

State of Idaho
Department of Water Resources
Water Right License
Water Right No. 77-14145

Priority: August 08, 2002

Maximum Diversion Rate: 0.22 CFS

Maximum Diversion Volume: 159 AF

It is hereby certified that:

UNIVERSITY OF IDAHO REGENTS
875 PERIMETER DR MS3162
MOSCOW ID 83844-3162

has complied with the terms and conditions of the permit, issued pursuant to Application for Permit dated August 08, 2002, and has submitted Proof of Beneficial Use on June 29, 2017. An examination confirms water is diverted from:

Source : PIONEER CREEK

Tributary: BIG CREEK

Beneficial Use

POWER

Period of Use

01/01 to 12/31

Rate of Diversion

0.22 CFS

Annual Volume

159 AF

Location of Point(s) of Diversion

PIONEER CREEK SW¼ NE¼, Sec. 3, Twp 20N, Rge 13E, B.M. VALLEY County

Place of Use: POWER

Twp	Rng	Sec	NE				NW				SW				SE			
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE
20N	13E	3			X													

Conditions of Approval

1. The point of diversion and place of use for this water right are unsurveyed land. The quarter-quarter description has been protracted from the adjacent public land survey.
2. The rights for the use of water confirmed in this license shall be junior and subordinate to all rights for the use of water other than hydropower, within the State of Idaho that are initiated later in time than the priority of this right and shall not give rise to any right or claim against any future rights for the use of water, other than hydropower, within the State of Idaho initiated later in time than the priority of this right.
3. This right does not constitute Idaho Public Utilities Commission or Federal Energy Regulatory Commission approval that may be required.
4. The term of this water right license shall extend to December 31, 2032. Prior to the expiration of the term, the Director may issue an order canceling all or any part of the use authorized herein, may establish a new term, or may revise, delete, or add conditions under which the subsequent water right license may be exercised. The order shall take effect on the date the current term expires. If the Director does not issue such an order, the term shall automatically extend to a length equal to the project's prior term and any prior conditions on the subsequent water right license shall remain in effect.
5. The following rights are diverted through point(s) of diversion described above: 77-7219 and 77-14145

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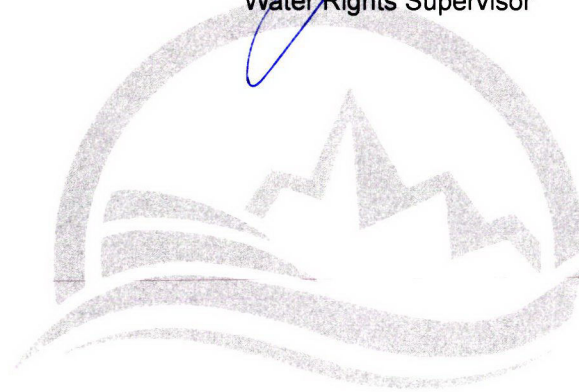
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Water Right No. 77-14145

6. Use of water under this right shall be non-consumptive.
7. This right does not grant any right-of-way or easement across the land of another.

This license is issued pursuant to the provisions of Idaho Code § 42-219. The water right confirmed by this license is subject to all prior water rights and shall be used in accordance with Idaho law and applicable rules of the Department of Water Resources.

Signed this 4th day of October, 2022.



CODY PARKER
Water Rights Supervisor

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Department of Water Resources
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77-14145

Water Service Area Boundary for University Of Idaho Regents
August 20, 2021



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

0 0.035 0.07 0.14 Miles

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IDAHO DEPARTMENT OF
WATER RESOURCES

322 E Front Street, Suite 648, Boise ID 83702 • PO Box 83720, Boise ID 83720-0098
Phone: 208-287-4800 • Fax: 208-287-6700 • Email: idwrinfo@idwr.idaho.gov • Website: idwr.idaho.gov

Governor Brad Little

Director Gary Spackman

October 11, 2022

UNIVERSITY OF IDAHO REGENTS
875 PERIMETER DR MS3162
MOSCOW ID 83844-3162

RE: License No. 77-14145

ISSUANCE OF LICENSE

Dear Water Right Holder:

The Department of Water Resources ("Department") has issued the enclosed Water Right License confirming that a water right has been established in accordance with your permit. Please be sure to thoroughly review all the conditions of approval listed on your license. The conditions may include ongoing requirements, such as maintenance of a measuring device or implementation of mitigation, as well as information about how your water use may be administered, such as regulation by a watermaster in a water district.

The license is a PRELIMINARY ORDER issued by the Department pursuant to Rule 730 of the Department's Rules of Procedure (IDAPA 37.01.01.730). It can and will become a final order without further action by the Department unless a party petitions for reconsideration, files exceptions, or requests a hearing as described in the enclosed information sheet.

