

State of Idaho
Department of Water Resources
Water Right License

WATER RIGHT NO. ~~85-15653~~ 82-12262

Priority: January 13, 2006

Maximum Diversion Rate: 0.20 CFS
Maximum Diversion Volume: 145.0 AF

It is hereby certified that OI MIN ANTHONY CHAI
Or
JEROSSELLE C CHAI
183 FARRENS CREEK LN
GRANGEVILLE ID 83530

has complied with the terms and conditions of the permit, issued pursuant to Application for Permit dated January 13, 2006; and has submitted Proof of Beneficial Use on May 22, 2009. An examination confirms water is diverted from:

SOURCE

FARRENS CREEK

Tributary: SOUTH FORK CLEARWATER RIVER

and a water right has been established as follows:

BENEFICIAL USE

POWER

PERIOD OF USE

01/01 to 12/31

DIVERSION RATE

0.20 CFS

**ANNUAL
DIVERSION VOLUME**

145.0 AF

LOCATION OF POINT(S) OF DIVERSION:

FARRENS CREEK NE¼NW¼ Sec. 11, Twp 29N, Rge 03E, B.M. IDAHO County

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	
29N	03E	11			X														

CONDITIONS OF APPROVAL

1. Use of water under this right shall be non-consumptive.
2. This right does not constitute Idaho Public Utilities Commission or Federal Energy Regulatory Commission approval that may be required.
3. 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.
4. The term of this right shall extend to 12/31/2031. 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 right 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 water right shall remain in effect.

This license is issued pursuant to the provisions of Section 42-219, Idaho Code. 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 28th day of August, 2013.

SCANNED
AUG 29 2013
Shelley W. Keen
for GARY SPACKMAN
Director

State of Idaho
Department of Water Resources
Water Right License

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POWER	01/01 to 12/31	0.20 CFS	145.0 AF

LOCATION OF POINT(S) OF DIVERSION:

FARRENS CREEK NE¼NW¼ Sec. 11, Twp 29N, Rge 03E, B.M. IDAHO County

PLACE OF USE: POWER

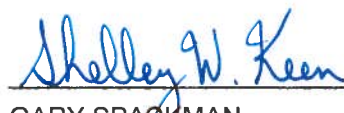
Twp	Rge	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
29N	03E	11		X															

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Signed this 28th day of August, 2013.


for GARY SPACKMAN
Director



State of Idaho

DEPARTMENT OF WATER RESOURCES

322 East Front Street • P.O. Box 83720 • Boise, Idaho 83720-0098

Phone: (208) 287-4800 • Fax: (208) 287-6700 • Website: www.idwr.idaho.gov

C.L. "BUTCH" OTTER
Governor

GARY SPACKMAN
Director

August 29, 2013

OI MIN ANTHONY CHAI
JEROSSELLE C CHAI
183 FARRENS CREEK LN
GRANGEVILLE ID 83530

RE: License No. 85-15653

Issuance of License

Dear Water Right Holder(s):

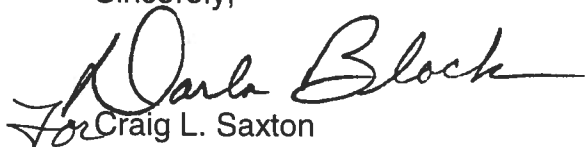
The Department of Water Resources has issued the enclosed Water Right License confirming that a water right has been established in accordance with your permit. Please be sure to thoroughly review the conditions of approval and remarks listed on your license.

The license is a PRELIMINARY ORDER issued by the Department pursuant to section 67-5243, Idaho Code. It can and will become a final order without further action by the Department unless a party petitions for reconsideration or files an exception and/or brief within fourteen (14) days of the service date as described in the enclosed information sheet.

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. Failure to report these changes could result in a \$100 late filing fee. Contact any office of the Department or visit the Department's homepage on the Internet to obtain the proper forms and instructions.

If you have any questions, please contact me at 208-287-4916.

Sincerely,



For Craig L. Saxton

Water Rights Supervisor

Enclosure(s)

CERTIFICATE OF SERVICE

I hereby certify that on August 30, 2013, I mailed a true and correct copy, postage prepaid, of the foregoing PRELIMINARY ORDER (Approved License) to the person(s) listed below:

RE: WATER RIGHT NO.

85-15653

**JEROSSELLE C CHAI
183 FARRENS CREEK LN
GRANGEVILLE ID 83530**

**OI MIN ANTHONY CHAI
183 FARRENS CREEK LN
GRANGEVILLE ID 83530**



**Darla Block
Technical Records Specialist**

EXPLANATORY INFORMATION TO ACCOMPANY A PRELIMINARY ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 730.02)

The accompanying order or approved document is a "Preliminary Order" issued by the department pursuant to section 67-5243, Idaho Code. **It can and will become a final order without further action of the Department of Water Resources ("department") unless a party petitions for reconsideration, files an exception and brief, or requests a hearing as further described below:**

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a preliminary order with the department within fourteen (14) days of the service date of this order. **Note: the petition must be received by the department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See Section 67-5243(3) Idaho Code.

EXCEPTIONS AND BRIEFS

Within fourteen (14) days after: (a) the service date of a preliminary order, (b) the service date of a denial of a petition for reconsideration from this preliminary order, or (c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration from this preliminary order, any party may in writing support or take exceptions to any part of a preliminary order and may file briefs in support of the party's position on any issue in the proceeding with the Director. Otherwise, this preliminary order will become a final order of the agency.

REQUEST FOR HEARING

Unless a right to a hearing before the Department or the Water Resource Board is otherwise provided by statute, any person aggrieved by any final decision, determination, order or action of the Director of the Department and who has not previously been afforded an opportunity for a hearing on the matter may request a hearing pursuant to section 42-1701A(3), Idaho Code. A written petition contesting the action of the Director and requesting a hearing shall be filed within fifteen (15) days after receipt of the denial or conditional approval.

ORAL ARGUMENT

If the Director grants a petition to review the preliminary order, the Director shall allow all parties an opportunity to file briefs in support of or taking exceptions to the preliminary order and may schedule oral argument in the matter before issuing a final order. If oral arguments are to be heard, the Director will within a reasonable time period notify each party of the place, date and hour for the argument of the case. Unless the Director orders otherwise, all oral arguments will be heard in Boise, Idaho.

