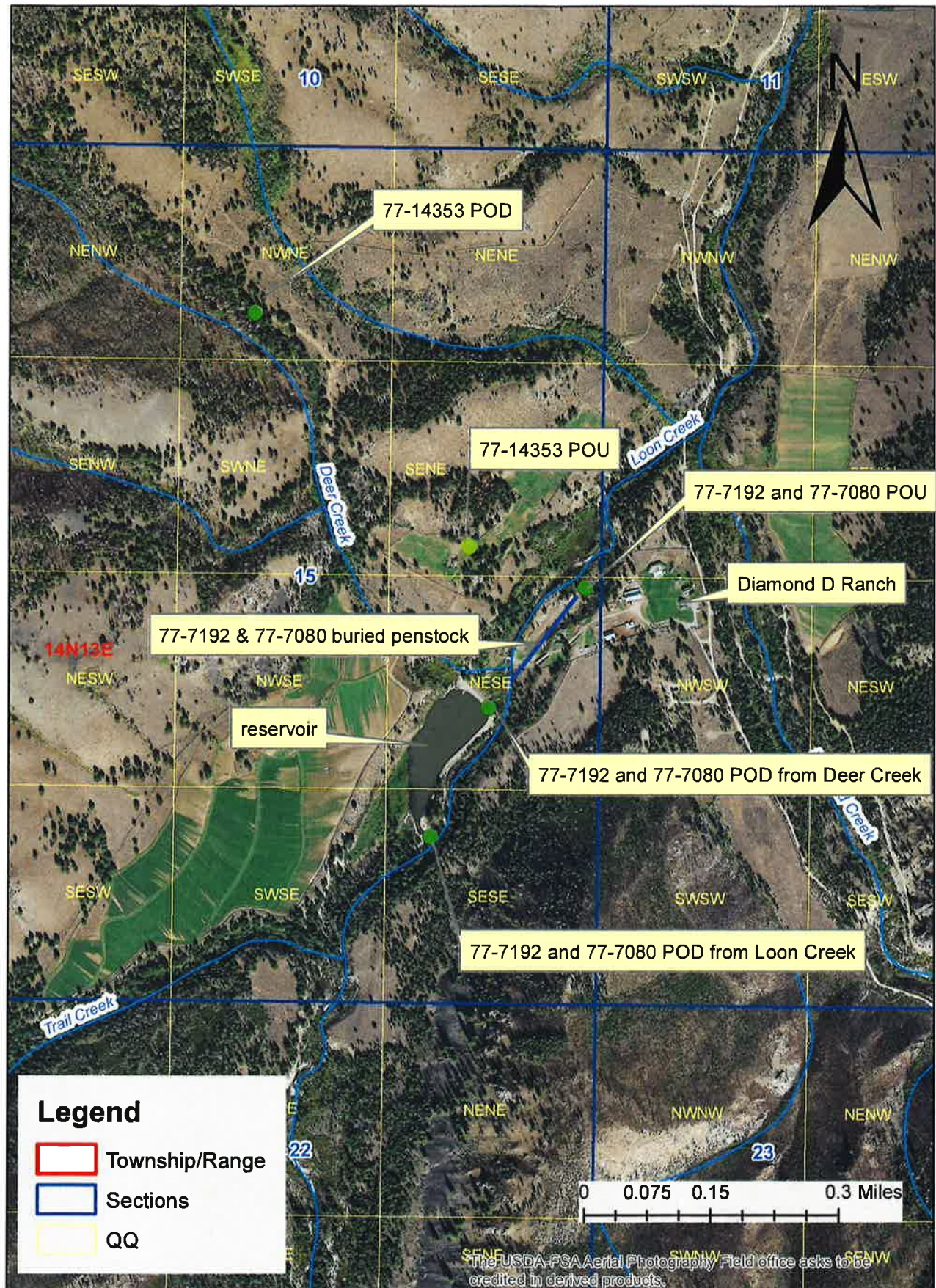


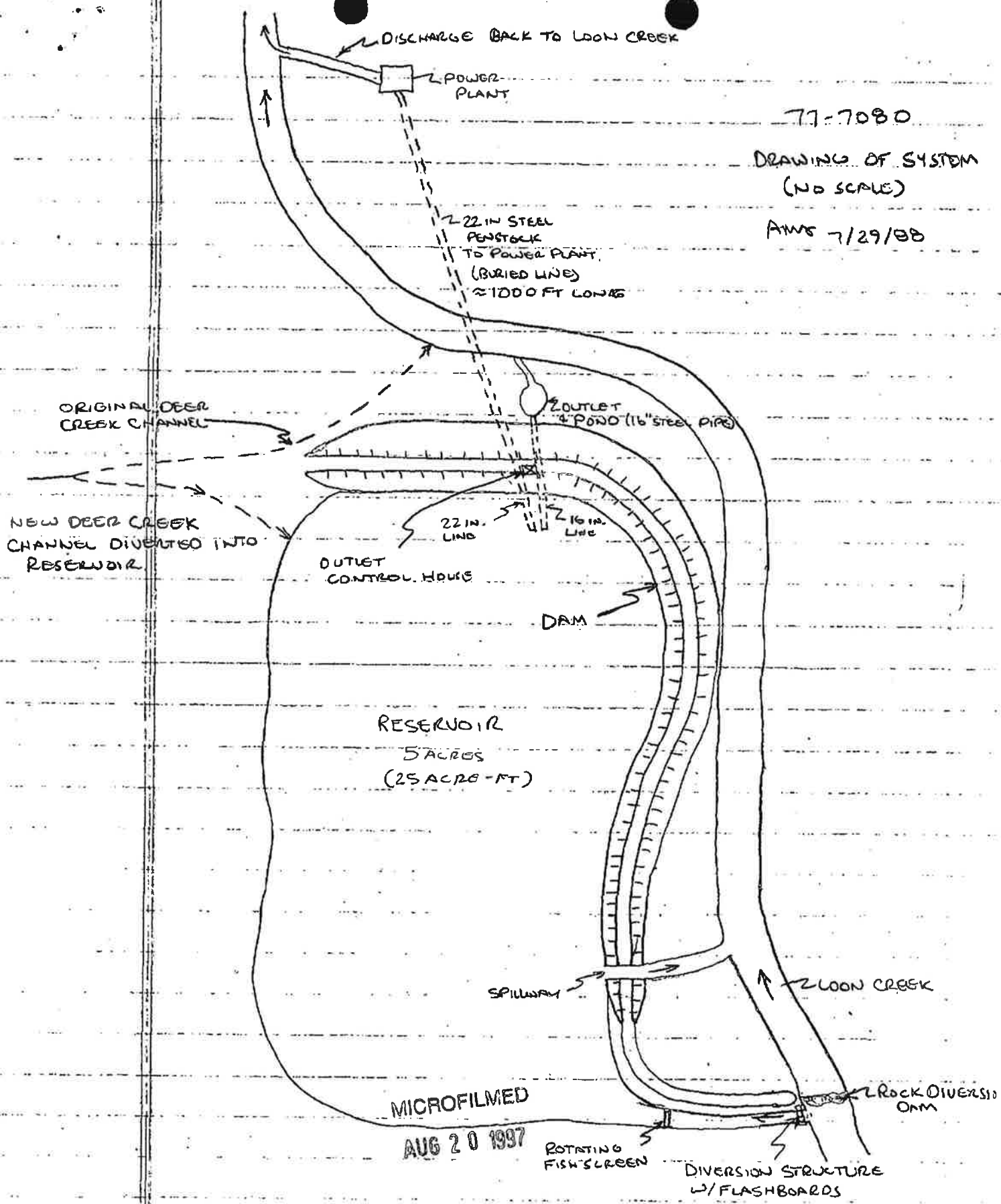
-  Point of Diversion
-  Place Of Use Boundary
-  Townships
-  PLS Sections

