

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 65-22723

Exam Date: 6/21/2012

1. Current Owner: US DEPT OF INTERIOR
BUREAU OF RECLAMATION
1150 N CURTIS RD STE 100
BOISE ID 83706-1234
(208) 378-5306

2. Assisted by the following USBR employees:

E Gail McGarry, Program Manager, Water Rights and Acquisitions, PN Region Office, PN 3100
Phone No: 208-378-5306

Address: 1150 N Curtis Rd, Boise ID 83706

Vicki Hoffman, Supervisory General Engineer, Operation and Maintenance Middle Snake Field Office, MSFO-3100

Ernie Bachman, Mechanical Engineer, Operation and Maintenance, Middle Snake Field Office, MSFO-3108

Also assisted by John Falk, P.E., Dam Safety, IDWR

A side benefit of the routine inspections conducted by the Dam Safety Unit is that IDWR had already amassed a significant collection of documents on the Deadwood Dam facility.

An additional field inspection by Water Rights Section personnel to confirm the beneficial use of water for this permit was not necessary. This report is a compilation of information available from the Dam Safety archive and from submittals provided by USBR personnel during a June 21, 2012 meeting.

- 3.

SOURCE

DEADWOOD RIVER

TRIBUTARY

SOUTH FORK PAYETTE RIVER

B. OVERLAP REVIEW

1. Other water rights with the same place-of-use:

There are no other water rights for this powerhouse.

Decreed Right 65-2917 authorizes power from storage and power uses linked to the powerhouse at the Black Canyon Dam.

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

Deadwood Reservoir provides storage to meet the USBRs irrigation and fish flow requirements. The same intake and conduits handle all of the water passing through the Deadwood Dam.

Decreed Right 65-9483 authorizes irrigation and irrigation from storage for the Payette Division of the Boise Project and in the Emmett Irrigation District.

C. DIVERSION AND DELIVERY SYSTEM

- 1.

LOCATION OF POINT(S) OF DIVERSION:

DEADWOOD RIVER

SW1/4SE1/4, Sec. 8, Twp 11N, Rge 07E, B.M.

VALLEY County

Method of Determination:

The point-of-diversion is typically submerged under the headwater pool of the reservoir. Existing spatial data point 396327, digitized by Dam Safety for 65-2917, was selected as the best fit for the POD for this right. Its location was confirmed by consultation with the permit holder's representatives and the Deadwood Dam Standard Operating Procedures manual #14 available from IDWR's Dam Safety Unit.

There are two, 66-inch conduits which convey water through the base of the dam. Each conduit receives water from the same semi-circular, trash rack and intake structure. I consider that intake structure to be the single POD for this right. The water flowing through the conduits is controlled by gates in the valve house of the dam. A small sliver of water is diverted from one or the other of the two conduit streams into the 10-inch diameter penstock for the turbine authorized by this permit.

Drawings created by E Bachman (mechanical engineer, USBR) of the system piping are attached.

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	
11N 07E 8															X		

Method of Determination:

The place-of-use was determined by aerial and ground-level photography provided by USBR and IDWR.

The turbine and generator are located inside the Deadwood Dam valve house. Aerial photography shows the valve house located approximately 50 ft north of the section line dividing sections 8 and 17.

GPS coordinates for the hydropower unit were provided by USBR personnel. Those coordinates are: Latitude 44.293593; Longitude:-115.645830 and are consistent with a location inside the valve house.

3. ☒ Delivery System Diagram Attached (required). Indicate all major components and distances between components. 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 1:24,000 or greater.
- ☒ Aerial Photo Attached (required for irrigation of 10+ acres).
- ☐ Photo of Diversion and System Attached.

The diversion is submerged. Interior and exterior photos of the valve house were provided by USBR and IDWR personnel.

4.