CERTIFICATE OF SERVICE

All exceptions, briefs, requests for oral argument and any other matters filed with the Director in connection with the preliminary order shall be served on all other parties to the proceedings in accordance with IDAPA Rules 37.01.01302 and 37.01.01303 (Rules of Procedure 302 and 303).

FINAL ORDER

The Director will issue a final order within fifty-six (56) days of receipt of the written briefs, oral argument or response to briefs, whichever is later, unless waived by the parties or for good cause shown. The Director may remand the matter for further evidentiary hearings if further factual development of the record is necessary before issuing a final order. The department will serve a copy of the final order on all parties of record.

Section 67-5246(5), Idaho Code, provides as follows:

Unless a different date is stated in a final order, the order is effective fourteen (14) days after its service date if a party has not filed a petition for reconsideration. If a party has filed a petition for reconsideration with the agency head, the final order becomes effective when:

- (a) The petition for reconsideration is disposed of; or
- (b) The petition is deemed denied because the agency head did not dispose of the petition within twenty-one (21) days.

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, if this preliminary order becomes final, any party aggrieved by the final order or orders previously issued in this case may appeal the final order and all previously issued orders in this case to district court by filing a petition in the district court of the county in which:

- i. A hearing was held,
- ii. The final agency action was taken,
- iii. The party seeking review of the order resides, or
- iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of this preliminary order becoming final. See section 67-5273, Idaho Code. The filing of an appeal to district court does not itself stay the effectiveness or enforcement of the order under appeal.

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 85-15653

Exam Date: 6/13/2012

1. Current Owner: OI MIN ANTHONY CHAI
JEROSELLE C CHAI
183 FARRENS CK LN
GRANGEVILLE ID 83530
(208)983-6276

2. Accompanied by: Anthony Chai

3. SOURCE

FARRENS CREEK

TRIBUTARY

SOUTH FORK CLEARWATER RIVER

B. OVERLAP REVIEW

1. Other water rights with the same place of use: None; 85-15652 (this is for the domestic use at the house)
2. Other water rights with the same point of diversion: None

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

FARRENS CREEK NE1/4NW1/4 Sec. 11, Twp 29N, Rge 03E, B.M. IDAHO County

Method of Determination: GPS

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	
29N	03E	11		X															

Method of Determination: The POU is where the WATER is used not the where the POWER is used. Note that the current PLSS layers in ArcMap places the power house in the SWSE of Section 2. However, the DRG map shows the power house within the NWNE as permitted. During a meeting with Shelley Keen, we decided to keep the POU's legal description as permitted (see attached map).

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 MakeHpMotor Serial No.Pump MakePump Serial No. or Discharge
Size

No tag placed—gravity fed system

D. FLOW MEASUREMENTS

1.

Measurement
EquipmentTypeMakeModel No.Serial No.SizeCalib. Date

Bucket and stopwatch

2. Measurements:

- 1). Bucket and stopwatch method (2 fills with a 5 gallon bucket)
- 2). Back-calculation using $Q=VA$
- 3). Flows through nozzles with given sizes
- 4). Manning's Equation
- 5). Hydroelectric power output estimation formula

E. FLOW CALCULATIONS

___x___ Additional Computation Sheets Attached

Measured Method:

1). The area to measure the flow at the discharge point was very steep, difficult, and a diversion rate that was too high to obtain a really good measurement. I conducted two measurement using the bucket and stopwatch method. The first 5 gallon bucket fill took 3.20 seconds and the second fill took 4.13 seconds. Those two measurements average 83.2gpm or 0.19 cfs.

2). I made a few measurements so I can calculate the surface area of the water in the pipe. I obviously could not acquire a velocity measurement but I back-calculated using the result from above to see if the result made sense.

INLET PIPE $Q = VA$

$$0.19 \text{ ft}^3/\text{second} = V \times 0.087 \text{ ft}^2$$

$$V = 2.18 \text{ feet/second (velocity is } < 5 \text{ fps so it makes sense)}$$

$$Q = 0.19 \text{ cfs}$$

V = solve for

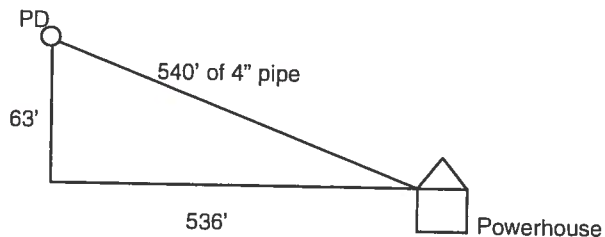
A = 4" pipe has an area of 0.087 ft²

3). The permit holder has two sets of 3 nozzles (3/8 or 1/2). He interchanges the nozzles when they need cleaned. The permit holder either has all three nozzles set to the 3/8 nozzles or he has the 1/2 nozzles installed, he never mixes them. Farrens Creek is at an elevation of 3980' and the power house is at 3917' for a difference of 63'. I used the attached spreadsheet to calculate the flow through the two different sets of nozzles as follows:

3/8 nozzles at 63' head = 21.4 gpm x 3 nozzles = 64.2 gpm or 0.14 cfs

1/2 nozzles at 63' head = 38 gpm x 3 nozzles = 114 gpm or 0.25 cfs

4). I have attached the results from the Manning's Equation worksheet. My inputs were 4" pvc pipe piped over 540'. The elevation at the PD is 3980' and the power house is at 3917'. The result is 0.94 cfs.



5). Dynamic Head (ft) x Flow (GPM) x 0.18 x Turbine Efficiency (use 0.40) = Output watts (480) known 4 amps per the permit holder and standard 120 volts in homes in U.S. (watts = amps x volts)

$$63 \text{ ft} \times \text{FLOW} \times 0.18 \times 0.40 = 480 \rightarrow \text{Flow} = 105.8 \text{ gpm or } 0.24 \text{ cfs}$$

Conclusion: It appears that the physical measurement I made with a bucket and stopwatch may not have been as far off as I originally thought. Given the diversion rate of 0.19 cfs, the velocity makes sense. In addition, the predicted diversions of 0.14 to 0.25 cfs through the nozzles place the measured rate within the range. Lastly, the result in #5s equation supports the physical measurement. Note that the Manning Equation result is obviously not the limiting factor. I suspect that the large pipe is used on the system to build the head against the nozzles.