0 0.05 0.1 0.2 Miles



Loon Creek Hydropower Water Rights System Diagram





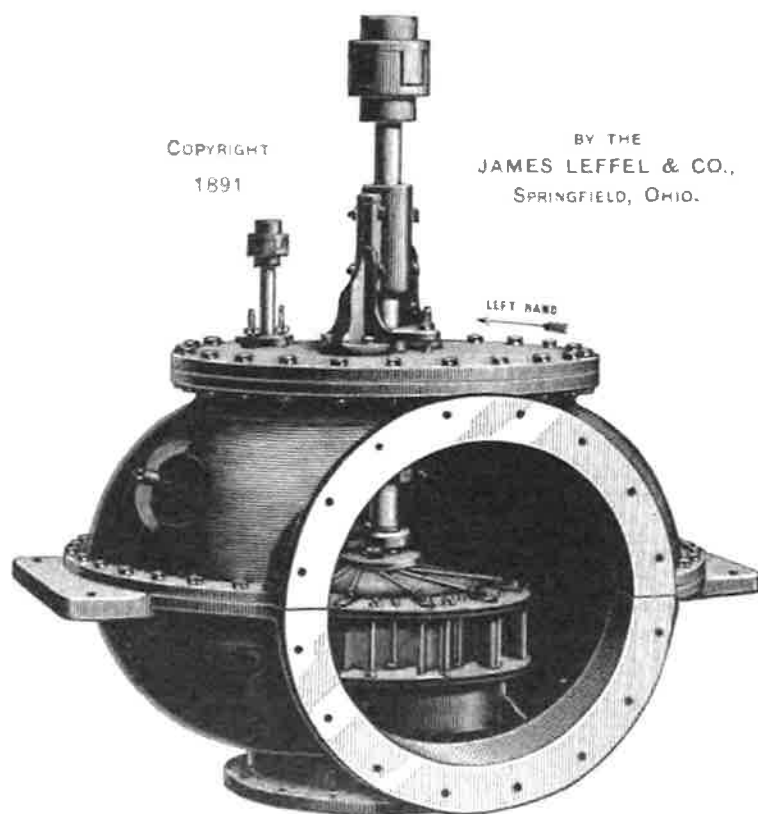
77-7080

DRAWING OF SYSTEM
(NO SCALE)