Well or DiversionID No.* see Method of determination discussions above

<u>Turbine Make</u>	<u>Turbine Model</u>	<u>Discharge (cfs)</u>	<u>Generator Make</u>	<u>Generator Model</u>	<u>Size (kW)</u>
Paco	5015-7 fixed flow pump	3.1 cfs	Marathon Electric, Lima	SER 441SDL0112, Synchronous,	50 kW
					Serial # LM-430424-0207

*Code to correspond with No. on map and aerial photo

D. FLOW MEASUREMENTS

1.

<u>Measurement Equipment Type</u>	<u>Make</u>	<u>Model No.</u>	<u>Serial No.</u>	<u>Size</u>	<u>Calibration Date</u>

Condition 3 of the permit required the permit holder to install a measuring device or to provide the department a flow rate measurement or computation made by a certified water rights examiner. E. Bachman, (mechanical engineer, USBR), provided both a flow measurement record and a flow computation. The measurement was taken coincident with the 2010 PFR (Periodic Facility Review). IDWR Dam Safety personnel were onsite that day but did not witness the measurement. Both the measurement record and the flow computation were provided to me during our June 21, 2012 meeting and are attached to this report.

2. Measurements:

The flow measured by USBR personnel on August 8, 2010 was 2.3 cfs.

2.
PLACE OF USE: POWER

Twp	Rge	Sec	NE				NW				SW				SE				Totals
11N	07E	8	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
																	X		

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E. FLOW CALCULATIONS

__X__Additional Computation Sheets Attached

Water Right Processing Limits:

The permit authorized 4.86 cfs for power use.

The fee submitted with the proof statement caps the licensed rate at 5 cfs.

Measured Method:

The measured rate does not represent the maximum rate used by the system for two reasons.

-The measurement was taken during temperate, daylight hours. Therefore the maximum power use would not have been occurring during the measurement.

-In the power relationship ($P = .0846 \times H \times Q$), flow rate and head are inversely proportional. During the measurement, the headwater elevation was not at the minimum so the flowrate would not have been at the maximum.

Even the best measurement setups are subject to some error. In this case, the measured rate was less than the lowest flowrate expected by the designer. Adding 0.23 cfs, (a 10% error), to the measurement, puts it in the range expected for this system.

To confirm the powerhouse capacity, I requested and received additional information from Dependable Turbines Ltd. Although not the manufacturer of the power house equipment, they are listed on the turbine nameplate. Dependable Turbine Ltd (DTL) staff provided me with copies of their proposal which shows the design max and min flow rates for the fixed flow pump which being used as a turbine in this project. I also confirmed with DTL the make and model of the generator.

Theoretical Method:

USBR personnel provided a theoretical calculation of the maximum flowrate which was higher than the maximum flowrate given by the design equipment specs.

I found that the headwater elevations used by DTL were different than the headwater elevations used by the USBR engineer in his theoretical calculations.

I am comfortable with recommending this right be licensed for 3.14 cfs, the rated capacity of the fixed flow pump.

F. VOLUME CALCULATIONS**1. Volume Calculations for Irrigation:**

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

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

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

2. Volume Calculations for Other Uses:

A volume may not be required for this license. Recent revisions to the Beneficial Use Exam Rules allow the exemption of on-stream, run-of-river, non-consumptive power generation uses from the volume requirement. This facility does not strictly fit that category but after consultation with the section manager, I am not recommending a volume for the license.

Should a volume be required, I am providing sufficient information in the narrative to develop a recommendation.

G. NARRATIVE/REMARKS/COMMENTS

Although hydro power use has been in place at the dam since the 1930's the USBR does not appear to have claimed the use in the SRBA.

This turbine-generator pair was installed during the summer of 2007. The power is used in the valve house and at cabins in the vicinity. In addition to the hydro generator, there is a propane powered generator and a diesel powered generator providing primary or backup power to the valve house.