F. VOLUME CALCULATIONS

1. Volume Calculations for Irrigation: NA
2. Volume Calculations for Other Uses: Power

$$0.20 \times 1.9835 \times 365 = 145 \text{ afa}$$

G. NARRATIVE/REMARKS/COMMENTS

The permit holder stated that they only run 4 amps in the house and that they must be efficient in every way to make sure there's enough power to meet their needs. The hydro is the permit holders only source of power. I believe that the volume can be licensed at the fully capacity since the hydro provides just enough to power the household; the full volume of water is beneficially used.

There are two conditions on the permit that are of concern. The following condition is standard on all power permits:

The right holder shall install a measuring device that can be used to determine the instantaneous rate of flow of water through the system, or the right holder shall provide to the department a flow rate measurement or computation made by a certified water right examiner in accordance with actual system design and operation.

Even though the permit holder has not installed a measuring device he could readily measure the un-diverted flow in both Farren's Creek at the point of diversion and the water that is discharging back into Farrens Creek after running through the power house. In addition, I was able to figure out flow rate based on actual system design. I consider this condition met. I reviewed micro-hydro power licenses that were issued in the last few years and see that this condition is simply removed at licensing.

The second condition that needs addressed says:

The Director retain jurisdiction for a period of five years to require a minimum bypass flow to maintain riparian or aquatic habitat for threatened or endangered wildlife species.

It appears that this condition was placed on the permit due to concerns by IDFG and IDEQ with the de-watering of Farrens Creek and wildlife habitat. It seems that IDWR gave IDFG and IDEQ five years to supply information to support their claims...that wildlife would be negatively affected. To date IDWR has not received any supporting information or any other correspondence from IDFG or IDEQ. This condition will be removed at the licensure of this right.

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	0.200 CFS	145.0 AF
<u>Totals:</u>		0.200 CFS	145.0 AFA

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

Field Examiner's Name Cherie Palmer Date 10/12/12
Reviewer Greg L. Taylor Date 2/26/13

ATTACHMENTS

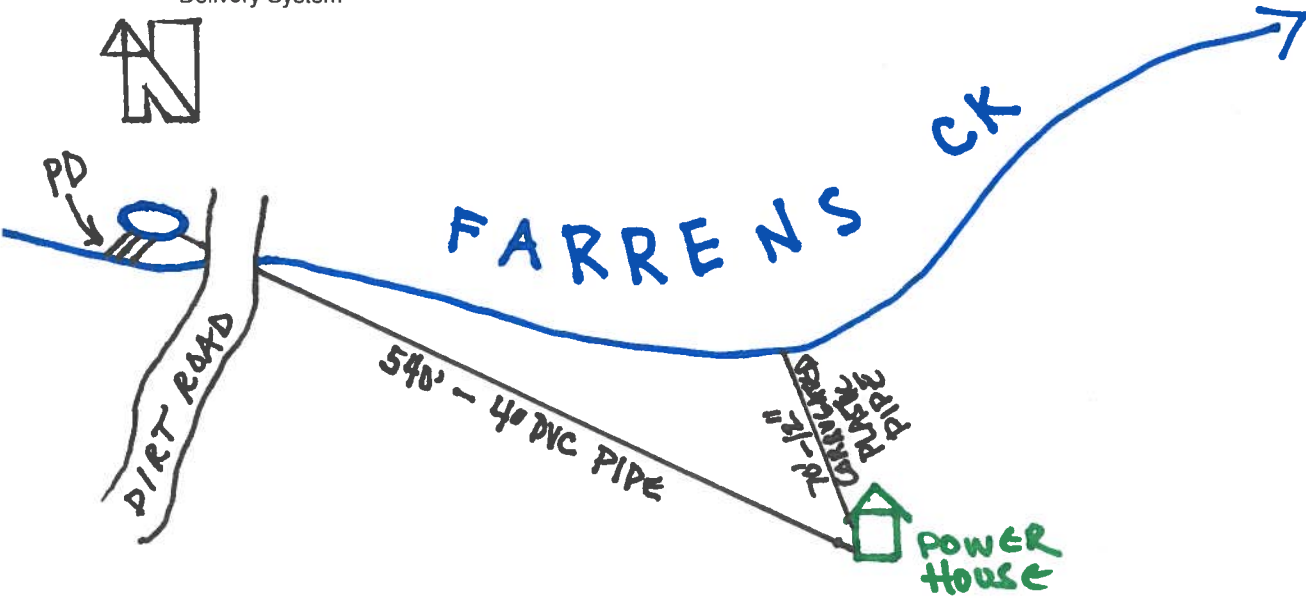
- #1: Manning's Equation Worksheet for a 4" pipe
- #2: Hydro fact sheet, Hydroelectric power output formula
- #3: Flow through nozzles
- #4: Alternative Machine and Power website print-out discussing their systems