Also, please note that water right owners are required to report any change of water right ownership and/or mailing address to the Department within 120 days of the change. Water right forms are available from any office of the Department or on the Department's website at idwr.idaho.gov

If you have any questions concerning the enclosed information, please contact me at (208) 287-4910.

Sincerely,

for Cody Parker
Water Rights Supervisor

Enclosures

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CERTIFICATE OF SERVICE

I hereby certify that on October 11, 2022, I served a true and correct copy of Water Right License No. 77-14145 by U.S. Mail, postage prepaid, to the following:

UNIVERSITY OF IDAHO REGENTS (Current Owner)
875 PERIMETER DR MS3162
MOSCOW ID 83844-3162



Debbi Judd
Technical Records Specialist

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 77-14145
Exam Date: 08/06/2019

1. Current Owner:
UNIVERSITY OF IDAHO REGENTS 875 PERIMETER DR MS3162 MOSCOW ID 83844-3162
2. Accompanied by: Andrew Armstrong
Phone No: (208) 315-2525
Address: Taylor Wilderness Research Center, HC83 Box 8070 Cascade, ID 83611
Relationship to permit Holder: Station Superintendent

3. **SOURCE:**
PIONEER CREEK

Tributary
BIG CREEK

Method of Determination: Field Observations

B. OVERLAP REVIEW

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

Water Right No.	Source	Purpose of Use	Basis
77-2219	Cliff Creek	Irrigation	
77-2219	Pioneer Creek	Irrigation	
77-2219	Rush Creek	Irrigation	

Comments:

Water Right 77-2219 was issued a partial decree in the Snake River Basin Adjudication (SRBA) on May 17, 2007 and has a priority date of March 6, 1948 for the purposes of domestic and irrigation uses. The irrigation component of the water right can annually divert 0.64 cfs from April 1st to October 30th. The domestic use of the water right can annually divert 0.11 cfs from January 1st to December 31st, and does not overlap with POU for the Water Right 77-14145. There are three (3) POD associated with this water right in which each POD is located in separate tributaries to Big Creek: 1. Cliff Creek, 2. Pioneer Creek, and 3. Rush Creek. In total, Water Right 77-2219 irrigates 32.0 Acres from the three (3) POD in various quarter-quarters in Sections 2 and 3 within T.20N and R.13E for the purposes of seasonal irrigation and annual domestic uses. The irrigation provided by each POD is not connected to any other respective POD and its associated irrigation system under this water right. A phone call with Steve Hacker, Senior Director for Operations and Outreach, was held on the 30th of August to confirm that each POD has its own separate irrigation system. Only the irrigation use of Water Right 77-2219 overlaps the POU for 77-14145.

2. Other water rights with the same point-of-diversion: NO Overlap

Water Right No.	Source	Purpose of Use	Basis
77-2219	Pioneer Creek	Irrigation	

Comments:

The irrigation use for Water Right 77-2219 in which the Pioneer Creek POD is used is also conveyed through the same penstock for Water Right 77-14145.

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

PIONEER CREEK SW¼ NE¼, Sec. 3, Twp 20N, Rge 13E, B.M. VALLEY County

Originally in the permit, the POD was located in the NW1/4 SE1/4 Sec. 3, T. 30N, R.13E. During the process of permitting the Water Right, it was determined the POD listed in the permit was located on U.S. Forest Service (USFS) property. Many attempts were made to permit the POD through the USFS, but the wilderness designation of the property where the POD was located required considerable environmental permitting in order to keep the POD at that location. Instead of keeping the POD on USFS property, the University of Idaho opted to move the POD onto the Taylor Ranch property to avoid the

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required permitting through the USFS. The POD was moved to the SW1/4 NE1/4 of Sec. 3 T.20N R. 13E. During the field examination this location was verified and documented using photographs and a hand held GPS unit.

Method of Determination: Visual Observation during the field examination (GPS Verification)

PLACE OF USE: POWER

Twp	Rng	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
20N	13E	3			X														

Method of Determination: Visual Observation during the field examination (GPS Verification)

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

4.

Well or Diversion ID No.*	Motor Make	Hp	Motor Serial No.	Pump Make	Pump Serial No. or Discharge Size
A0017567	N/A	N/A	N/A	N/A	N/A

D. FLOW MEASUREMENTS

1.