This power plant takes advantage of the head developed from water stored in Deadwood Reservoir. It diverts a very small portion of the water that is flowing through the conduits. Minimum streamflow requirements of 65-12733 guarantee that at least 212 cfs passes through the dam and into the Deadwood River below the dam. The maximum diversion used by this powerhouse is within the measurement error for that streamflow requirement. The turbine discharge is returned to the Deadwood River at tailwater pool of the dam. Dedicated discharge piping can be seen in photos of the exterior, northeast side of the valve house.

There isn't a perpetual damtender stationed at the dam and the powerhouse equipment is not yet part of a SCADA system. However, according to USBR personnel, an RTU is in place. *(Remote Terminal Units (RTUs) collect data automatically and connect directly to sensors, meters, loggers or process equipment. They serve as slave units to supervisory control and data acquisition (SCADA) masters. Remote terminal units are located near the process they monitor and can transfer data to the controller unit.)*

The SOU is year-round. The site is isolated from any utility service territory. This is not a standby power supply. This is an AC-direct system. The turbine-generator produces continuous power output at 240 volts which can be sent directly to standard household loads. There is no battery bank. The power must be used as it is generated. And peak or surge loads cannot exceed the output of the generator. To keep the total load on the generator constant, excess power is diverted to a dump load. In this case, the dump load is a small, 25 kW, water heater located near the generator in the valve house. I believe that the load on the system is near 25 kW at all times. This is a higher power demand than the USBR engineer used in his theoretical flow calculation.

A butterfly valve is available to control the inlet to the turbine. I understand that USBR maintenance personnel leave that valve wide open. So the turbine would see the pressure vary as the headwater changes.

The Paco pump which is used as the turbine has a limited range of flow but it is flexible. The design flow range provided in the DTL spec sheet is derived from the headwater elevations given to the designer. My back of the envelope calculation of the power generation, using low pool headwater elevation (108.57 ft) and 35-ft equivalent length penstock indicates that 3.1 cfs flow is needed to provide 24.9 kW at 88% efficiency.

I recommend 3.1 cfs as the rate for the license.

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

H. RECOMMENDATIONS

1. Recommended Amounts

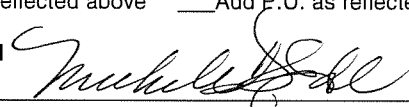
<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>DIVERSION RATE</u>	<u>ANNUAL VOLUME</u>
POWER	01/01 to 12/31	3.1 CFS	
<u>Totals:</u>		3.1 CFS	