Condition 258

Permit issued 2006 + *25 years = 2031

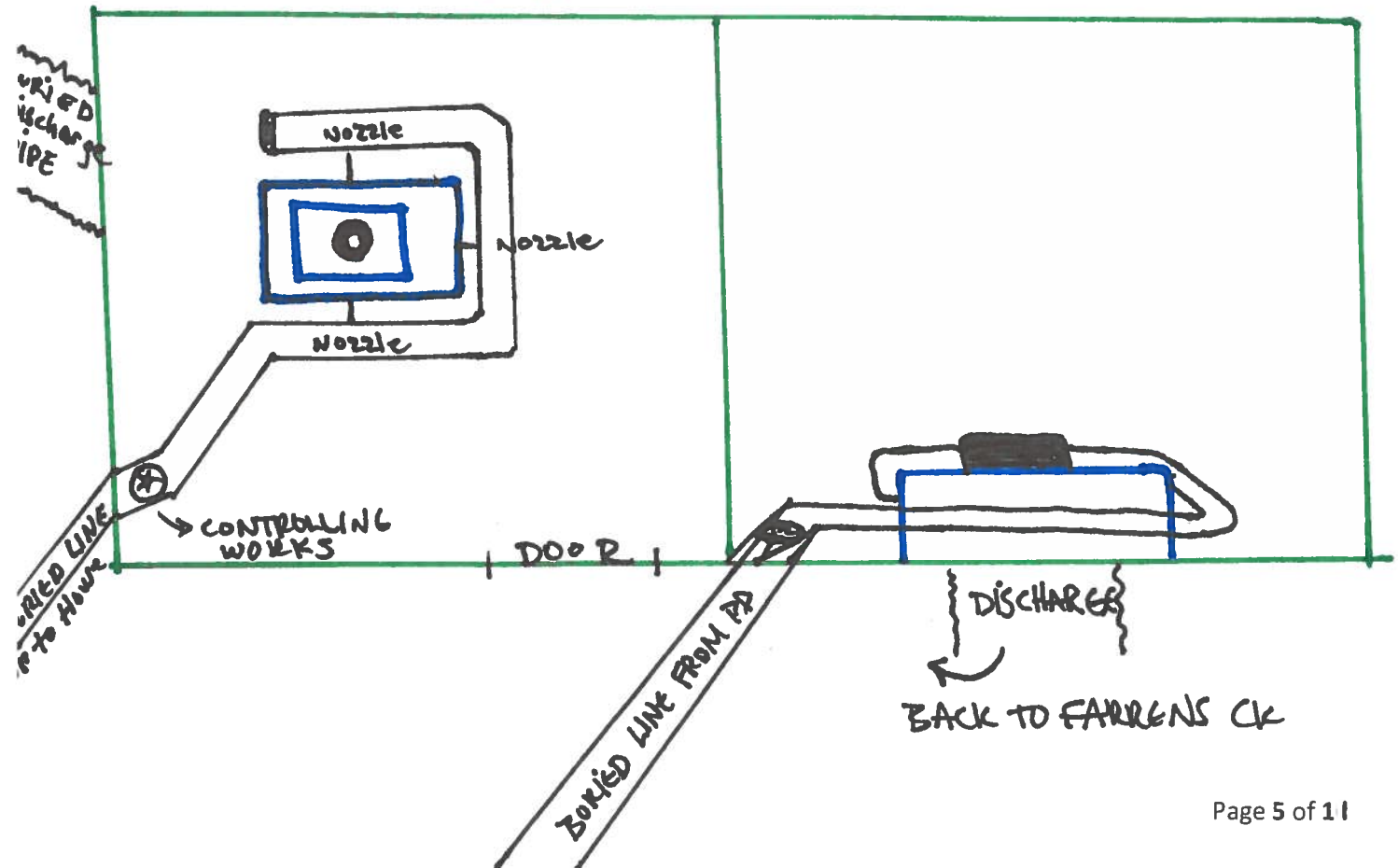
*Based on personal, micro-hydro that is well maintained