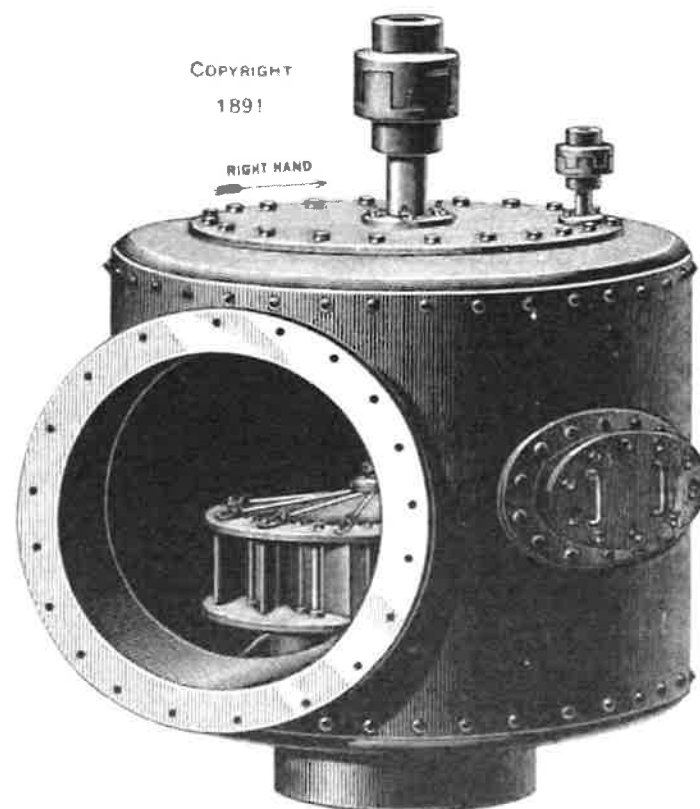
AMS 7/29/88

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AUG 20 1997

Style and Size of WHEEL.	Head in Feet	New Table for STANDARD CAPACITY Wheels. Copyright 1897, by James Leffel & Co.																								19
		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48		
STANDARD 20	Power Water Speed	33 3/4 814 351	35 1/2 831 358	37 1/2 846 365	39 1/2 861 371	41 1/2 874 378	43 1/2 887 384	45 1/8 901 390	47 3/4 914 396	50 929 402	52 1/4 943 408	54 1/2 957 414	56 3/4 970 419	59 1/8 983 425	61 1/2 996 430	63 7/8 1009 436	66 1/4 1021 441	68 3/8 1032 446	71 1043 452	73 1/2 1056 458	75 1068 463	78 1081 468	81 1094 474	84 1106 480		
STANDARD 23	Power Water Speed	44 3/8 1086 306	47 1/4 1106 311	49 3/8 1126 317	52 1/2 1144 323	55 1/4 1164 328	58 1182 334	61 1206 339	63 3/4 1221 344	66 1/4 1241 350	69 1/4 1259 355	72 3/4 1276 360	75 1/2 1293 365	78 3/8 1311 369	82 1329 374	85 1/8 1345 379	88 1/4 1360 384	91 1/2 1377 389	94 3/4 1392 393	98 1/4 1411 398	101 1/2 1427 403	104 3/4 1443 408	108 1459 412	112 1474 416		
STANDARD 26 1/2	Power Water Speed	58 1410 265	61 3/8 1436 270	64 3/8 1458 275	68 1/4 1487 280	72 1512 285	75 1/2 1539 290	79 1/4 1565 294	83 1589 299	86 1/4 1612 303	90 1/2 1634 308	94 1/2 1659 312	98 1/2 1682 316	102 1/2 1705 321	106 1/2 1726 325	110 3/4 1750 329	115 1772 333	119 1790 337	123 1/4 1811 341	127 1/4 1835 346	132 1857 349	136 1879 352	141 1901 356	146 1922 360		
STANDARD 30 1/2	Power Water Speed	77 1/4 1878 230	81 1/4 1913 235	86 1/2 1952 239	91 1983 243	96 2022 248	100 1/2 2049 252	105 1/2 2083 256	110 1/2 2116 260	115 1/4 2151 264	121 2185 268	126 2212 271	131 1/4 2242 275	136 1/4 2274 279	142 2301 282	147 1/2 2330 286	153 2358 289	159 2395 292	164 2421 296	170 2442 300	175 1/2 2470 303	182 2498 307	188 2526 311	194 2554 314		
STANDARD 35	Power Water Speed	102 2475 201	107 3/4 2522 205	113 1/4 2567 208	120 2615 212	126 3/4 2660 216	132 3/4 2706 219	139 2745 223	145 3/4 2791 226	152 1/4 2830 230	159 2871 233	166 2914 236	173 2955 240	180 2993 243	187 3030 246	194 1/4 3069 249	201 1/4 3110 252	209 3145 255	216 1/2 3182 259	224 3217 262	232 3251 264	240 3280 266	248 3330 270	256 3370 272		
STANDARD 40	Power Water Speed	133 1/4 3251 176	141 1/2 3312 179	149 1/2 3374 182	157 1/4 3437 186	166 3497 189	174 1/4 3552 192	182 1/4 3609 195	191 1/4 3662 198	200 3717 201	209 3773 204	218 3827 207	227 1/4 3876 210	236 1/2 3933 212	245 1/2 3982 215	255 1/4 4032 218	265 4086 220	275 1/2 4140 223	286 4194 225	296 4248 228	306 4292 230	315 4336 233				
STANDARD 44	Power Water Speed	161 3913 161	170 1/2 3990 164	180 4062 167	190 4140 170	200 4213 173	210 4281 176	220 4345 178	230 4404 181	240 1/2 4470 184	251 4532 187	262 4599 189	273 4663 192	284 4723 194	295 1/2 4762 197	307 4850 200	316 4872 202	325 1/2 4895 204	335 4918 206	344 4940 208	NEW TABLE.					
STANDARD 48	Power Water Speed	193 1/4 4697 144	204 1/2 4786 147	216 4875 150	227 1/2 4957 153	240 5056 155	252 5137 157	264 5214 160	276 1/2 5295 163	289 5372 165	302 5453 168	315 5530 170	328 5602 173	342 5688 175	355 5752 177	369 5830 179	383 5895 181	396 5960 182	This TABLE is for the Leffel STANDARD Wheel Invented and Patented by James Leffel. BUILT BY JAMES LEFFEL & CO., Springfield, Ohio, U.S.A.							
STANDARD 56	Power Water Speed	328 7972 126	347 8122 128	366 8261 130	386 8412 132	406 8553 135	427 8705 137	448 8848 139	469 8982 142	490 9108 144	513 9263 147	536 9409 149	558 9531 150	580 9646 153	602 9755 155	625 9875 157										
STANDARD 61	Power Water Speed	386 9382 115	408 9550 117	431 9728 119	455 9915 121	479 10090 124	503 10254 126	528 10428 128	553 10590 130	578 10744 132	604 10906 134	630 11060 136	656 11205 137													
STANDARD 66	Power Water Speed	463 11254 105	490 11469 108	518 11692 110	546 11899 113	575 12113 115	604 12313 117	633 12501 120	663 12697 122	694 12900 124	725 13091 126	756 13272 128	787 13442 130													
STANDARD 74	Power Water Speed	572 13904 93	606 14161 95	638 14400 97	673 14666 99	708 14915 100	743 15147 102	777 15345 104	813 15570 105	850 15800 107	888 16034 109															
Write for DISCOUNTS from Prices. POWER=Horse Power. WATER=Cubic Feet per Minute. SPEED=Revolutions per Minute.																										