Measurement Equipment	Type	Make	Model No.	Serial No.	Size	Calib. Date
GE	Panametrics	PT878				

2. Measurements: Flow Measurement Made in the Field

Two flow measurements were made in the field. Both field measurements corroborated the theoretical and estimated flows described below. During both measurements, no errors were indicated by the flow meter. A table is provided below for each measurement showing the approximate velocity in the pipe, the volume passing through each time-step and the estimated flow in the field measurement based on the totalized volumes:

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1st Measurement:

Date/Time	RABBUE Ch 1 Velocity ft/s	Error	RABBUE C Error	RABBUE Ch 1 Fwd Totalizer gal	Error
8/6/2019 9:08	1.211726513	0	96.17229	0	1111169.269
8/6/2019 9:09	1.223007289	0	97.06762	0	1111263.871
8/6/2019 9:10	1.210361124	0	96.06392	0	1111361.367
8/6/2019 9:11	1.220428082	0	96.86291	0	1111456.369
8/6/2019 9:12	1.220131759	0	96.83939	0	1111553.901
8/6/2019 9:13	1.217234831	0	96.60947	0	1111652.36
8/6/2019 9:14	1.2200478	0	96.83273	0	1111750.243
8/6/2019 9:15	1.218956693	0	96.74613	0	1111845.47
8/6/2019 9:16	1.224218875	0	97.16378	0	1111943.608
8/6/2019 9:17	1.221373934	0	96.93798	0	1112038.804
8/6/2019 9:18	1.218005588	0	96.67064	0	1112136.507

Flow calculated from Totalizer

96.72371655 gpm
0.215516302 cfs

2nd Measurement:

Date/Time	RABBUE C Error	RABBUE C Error	RABBUE Ch 1 Fwd Totalizer gal	Error		
8/6/2019 9:32	1.221217	0	96.92554	0	1113464.439	0
8/6/2019 9:33	1.226075	0	97.31109	0	1113562.56	0
8/6/2019 9:34	1.217791	0	96.65359	0	1113661.273	0
8/6/2019 9:35	1.221389	0	96.93919	0	1113755.422	0
8/6/2019 9:36	1.219882	0	96.81954	0	1113854.313	0
8/6/2019 9:37	1.219819	0	96.81461	0	1113948.396	0
8/6/2019 9:38	1.217477	0	96.6287	0	1114047.083	0
8/6/2019 9:39	1.211169	0	96.12805	0	1114140.65	0
8/6/2019 9:40	1.230225	0	97.64048	0	1114239.473	0
8/6/2019 9:41	1.233919	0	97.93366	0	1114338.342	0
8/6/2019 9:42	1.220025	0	96.8309	0	1114433.791	0

Flow calculated from Totalizer

96.93515947 gpm
0.215987432 cfs

E. FLOW CALCULATIONS

x Additional Computation Sheets Attached

Measured Method: Theoretical Calculation & Field Measurement

To corroborate the flow measurement in the field, a theoretical calculation was made knowing the dimensions of the nozzle and the amount of head acting on the turbine using IDWR's sprinkler nozzle rate calculator. The calculations are provided in Figure 5.

Theoretical flow calculations using Bernoulli's and Darcy-Weisbach's equations were also performed to verify flows measured in the field. They are presented below.

Head = 66 ft

Length of Pipe = 839 (approximated)

Pipe Diameter: 0.5 ft

K for fittings: 15 (estimated based on coefficients for inlet, bends, valves etc.)

Friction factor: .02 for the 4" pipeline and .005 for the 6" pipeline (Based on iterations using the Moody diagram and pipe roughness estimates)

Area: $A = \pi D^2/4 = 0.196 \text{ ft}^2$ for 6" Diameter Pipe

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Velocity : $V = [\text{Head} \times 2g / (fL/D + K)]^{1/2} = 1.14 \text{ ft/s}$ for the 6" pipeline and 53.2 ft/s at the nozzle (Bernoulli's Equation and the continuity equation were used to determine velocity using the estimated friction and minor losses in the system).

Flow : Area x Velocity = $1.14 \text{ ft/s} \times 0.196 \text{ ft}^2 = 0.22 \text{ ft}^3/\text{s}$ (which is consistent with the field measurement).

F. VOLUME CALCULATIONS

1. Volume Calculations for irrigation:

N/A

2. Volume Calculations for Other Uses:

Power is generated for uses on site all year. The volume associated with power generation is calculated below:

$Q_{\text{power}} = 0.22 \text{ cfs}$

Daily Volume: $0.22 \text{ cfs} \times 86,400 \text{ sec/day} = 19,008 \text{ ft}^3/\text{day}$ converts to 0.4363 Ac-ft/day

Annual Volume: $0.4363 \text{ Ac-ft/day} \times 365 \text{ days} = 159.27 \text{ Ac-ft}$

G. NARRATIVE/REMARKS/COMMENTS

At the time the permit 77-14145 was issued, the location of the POD and POU were unsurveyed and broadly described as follows: "the POD could be listed in the NESE and the place of use could be listed in the SENE or the N/1/2 of the SE". While processing the beneficial use exam it was confirmed that both the POD and POU are located in the SWNE of Section 3. The records were updated to reflect the locations identified and no amendment to the license is needed.