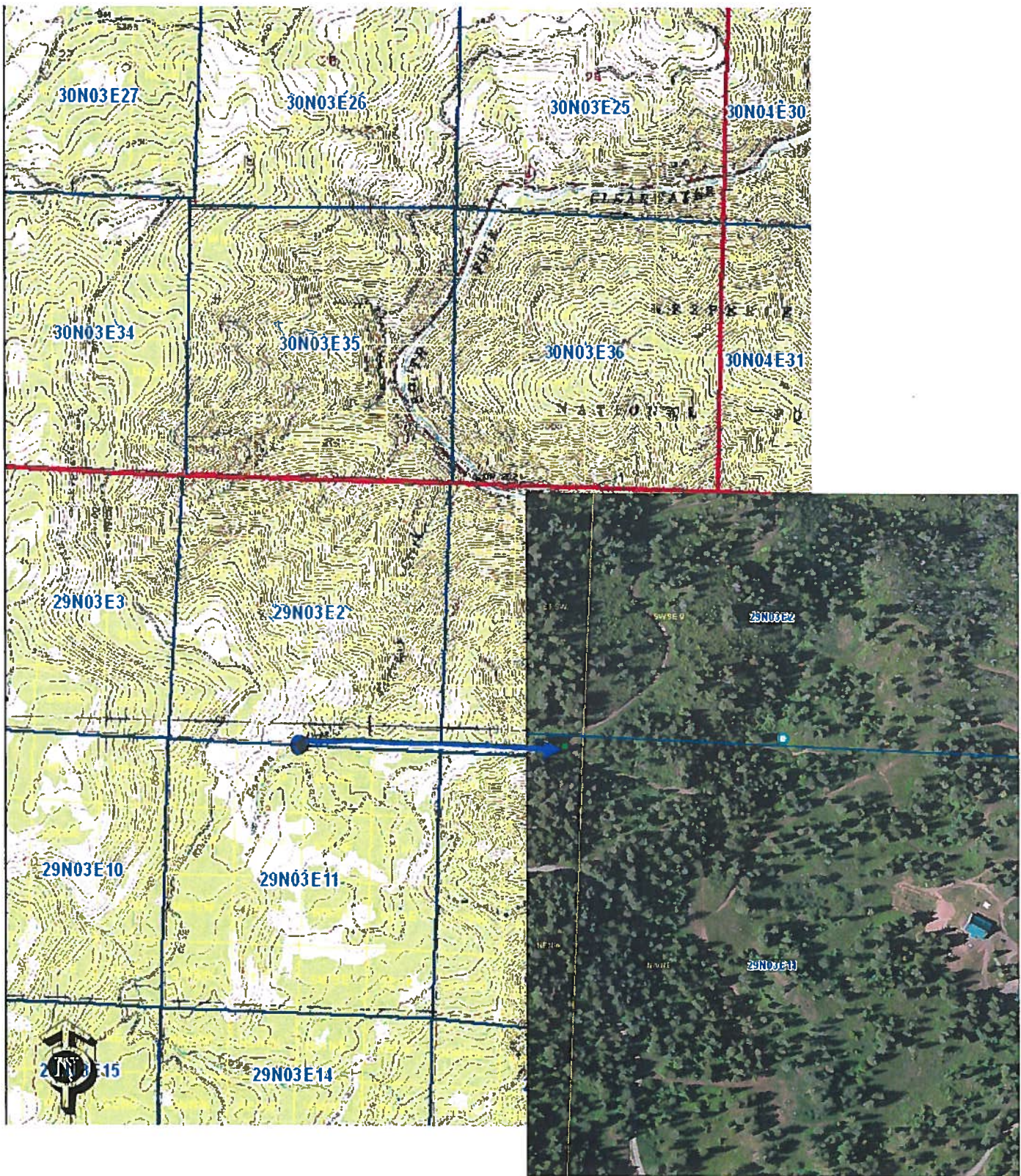
Delivery System

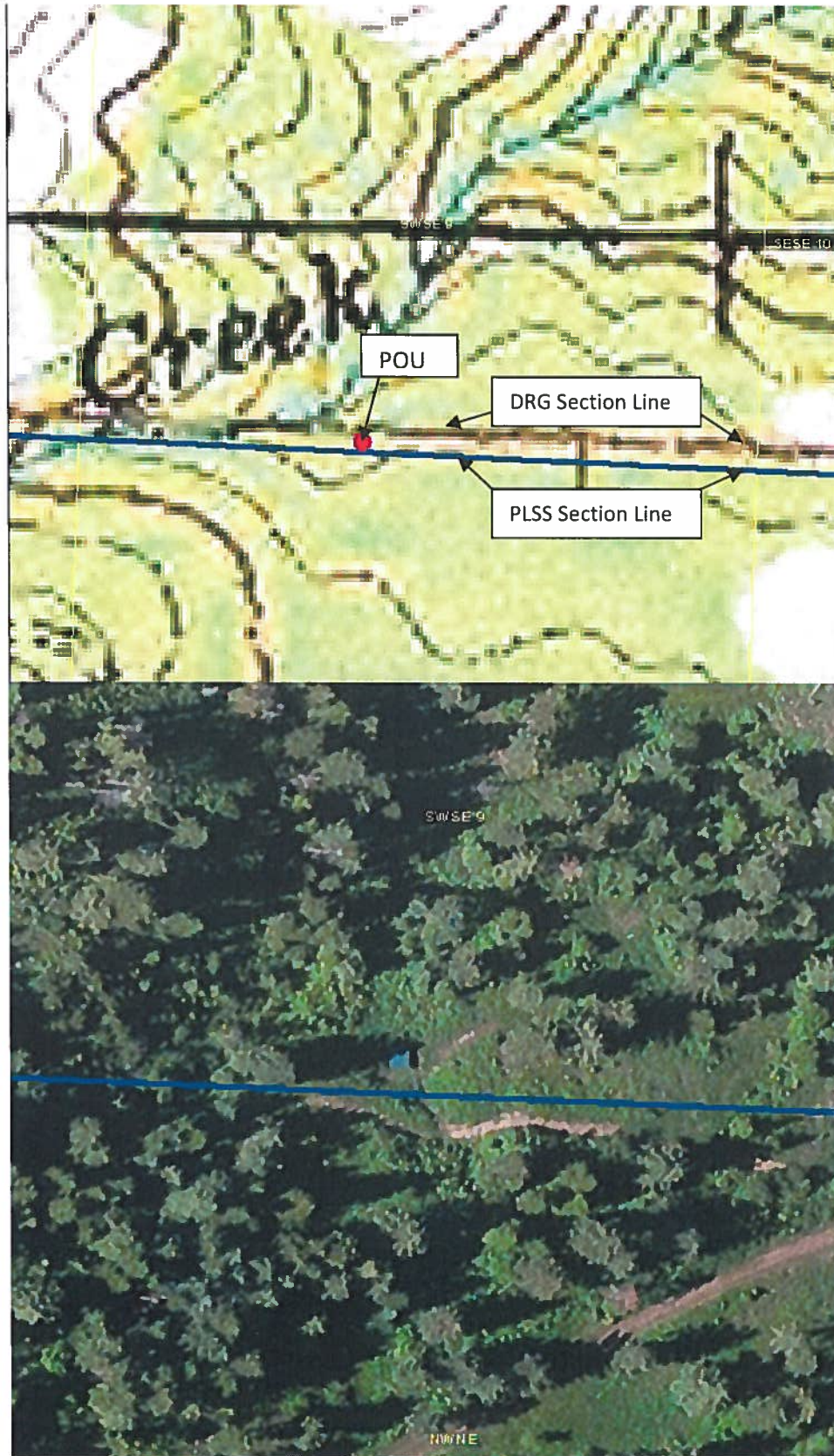


Aerial View of Inside the POWER HOUSE

Cross Section of the POWER HOUSE







BING IMAGERY

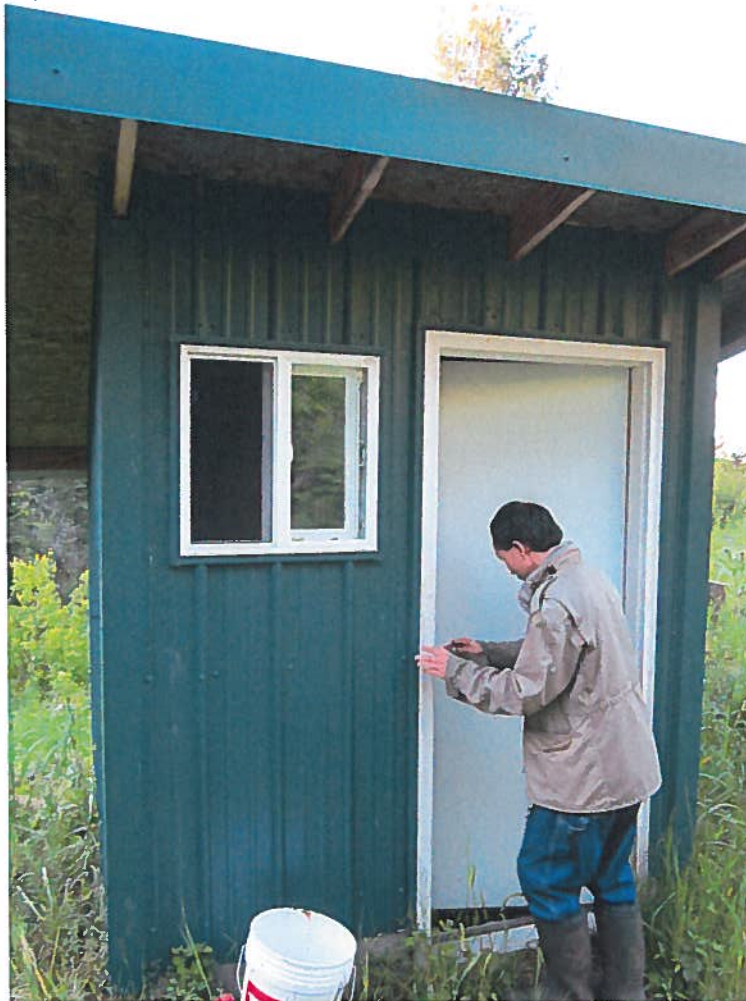


Point of Diversion
The 3 pipes carry
water from
Farrens Creek
where the water
ponds somewhat
to reduce sediment.