Patent Globe Casing.



Improved Cylinder Casing.

IMPROVED IRON CASTINGS FOR JAMES LEFFEL WATER WHEELS.

GE Panametrics PT878 Ultrasonic Flow Meter Measurements				
File Name:	77-7192			
Start Time:	7/23/2018 12:25			
End Time:	7/23/2018 12:36			
Interval:	60			
Records:	11			
Cyclic Flags:	2			
Error Flags:	8208			
Date/Time	Velocity (ft/s)	Volume (gal/m)	Volume (cfs)	(+)Total (gal)
7/23/2018 12:25	8.0	9,174.5	20.4	770,761.2
7/23/2018 12:26	8.0	9,169.9	20.4	780,088.3
7/23/2018 12:27	8.0	9,206.6	20.5	788,913.0
7/23/2018 12:28	7.7	8,829.1	19.7	798,083.5
7/23/2018 12:29	7.6	8,747.6	19.5	806,950.0
7/23/2018 12:30	7.6	8,726.3	19.4	815,319.9
7/23/2018 12:31	7.2	8,243.6	18.4	824,172.5
7/23/2018 12:32	7.7	8,826.9	19.7	832,532.2
7/23/2018 12:33	7.7	8,896.3	19.8	841,414.4
7/23/2018 12:34	7.8	8,970.9	20.0	849,992.9
7/23/2018 12:35	7.7	8,877.0	19.8	859,590.8
		Max	20.5	
		Average	19.8	
0.002228009	gpm to cfs			

THEORETICAL CALCULATION FOR 77-7080

HEAD (H) = 37 FT. (MAX)

34 FT. (MIN)

GENERATOR RATED AT 100 KW

GENERATOR WILL PRODUCE $\approx$ 65 KW

EFFICIENCY = 65%

$$H_p = \frac{62.4 (Q) (H)}{550}$$

$$Q = \frac{H_p (550)}{62.4 (H)} = \frac{8.8 \text{ HP}}{(H)} = \frac{8.8 \text{ HP}}{37} = 238 \text{ HP}$$

$$1 \text{ HP} = .746 \text{ KW} \therefore 65 \text{ KW} = 87.13 \text{ HP}$$

$$Q = 238 (87.13) = \underline{\underline{20.74 \text{ CFS}}}$$

MICROFILMED

AUG 20 1997

Loon Creek Land Company
Water Right 77-7192
Field Exam Completed: 7/23/18
IDWR Staff: Rachael Smith and Dan Nelson



Panoramic view inside the building that houses the turbine and generator



22 inch diameter steel penstock



100 kW AC generator



5 acre reservoir



Location where Deer Creek outlets to the reservoir



Main channel of Loon Creek (left), diversion to reservoir (right)

Smith, Rachael

From: J.R. Williams <diamonddgustranch@mac.com>
Sent: Monday, July 30, 2018 1:03 PM
To: Smith, Rachael
Subject: Re: water rights field exams

Sure,

For the large turbine, it is used year round. At times in the winter, it may be shut off for 6-8 hours at a time to let the lake refill. It generally needs about the same cfs to operate. For the smaller system, it is only 3-4 months per year, running at the same speed you observed.

No problem! Come see us anytime!

J.R.