The Station Superintendent stated the required flow meter on the 6" penstock had not worked correctly since it was installed. Several attempts have been made to calibrate the flow meter and each was unsuccessful. The original contractor who installed the device may not have installed the transducer correctly and access to the transducer is difficult because of the buried depth of the penstock.

The system as observed in the field was consistent with the requirements of the permit that was issued by IDWR.

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

H. RECOMMENDATIONS

1. Recommended Amounts

Beneficial Use	Period of Use	Rate of Diversion	Annual Volume
POWER	01/01 to 12/31	0.22 CFS	159 AFA

Totals: 0.22 CFS

(CP)

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 ☐ None

I. AUTHENTICATION

Randy Broesch - Engineer Tech 1

Field Examiner's Name: Randall A. Bunch P.E. Date: 01-SEPT-2021

Reviewer: Cody Rich Date: 09-04-22

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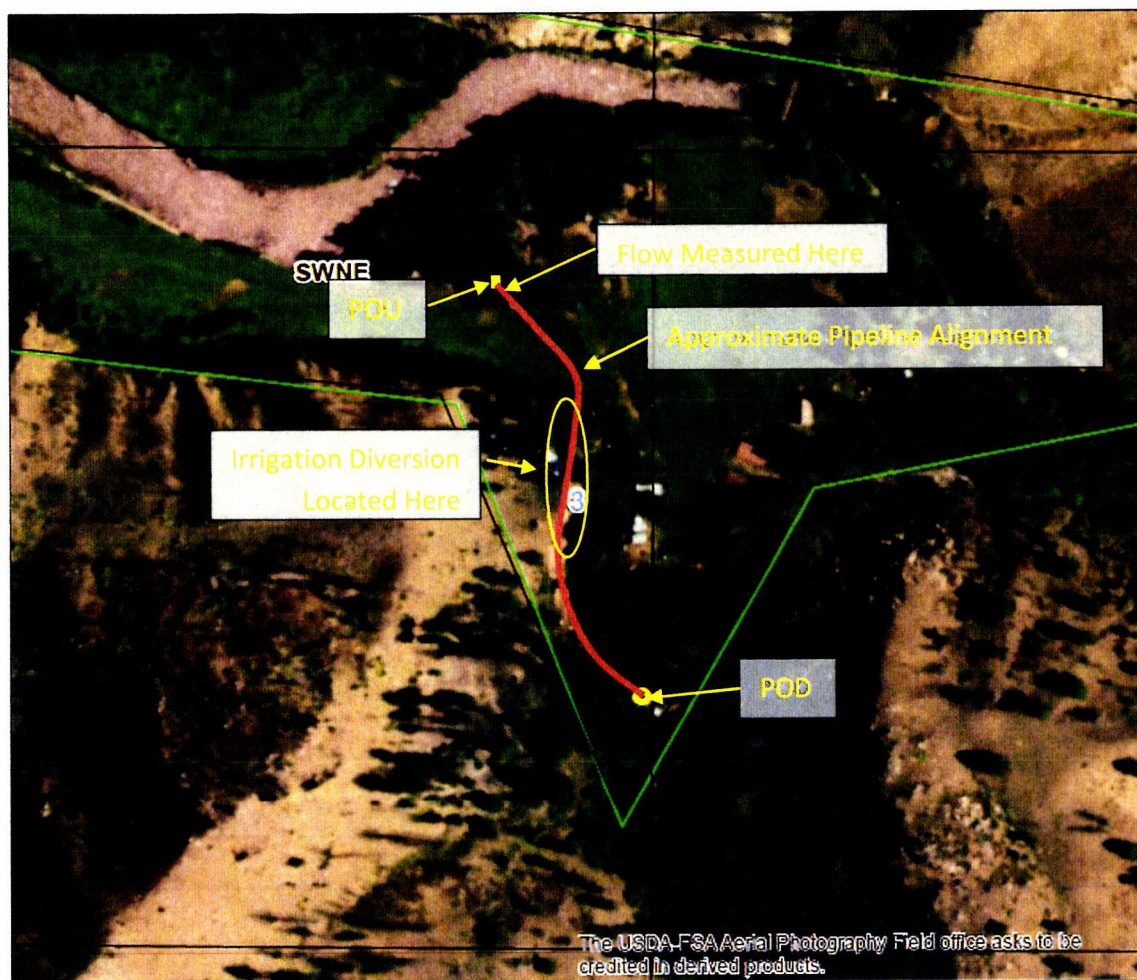


Figure 1 Field Exam Map of Place of Use (POU) and Point of Diversion (POD) and Approximate Pipeline Location

Water is diverted from Pioneer Creek into a diversion structure at the POD indicated in Figure 1. The pipeline alignment is approximated in Figure 1 and carries both irrigation and hydropower flows to the POU where the turbine is housed in a wood enclosure. The irrigation component of flow in the penstock is diverted prior to flows reaching the turbine. It should also be noted that the other two POD for the irrigation are not interconnected with the irrigation provided by Pioneer Creek and the associated hydropower unit.