Photo taken looking
west.



Colvert that runs under the road that
carries Farrens Creek water that is not
being diverted by the permit holder.
Mr. Chai is standing in the creek's
natural channel.



Power House - POV

Photo is looking in
the eastern direction

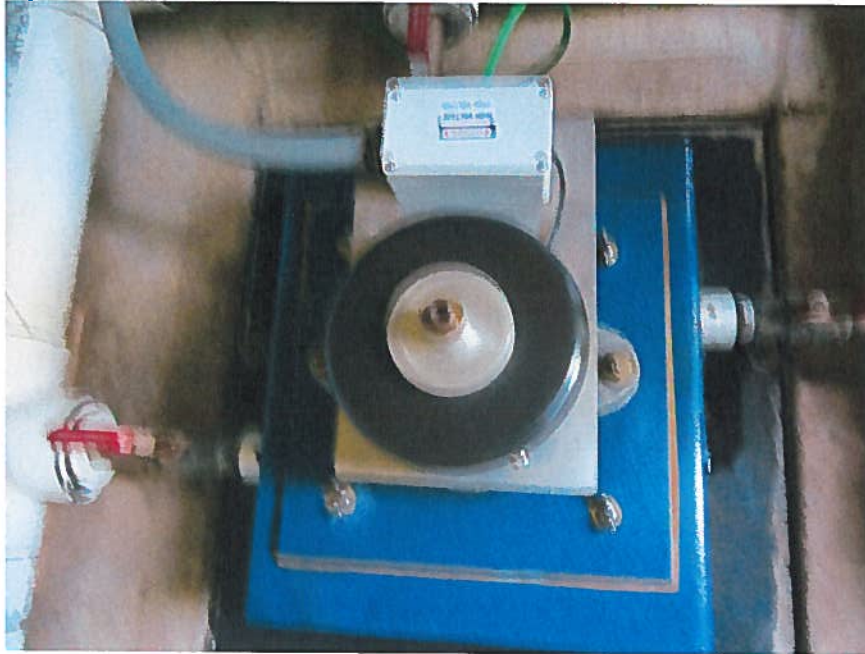


Micro-hydro Model
1032-20 LDT
(long distance transmissi

3 Jets

Water is discharged
underneath the
hydro system
into a 12" pipe.
All 3 jets were
open during the
exam.

Jerry of APM Hydro
Confirmed Specs.



This system is custom
built by AFM -
Alternative Machine Power
of Oregon.



12" Discharge pipe
leading back to
Farrans Creek

Picture is looking
North



Measurement point. Measured an average of 0.19 cfs using bucket.

Attachment #1

Manning's Equation Calculator for Flow Rate in a Circular Conduit Flowing Full

S = 0.1175 ft/ft
 n = 0.009 manning's coefficient
 d = 4.0 pipe diameter (inches)
 D = 0.33 pipe diameter (feet)
 r = 0.17 pipe radius (feet)
 A = 0.09 area (ft²)
 WP = 1.05 wetted perimeter (ft)
 R = 0.08 hydraulic radius (ft)

Q = 0.94 flow rate (CFS)

READ ME

Manning's Equation (1), is an empirical formula that sol velocity (v) in a open channel under uniform flow. The equation (2) when combined with equation (1) allows for computation of the flow rate (Q) in an open channel un flow.

In equations (1) and (3), η refers to Manning's Coefficient Roughness and can be found in tabulated form for mar channel types. R is the hydraulic radius of the open ch equal to the area of the open channel divided by the w perimeter, $R = A/P$. S is the slope of the energy grade often assumed to be equal to the slope of the channel.

Because Manning's Equation is empirical the units are To obtain a velocity in ft/s and a flow rate in ft³/s, area i reported in ft², hydraulic radius must be reported in ft, a be reported in ft/ft. Manning's Coefficient of Roughnes unitless constant.

Channel Slope

Slope Options

☐ Manual Entry
 ☒ Slope Calculator

Slope Calculator

Rise = 63 feet

Run = 536 feet

Slope, S = 0.1175 ft/ft

Pipe Material, (n):

plastic (pvc, abs)

Pipe Diameter (inches)

4.0 inches

$$(1) \quad v = 1.49 \left(\frac{1}{\eta} \right) \left(R^{\frac{2}{3}} \right) \sqrt{S}$$

$$(2) \quad Q = vA$$

$$(3) \quad Q = 1.49 \left(\frac{1}{\eta} \right) (A) \left(R^{\frac{2}{3}} \right) \sqrt{S}$$

How much power can you generate with a hydroelectric turbine?

The amount of power available depends on the dynamic head, the amount of water flow and the efficiency of the turbine generator combination. To get an idea about available power in watts, multiply the head in feet, times flow in gallons per minute, times 0.18, times turbine efficiency. Turbine efficiency ranges from 35% to 70%, with higher efficiency at higher heads. To get a rough idea, use 0.40 (representing 40%) as a multiplier for efficiency. The Harris Pelton turbines are well suited to higher head and lower flow situations. Flow is limited by nozzle size (a maximum 1/2"). Harris turbines are now available with permanent magnet (PM) alternators providing up to 50% efficiency. Higher flows are accommodated by the ESD Turgo Turbines. They can have nozzles of up to 1" diameter, and provide better efficiency at low heads. The HI-Power

Hydros are ideal for sites where water is available at long distances from power needs. They generate 100+ volts AC that is stepped down and rectified at the batteries. This allows the use of relatively small wire for a distance of up to 10,000 feet. Transmitting the power from the generator to the battery at twice the battery voltage allows you to use 1/4 of the wire size for the same power loss. At 4 times the battery voltage, you can use 1/16 of the wire size required to transmit power at the battery voltage. The HI-Power hydroelectric generator can also deliver up to 3600 watts where higher power is needed. The LV Hydroelectric Generator and the ES&D Water Baby are a good solution for very low flow situations where the head is high enough to make some power.

Pipelines

A hydroelectric turbine operates from the pressure at the bottom end of a pipeline. This pressure, usually measured in pounds per square inch (psi), is directly related to the head, the vertical drop from the top of the pipeline where the water goes into the turbine located at the bottom of the pipeline. The pressure at the lowest point of a pipeline is equal to 0.433 times the head, (the vertical distance in feet).