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

I. AUTHENTICATION

Examiner's Signature  Date 6/29/2012
Michele D. Edl

Reviewer _____ Date _____

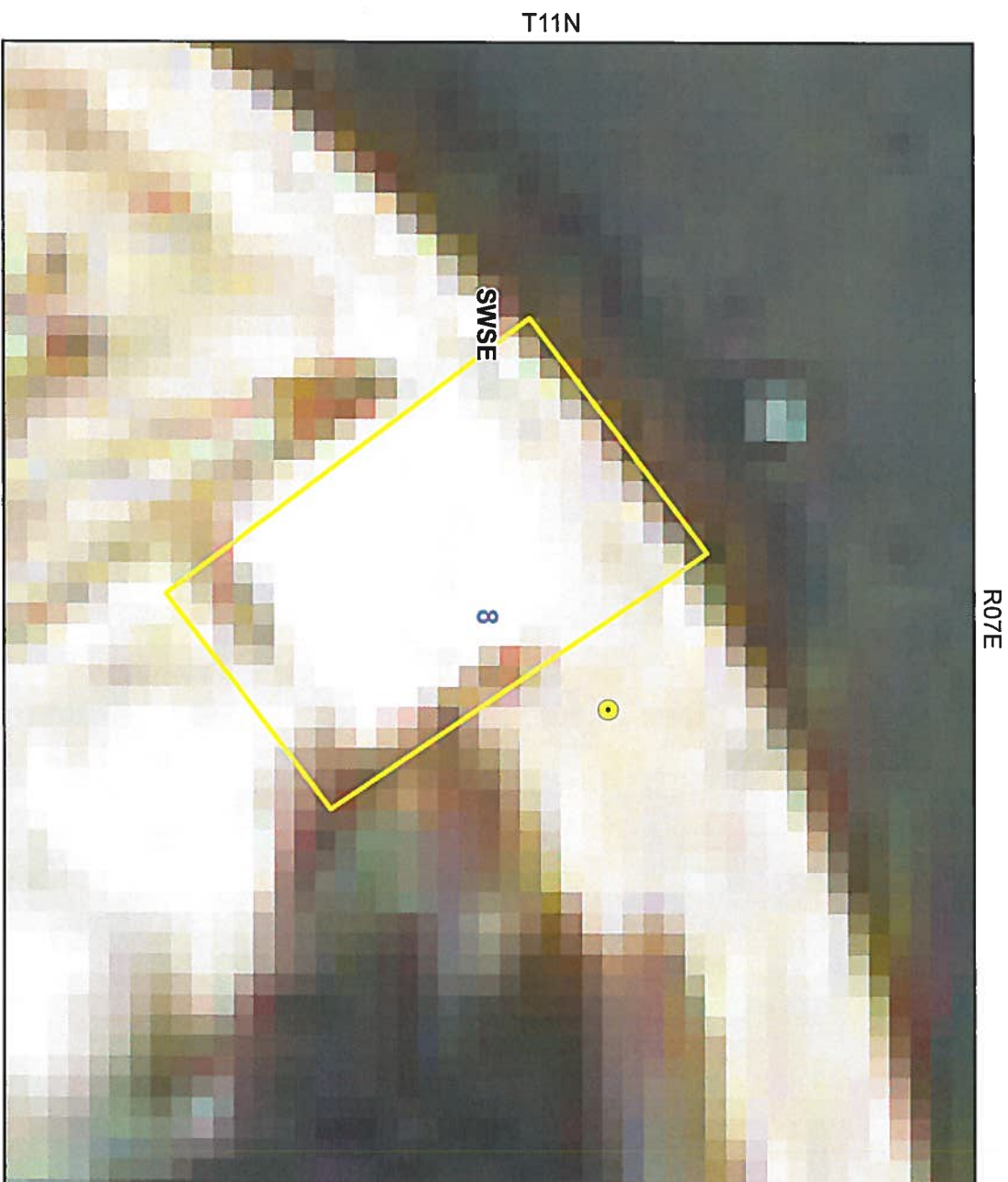
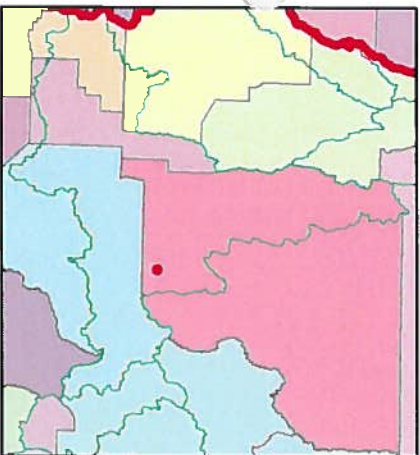




Water Right
65-22723
(POWER)

Idaho Department of Water Resources

- Point of Diversion
- Place of Use
- State Outline
- Townships
- PLS Sections
- Quarter Quarters



Valley County
IDWR Basin 65
Prepared by Edl, Michele
2009 Aerial Photography

HYDROPOWER ANALYSIS SHEET

Deadwood Dam Valvehouse Hydro

Static Head ----- 108.57 Feet Nominal Pipe Size- 10.00 Inches I.D.
 Penstock Length - 35 Feet Turbine Type ----- Paco pump as turbine