Once flows reach the wood enclosure, the flow is used to turn the pelton wheel in the turbine, and then the flows are discharged into a channel that returns flows back to Pioneer Creek before Pioneer Creek discharges in to Big Creek.

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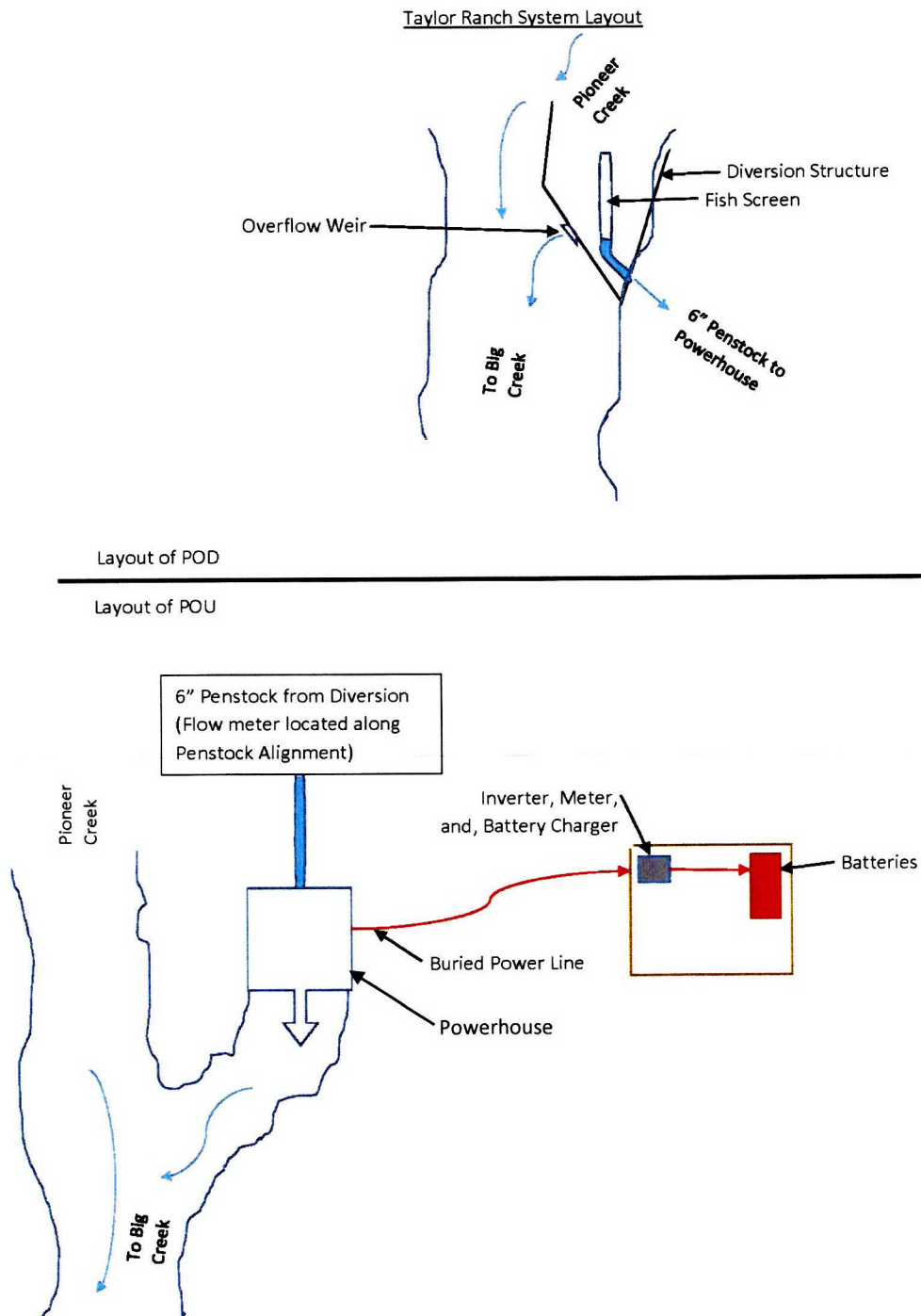