Pressure is important because it is a determining factor in how much power is available and what type of pipe is required. Polyethylene pipe can be used for pressures up to 100 psi, PVC pipe is available with pressure ratings from 160 to 350 psi and steel pipe can withstand 1000 psi or more. Check with your local plumbing supplier for pipe ratings. Pipe diameter is very important. All pipelines will cause the water flowing in them to lose some energy to friction. The pipe must be large enough for the maximum quantity of water it will carry.

The pressure at the bottom of a pipeline when water is not flowing is called static pressure. When water is flowing through the outlet or nozzle of the hydroelectric turbine, the pressure at the outlet is the dynamic pressure or running head. If you install a gate valve on the pipeline just above the turbine and a pressure gauge on a "T" fitting just above the gate valve, you will read the static pressure on the gauge when the valve is closed and the dynamic pressure when the valve is opened. The maximum power that can be delivered by a pipeline will occur when the dynamic pressure is approximately 2/3 of the static pressure.

The actual flow rate of the water in a hydroelectric system is determined by the diameter of the nozzle. We will supply a turbine with the proper size nozzle for your site, depending on the head, flow, length and diameter of the pipe. We carry hydroelectric generators made by Energy Systems and Design, HI-Power Hydroelectric, and Harris Hydroelectric. Use the descriptions on the following pages to help determine which turbine will work best for your site and power requirements.

We can help you design your system

If you think you have a suitable site, contact us and we will help you choose the best unit for your situation. Please provide the following information about your site:

1. **Head** – The total vertical elevation from the place where the water enters the pipe to the point where the turbine will be located.
2. **Flow** – The number of gallons per minute that are available.
3. **Distance** – The length of pipe that will be necessary to carry the water from the pickup to the turbine. If the pipe is already installed, what is the type and diameter?
4. **Location** – Distance from turbine to batteries.

Nozzle selection

Power output of a hydroelectric generator is determined by the pressure of the water at the nozzle and the amount of water flowing out of the nozzle. The larger the nozzle, the greater the flow will be. The nozzle must also be sized small enough to keep your pipeline full and keep the speed of the water in the pipe below 5 feet per second. The nozzle selection table on the next page shows water flow through various size nozzles at given pressures. Use this table to determine what size nozzle and how many nozzles you need to accommodate the flow of water you have and to deliver the amount of power you need. A pressure gauge in the pipe feeding your turbine, installed before the shutoff valve, can help you check proper operation and diagnose problems. When the valve is shut off, the gauge will read the static pressure in pounds per square inch psi (head in feet x 0.433). When the valve is turned on the gauge will read a lower (dynamic) pressure.

The difference between these two pressures represents your loss to friction in the pipe. The greater the flow, the greater your loss will be. (See PVC pipe loss table on the next page.)

Attachment #2

Hydroelectric Power Output Estimation Formula:

Dynamic Head (ft) x Flow (GPM) x 0.18 x Turbine Efficiency (use 0.40) = Output Watts

Water Flow Information for Pumping and Hydroelectric Design

Flow Through Nozzles

The table below shows the flow in gallons per minute (gpm) through various diameter nozzles at a range of heads from 5 feet to 400 feet. Use table to choose what nozzle size to use and how many nozzles a turbine must have to give the required flow to use all of the water available in the system.

Head		Flow in gpm through these nozzle diameters:											Rpm for 4" turbine
feet	psi	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	7/8"	1.0"	
5	2.2	-	-	-	-	6.18	8.4	11	17.1	24.7	33.6	43.9	460
10	4.3	-	-	3.88	6.05	8.75	11.6	15.6	24.2	35	47.6	62.1	650
15	6.5	-	2.68	4.76	7.4	10.7	14.6	19	29.7	42.8	58.2	76	800
20	8.7	1.37	3.09	5.49	8.56	12.4	16.8	22	34.3	49.4	67.3	87.8	925
30	13	1.68	3.78	6.72	10.5	15.1	20.6	26.9	42	60.5	82.4	107	1140
40	17.3	1.94	4.37	7.76	12.1	17.5	23.8	31.1	48.5	69.9	95.1	124	1310
50	21.7	2.17	4.88	8.68	13.6	19.5	26.6	34.7	54.3	78.1	106	139	1470
60	26	2.38	5.35	9.51	14.8	21.4	29.1	38	59.4	85.6	117	152	1600
80	34.6	2.75	6.18	11	17.1	24.7	33.6	43.9	68.6	98.8	135	176	1850
100	43.3	3.07	6.91	12.3	19.2	27.6	36.6	49.1	76.7	111	150	196	2070
120	52	3.36	7.56	13.4	21	30.3	41.2	53.8	84.1	121	165	215	2270
150	65	3.76	8.95	15	23.5	33.8	46	60.1	93.9	135	184	241	2540
200	86.6	4.34	9.77	17.4	27.1	39.1	53.2	69.4	109	156	213	278	2930
250	108	4.86	10.9	19.9	30.3	43.6	59.4	77.6	121	175	238	311	3270
300	130	5.32	12	21.3	33.2	47.8	65.1	85.1	133	191	261	340	3590
400	173	6.14	13.8	24.5	38.3	55.2	75.2	98.2	154	221	301	393	4140

PVC Pipe Loss Table

Use the table below to determine what pipe size is required to efficiently allow necessary flow for your power need. Once you know the required flow for your system (gpm), find the head loss for various pipe sizes. Multiply the head loss number by the length of the pipe divided by 100 and you will get the loss of head for that pipe size. The actual head minus the head loss will give you the effective dynamic head in the system.

Pipe Friction Loss Table – Head Loss in Feet per 100 Feet of Schedule 40 PVC Pipe																									
		Flow (gallons per minute)																							
		1	2	3	4	5	7	10	15	20	25	30	40	50	60	70	80	100	150	200	250	300	400	500	
Pipe diameter (inches)	1/2	2.08	4.16	8.7	14.8	23.5	43																		
	3/4	0.51	1.02	2.2	3.7	5.73	10.5	20.1	42.5																
	1	0.1	0.55	0.68	1.15	1.72	3.17	6.02	12.8	21.8	32.9	46.1													
	1-1/4	0.03	0.14	0.19	0.31	0.44	0.81	1.55	3.28	5.59	8.45	11.9	22	30.5	45.6										
	1-1/2		0.07	0.08	0.13	0.22	0.38	0.72	1.53	2.61	3.95	5.53	9.43	14.3	20	28.6	36.7								
	2			0.03	0.05	0.07	0.11	0.21	0.45	0.76	1.15	1.62	2.75	4.16	5.84	7.76	9.94	15.1	34.8	59.3					
	2-1/2				0.03	0.04	0.05	0.09	0.19	0.32	0.49	0.68	1.16	1.75	2.46	3.27	4.19	6.33	13.4	25.0	37.8	46.1			
	3						0.02	0.03	0.07	0.11	0.17	0.23	0.4	0.6	0.85	1.13	1.44	2.18	4.63	7.88	11.9	18.4	40.1		
	4										0.04	0.06	0.11	0.16	0.22	0.3	0.38	0.58	1.22	2.08	3.15	4.41	7.52		
	5											0.03	0.04	0.05	0.07	0.1	0.13	0.19	0.4	0.69	1.05	1.46	2.49	3.76	
6													0.02	0.03	0.04	0.05	0.08	0.16	0.28	0.43	0.6	1.01	1.53		