	FLOW CFS	FLOW GPM	BYPASS CFS	POWER CFS	SPILL CFS	VELOCITY Feet/Sec	TOTAL EFFICY	NET HEAD	POWER WATTS	WEEKLY WATT-HRS
	0	0	0	0	0	0	0	108.57	0.00	
	0	0	0	0	0	0	0	108.57	0.00	
	0	0	0	0	0	0	0	108.57	0.00	
	0.10	44.9	0	0.100	0.0	0.18	88	108.57	808.98	
	1.10	493.7	0	1.100	0.0	2.02	88	108.48	8,891.11	
average	2.00	897.7	0	2.000	0.0	3.67	88	108.28	16,137.05	
	2.10	942.5	0	2.100	0.0	3.85	88	108.26	16,939.66	
	2.40	1077.2	0	2.400	0.0	4.40	88	108.17	19,343.86	
design	2.50	1122.1	0	2.500	0.0	4.58	88	108.14	20,143.97	
	2.60	1167.0	0	2.600	0.0	4.77	88	108.10	20,943.41	
	2.70	1211.8	0	2.700	0.0	4.95	88	108.07	21,742.13	
	2.80	1256.7	0	2.800	0.0	5.13	88	108.04	22,540.13	
	2.90	1301.6	0	2.900	1.0	5.32	88	108.00	23,337.38	
	3.00	1346.5	0	3.000	2.0	5.50	88	107.96	24,133.85	
max	3.10	1391.4	0	3.100	3.0	5.68	88	107.92	24,929.52	
	3.50	1570.9	0	3.500	0.0	6.42	88	107.76	28,103.80	
	4.50	2019.7	0	4.500	0.0	8.25	88	107.28	35,972.80	
	5.50	2468.6	0	5.500	0.0	10.08	88	106.70	43,729.26	
	6.50	2917.4	0	6.500	0.0	11.92	88	106.03	51,352.17	
	7.50	3366.2	0	7.500	0.0	13.75	88	105.25	58,821.08	
	8.50	3815.1	0	8.500	0.0	15.58	88	104.39	66,116.01	
	9.50	4263.9	0	9.500	0.0	17.42	88	103.43	73,217.39	
	10.50	4712.7	0	10.500	0.0	19.25	88	102.39	80,105.96	
	11.50	5161.6	0	11.500	0.0	21.08	88	101.25	86,762.78	
	12.50	5610.4	0	12.500	0.0	22.92	88	100.03	93,169.16	
	13.50	6059.2	0	13.500	0.0	24.75	88	98.72	99,306.67	
	14.50	6508.0	0	14.500	0.0	26.59	88	97.33	105,157.08	
	15.50	6956.9	0	15.500	0.0	28.42	88	95.85	110,702.36	
	16.50	7405.7	0	16.500	0.0	30.25	88	94.29	115,924.68	
	17.50	7854.5	0	17.500	0.0	32.09	88	92.64	120,806.35	
	18.50	8303.4	0	18.500	0.0	33.92	88	90.92	125,329.88	
	19.50	8752.2	0	19.500	0.0	35.75	88	89.11	129,477.89	
	20.50	9201.0	0	20.500	0.0	37.59	88	87.22	133,233.15	
	21.50	9649.9	0	21.500	0.0	39.42	88	85.25	136,578.57	
	22.50	10098.7	0	22.500	0.0	41.25	88	83.21	139,497.17	
	23.50	10547.5	0	23.500	0.0	43.09	88	81.08	141,972.10	
	24.50	10996.4	0	24.500	0.0	44.92	88	78.87	143,986.61	
	25.50	11445.2	0	25.500	0.0	46.75	88	76.59	145,524.05	
	26.50	11894.0	0	26.500	0.0	48.59	88	74.23	146,567.89	
	27.50	12342.9	0	27.500	0.0	50.42	88	71.79	147,101.68	
	28.50	12791.7	0	28.500	0.0	52.25	88	69.27	147,109.06	
	35.00	15709.1	0	35.000	0.0	64.17	88	51.08	133,210.31	
	36.00	16158	0	36.000	0.0	66.00	88	48.00	128,756.71	
	37.00	16607	0	37.000	0.0	67.84	88	44.85	123,640.92	
	38.00	17056	0	38.000	0.0	69.67	88	41.62	117,847.31	
	39.00	17504	0	39.000	0.0	71.51	88	38.32	111,360.29	
	40.00	17953	0	40.000	0.0	73.34	88	34.95	104,164.35	
	41.00	18402	0	41.000	0.0	75.17	88	31.50	96,244.03	
	42.00	18851	0	42.000	0.0	77.01	88	27.99	87,583.93	