Figure 2 Schematic of the Taylor Ranch Power Generation System

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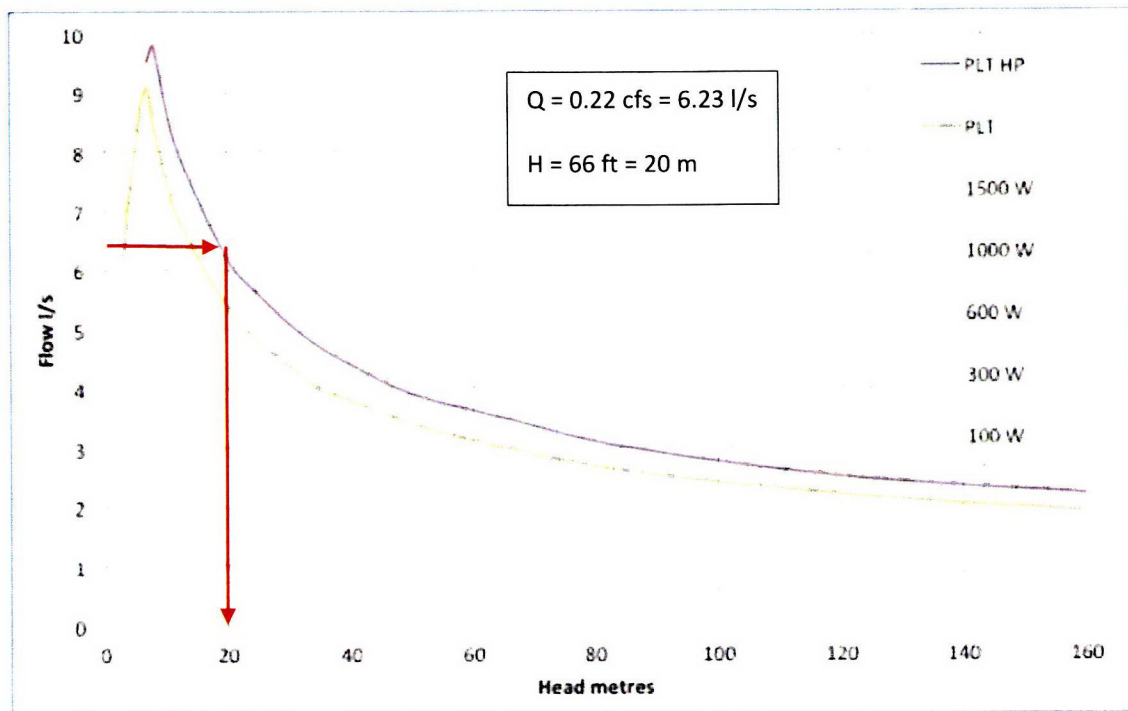


Figure 3 Flow vs Head Chart for Turbine

Based on the flows measured in the field, using the manufacturers information for the turbine it is estimated there is approximately 66 ft of head acting on the turbine during operations.