Attachment #3

Attachment # 4

2011 "User Friendly" Hydro Product guide

Our hydro-electric turbines are built in two parts to make jet changes and maintenance as easy as possible. The bottom half containing the water box, nozzles and jets, piping and/or manifold is intended to be mounted down permanent. The top half rests on top of the bottom half and is sealed by a rubber sheet insulator. Four wing nuts hold it down. It takes about 2 minutes to change jet sizes. Our product is unique in its ease of maintenance and is greatly appreciated by people who have previously owned our competitors' products.

The water box mounts over a 14" X 14" square hole. Water discharge is out the bottom. The water box is available in one thru four nozzle versions with or without valves and several different manifold or pipe options. Standard jet sizes are from .125" to .760" with best efficiencies falling between .250" and .620". We are very open to the idea of building a machine the way you want it.

Our standard runner (pelton wheel) is made of a structural polymer known under the trade name DELRIN which resists wear from silt and sand. It wears at about 1/5th the rate of bronze runners. Optional runners are made of 416 stainless and are also more efficient but they are more expensive.

The power head (top half) comes in about 250 different versions at present to best match your site potential. We are still building wound field units for those on a budget or for applications needing higher wattage out of a single turbine than is possible with the PM's at present. The most popular units are of course the Permanent Magnet models with higher efficiency and almost no maintenance. Model 1032 and 1038 are built in such a manner that magnet strength adjustment is unnecessary except rarely. New this year are enhanced models 1000, 1200, 1400, 1800 which feature stronger magnets and thicker stators which can improve efficiencies and make larger outputs possible. The model 2000 should be available about mid-2011. We intend to have a PM capable of 4 KW at the end of the year.

We include a sundry parts kit and jet assortment on a complete turbine. On standard units we also include a spare runner to eliminate down time if the DELRIN runner breaks. Simply return the runner and we will repair it for free. Breakage is almost always caused by a rock, twig, or air in the pipeline which will not be present in a properly installed penstock. Warranty is 3 years and covers most everything reasonable, keeping in mind that most wound field units will need brush and bearing replacement before that.

An abbreviated listing by group of some of the power heads available:

Group 1: automotive sized wound field alternators, most with special components using rheostat control. Brush and bearing replacement is recommended yearly under continuous use. Available in 12, 24, and 48 volt DC.

Group 2: Similar to group 1 except truck size alternators using larger bearings. Available in 12, 24, and 48 volt DC. Brush and bearing replacement is recommended at two year intervals under continuous use. Several brushless versions are available.

Group 3: Our best performing class of wound field rheostat controlled alternators having excellent output characteristics. Up to 3300 watt potential at 48 volt. Available in 12, 24, 48, and 120 volt DC.

Model 1032 PM: An entry level permanent magnet alternator. These are single phase and have about the same efficiency as the large frame Ford alternators that have been used for years. Very low maintenance and easy to use and install. They perform best for 12 and 24 volt DC applications but can be used at 48 and 120 volt DC and also wild frequency 120 to 480 volt AC for long distance transmission using a step down transformer/rectifier unit sold separately. We have built a number of these for dedicated loads like base board heating units. 500-750 watt maximums are possible depending on voltage. Electrically isolated with outdoor PVC junction box for maximum safety.

Model 1038 PM: Our most popular permanent magnet alternator up until now. A 3-phase stator offering 20-30% more output than a comparable wound field unit. Available in 12 to 480 volts AC or DC. The AC models are wild frequency for use with a step down transformer/rectifier for long distance transmission to a battery based system. The step down unit is sold separately. They are MPPT controller compatible. Electrically isolated with outdoor PVC junction box. Magnet strength is adjustable but rarely needed and not usually supplied. Optional 6, 12, and 24 wire reconfigurable stators are also available for applications with highly variable flow rates. The 24 wire unit is intended for stocking dealers to cover about 90% of the applications from 10 amp to 66 amp for 12-120 volt systems. 900-1100 watt maximums are possible depending on voltage.

Model 1000 PM: This is an enhanced version of model 1038 featuring a stronger magnet rotor which can improve efficiencies in some of the lesser applications and increase maximum potential to almost 1200 watts. 12 wire reconfigurable stator.

Model 1200 PM: This is an enhanced version of model 1000 featuring a thicker stator which can improve outputs and efficiencies up to 1350 watts in some of the better applications. 12 wire reconfigurable stator.



State of Idaho

DEPARTMENT OF WATER RESOURCES

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May 30, 2012

C. L. "BUTCH" OTTER
Governor

GARY SPACKMAN
Interim Director

OI MIN ANTHONY CHAI
JEROSSELLE CHAI
PO BOX 507
GRANGEVILLE ID 83530

RE: PERMIT TO APPROPRIATE WATER 85-15652 AND 85-15653

Dear Permit Holder(s):

I am planning to conduct water right examinations in the vicinity of the above-referenced permit on June 13th, 14th, and 15th. An examination is a necessary step in the water appropriation process. During the examination, I will verify your water uses pursuant to your permits (copy enclosed).

In order to conduct your exam as efficiently as possible, please call me at (208) 287-4944 to schedule a day and time that is convenient for you. Please be advised that you will need to operate your system under normal conditions during the examination.

I look forward to meeting with you and working towards finalizing permit 85-15652 and 85-15653.

Sincerely,

A handwritten signature in black ink, appearing to read 'Cherie Palmer', is written over a horizontal line.

Cherie Palmer, Sr. Water Resource Agent
Water Allocation Bureau