On Jul 30, 2018, at 12:36, Smith, Rachael <Rachael.Smith@idwr.idaho.gov> wrote:

Hi John,

I hope you had a great weekend! I'm currently working on the reports for the two hydropower sites and I think we have all the information needed except for the annual volume calculations. My notes on typical season of use for each system are lacking (I think I was distracted with getting flow measurements). Could you estimate what the longest season of use would be for each system and to what capacity they are used during different times of the year?

Thanks again, I really appreciate your time and help!

Rachael

From: J.R. Williams [<mailto:diamonddgustranch@mac.com>]
Sent: Thursday, July 19, 2018 4:03 PM
To: Smith, Rachael <Rachael.Smith@idwr.idaho.gov>
Subject: Re: water rights field exams

It sure does! I'll be watching for you!

On Jul 19, 2018, at 15:37, Smith, Rachael <Rachael.Smith@idwr.idaho.gov> wrote:

Hi John,

We're planning to be at the ranch around 11:30AM on Monday. Does that still work for you?

Smith, Rachael

From: J.R. Williams <diamonddgustranch@mac.com>
Sent: Wednesday, August 08, 2018 7:13 AM
To: Smith, Rachael
Subject: Re: water rights field exams

Honestly I'm unsure, I would guess the flow is only reduced a small percentage (say 25%) as the lake level will drop and we end up with less overall head. Honestly just a wag...demand for electricity definitely drops, but its tough to replicate that situation outside of winter.

Apologies!

J.R.

On Aug 7, 2018, at 15:45, Smith, Rachael <Rachael.Smith@idwr.idaho.gov> wrote:

Thanks! Any idea of what the reduced flow rate in the winter months may be? (50%? More? Less?)

From: J.R. Williams [<mailto:diamonddgustranch@mac.com>]
Sent: Tuesday, August 07, 2018 2:25 PM
To: Smith, Rachael <Rachael.Smith@idwr.idaho.gov>
Subject: Re: water rights field exams

Most days in the winter, the system is running 24/7 at a reduced flow. Some days, we must shut down and let the lake refill to generate head/flow. Only had to do that a few times last year.

Regarding the other system, I do believe the drinking water for the house comes off of there as well, and perhaps a few sprinklers as well.

Thank you!

J.R.

On Aug 7, 2018, at 14:13, Smith, Rachael <Rachael.Smith@idwr.idaho.gov> wrote:

Good afternoon,

As Dan was reviewing my report, he noticed that my calculations for annual water usage were different than how he understood them the day we were out at the ranch. How often during the winter do you think the system may be shut off to let the lake refill? Or maybe a better way to ask/calculate that is how many hours per day do you think the system is running in the winter? And when the system is operating during the wintertime, is it at full capacity or at reduced flow?

Also, looking at the smaller system for the cabin, I know that there is a split for irrigation and hydropower where you showed us the valves, but are there any other splits lower down (such as for irrigating the lawn with sprinklers)? We were just thinking about that and wondering if any of the flow is lost above the two turbines.

Thanks again! I keep on working on other projects and coming back to these files.
Sometime soon I will be done with them.

Rachael

From: Smith, Rachael
Sent: Monday, July 30, 2018 12:37 PM
To: 'J.R. Williams' <diamonddgustranch@mac.com>
Subject: RE: water rights field exams

Hi John,

I hope you had a great weekend! I'm currently working on the reports for the two hydropower sites and I think we have all the information needed except for the annual volume calculations. My notes on typical season of use for each system are lacking (I think I was distracted with getting flow measurements). Could you estimate what the longest season of use would be for each system and to what capacity they are used during different times of the year?

Thanks again, I really appreciate your time and help!

Rachael

From: J.R. Williams [<mailto:diamonddgustranch@mac.com>]
Sent: Thursday, July 19, 2018 4:03 PM
To: Smith, Rachael <Rachael.Smith@idwr.idaho.gov>
Subject: Re: water rights field exams

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Hi John,

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Thank you,
Rachael

From: J.R. Williams [<mailto:diamonddgustranch@mac.com>]
Sent: Tuesday, July 10, 2018 9:44 AM
To: Smith, Rachael <Rachael.Smith@idwr.idaho.gov>
Subject: Re: water rights field exams