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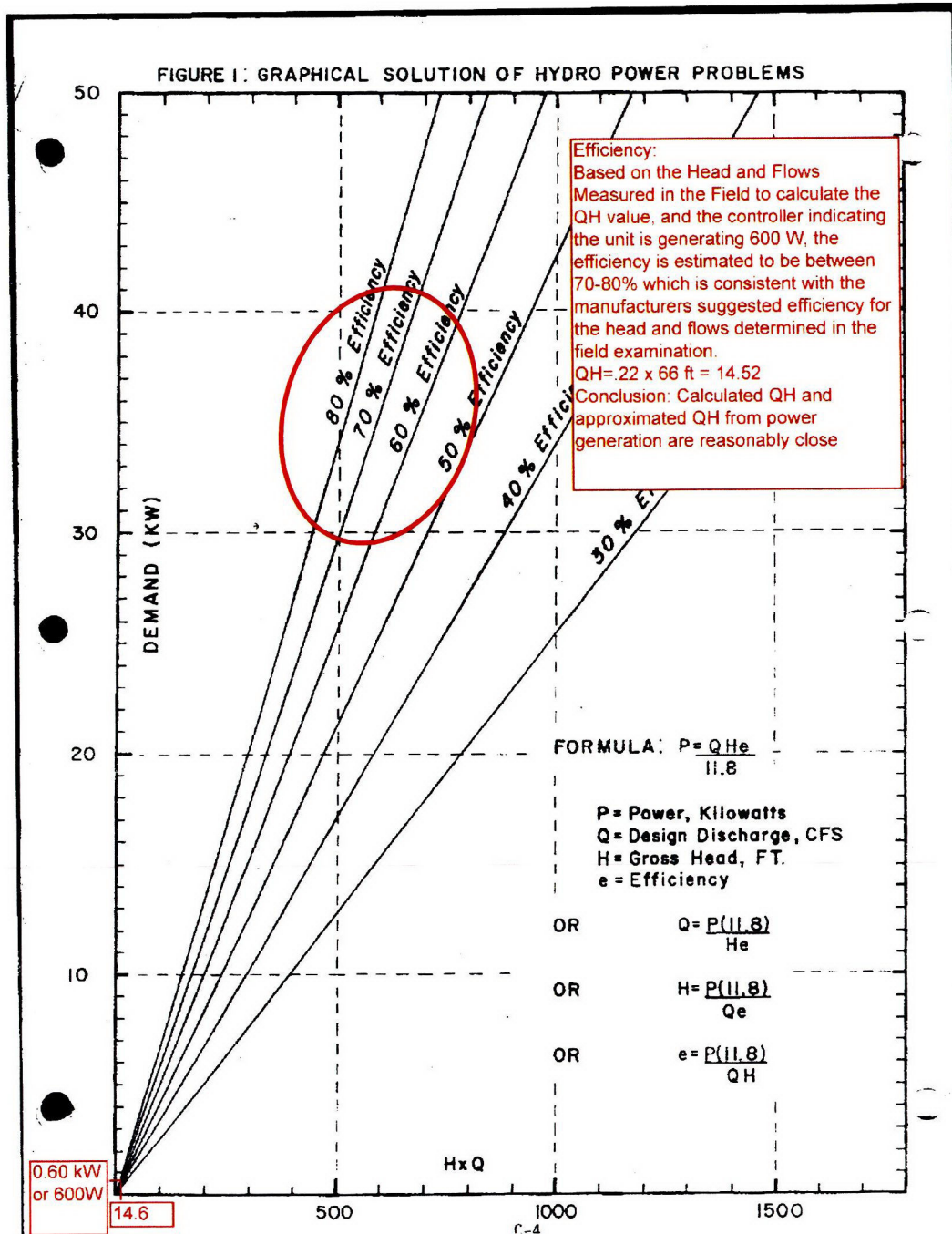


Figure 4 Hydropower Power Efficiency Verification

Based on the power generation indicated on the control panel, the estimated power generation of the turbine was 0.98 kW at the time of the field inspection. Based on the chart provide in Administrator's Memorandum 24 for Approval of Permits for Power Purposes, the efficiency of the system can be estimated to be between 60-80%. The manufacturer's literature suggests an efficiency of greater than 70% but less than 80%. The chart in the Administrator's Memorandum 24 approximates the manufacturers claim for efficiency based on measurements made in the field.

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Sprinkler Nozzle Flow Rate Calculator[READ ME](#)**Step 1 - Specify 1st Nozzle Type Configuration**

Select Sprinkler Coefficient, C

☒ User Defined ☐ Theoretical Maximum

Input C Value:

0.9

Input Nozzle Pressure:

66

ft of water ▼

Input Nozzle Diameter:

0.5938

in ▼

Input Number of Type 1 Sprinkler Nozzles:

2

Step 2 - Specify 2nd Nozzle Type Configuration

Select Sprinkler Coefficient, C

☐ User Defined ☒ Theoretical Maximum

Input Nozzle Pressure:

psi ▼

Input Nozzle Diameter:

in ▼

Input Number of Type 2 Sprinkler Nozzles:

Step 3 - Specify 3rd Nozzle Type Configuration

Select Sprinkler Coefficient, C

☐ User Defined ☒ Theoretical Maximum

Input Nozzle Pressure:

psi ▼

Input Nozzle Diameter:

in ▼

Input Number of Type 3 Sprinkler Nozzles:

Flow Rate Summary

Type 1 Nozzle(s): 0.226

Type 2 Nozzle(s): 0.000

Type 3 Nozzle(s): 0.000

Combined: 0.226

cfs ▼

Figure 5 IDWR Calculation to Estimate Hydropower Flow

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Figure 6 POD Showing Fish Screen and Diversion Structure in Pioneer Creek