From: DTL Hydro [sales@dtlhydro.com]
Sent: Thursday, June 28, 2012 12:40 PM
To: Edl, Michele
Subject: Fw: Request for budget pricing on small Hydroelectric Generatorreplacement.

Hi Michele,
Will this be enough information?
I will look to see if there is more.
Regards,
Robert Prior
DTL

----- Original Message -----

From: Ernie Bachman
To: sales@dtlhydro.com
Sent: Monday, May 15, 2006 10:21 AM
Subject: Request for budget pricing on small Hydroelectric Generatorreplacement.

Dear Sirs, I filled out a Project Data Sheet for a hydroelectric turbine generator set on your web site, but the Data Sheet failed to transmit. I decided to go ahead and e-mail you the info on the data sheet.

I entered the following data:

Name: Ernie Bachman
Company: US Bureau of Reclamation, Snake River Area Office, Department of the Interior
Address: 230 Collins Road
Boise, Idaho 83702, USA

E-mail: ebachman@pn.usbr.gov
Phone: 208-383-2270
Fax: 208-383-2275
Site Location: Small station-service hydrogenerator at Deadwood Dam near Boise, Idaho.
Available Gross Head: 132 feet (40 m)
Net head at design flow: 120 to 125 feet (@ pipe velocity of 5 ft/sec) 36 to 38 m

Design Flow: 2.5 cfs (.070 cubic meters/sec).
Low flow: 1.0 cfs, (.028 cubic meters/sec)
Average flow: 2.0 cfs (.057 cubic meters/sec)
Length of Penstock: 32 feet (10 m)
Penstock Diameter: 10" (.25 m)

Height of Dam: 137 feet (42 m)
Elevation of Powerhouse above sea level: 1625 m
Length of transmission line: 1/4 to 1/2 mile. (400 to 800 m)
Reservoir storage: 162,000 acre-feet impounded storage.(2.0 x 10⁸ cubic meters)
Expected Output: 20 KW
Is the dam built? Yes.
Will the system be connected to the grid? No.
Voltage Required: 240/480 v-ac
Cycles (hertz): 60 Cycles
Phases: Three phase

Other Comments: The proposed site is located at Deadwood Dam, which is owned and operated by the Bureau of Reclamation, Department of Interior, US gov. We have a small existing hydroelectric generator, which has operated for over 50 years, as a small station service generator for the . It operates from two 4-inch pipes, which come from the outlet works of the dam. We are looking into replacing the hydrogenerator with a new, larger capacity one, and would use a 10-inch outlet pipe coming directly from a 60-inch outlet pipe. The existing hydroelectric unit generates power off-grid for several cabins at the dam. A typical load is 30 amps at 240 volts (7.2KW), with peak loads up to 8 Kw or more. With the increased capacity of a new hydrogenerator, and the 10-inch pipe, we would like to be able to produce 20 KW (off grid) at a full head of 132 feet. Since the reservoir head fluctuates during the operating season from 40

meters down to about 29 meters, we could probably be looking at an optimal design head of around 35 meters.

If you are interested, I would appreciate a budgetary estimated cost for you to supply an appropriate turbine/generator set for this application, which would be installed by our own government forces.

Please contact me with any questions or for more clarification at the phone number or e-mail address listed above.

Thanks.

Ernie Bachman
US Bureau of Reclamation