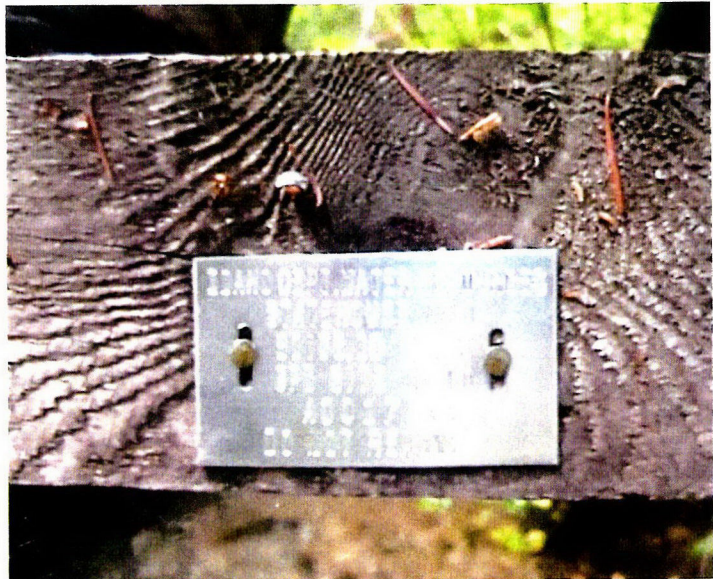


Figure 7 Administrative Tag for POD found on Site

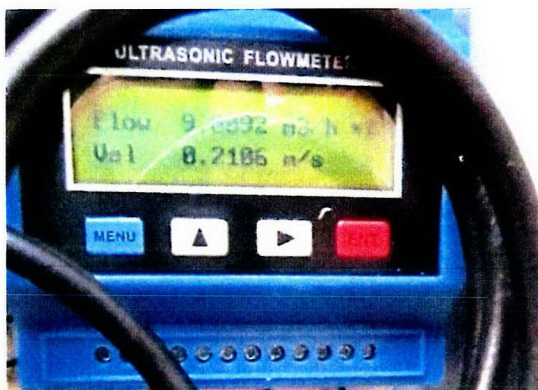


Figure 8 Flow Meter Reading for 6" Penstock
(Note: Station Superintendent Stated the Flow Meter Never Worked Correctly After Installation)



Figure 9 POU for Turbine Housed in a Wood Enclosure

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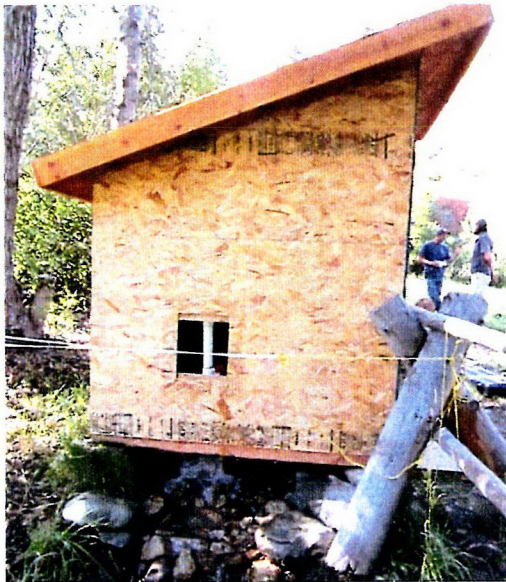


Figure 10 POU outfall from the Turbine (Flows Returning to Pioneer Creek)



Figure 11 POU showing Turbine inside Enclosure



Figure 12 Penstock Penetrating Through Enclosure floor & 4" Pipes leading to 2 Nozzle Locations on the Turbine



Figure 13 Field Measurement on the 6" Penstock

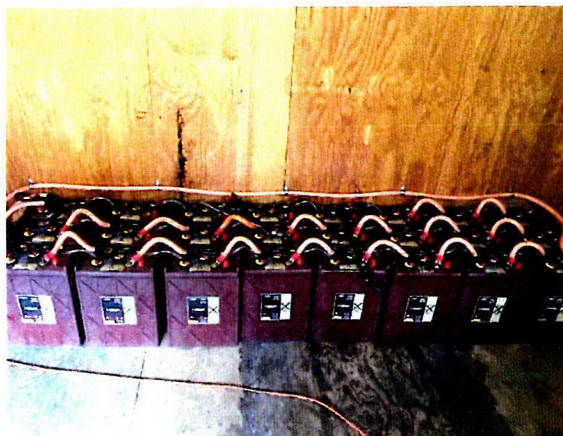


Figure 14 Batteries to Store Power for the System



Figure 15 Control Panel for the Batteries & Hydropower Systems

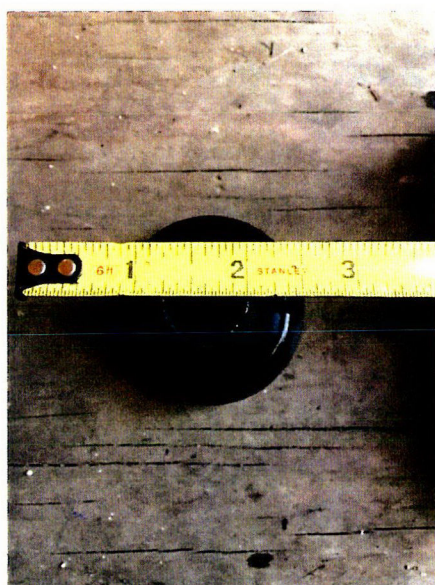


Figure 16 Nozzle Diameter to Turbines

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