

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 98-7998
Exam Date: 03/18/2022

1. Current Owner:
KENDALL D BODKIN AND DONNA K BODKIN LIVING TRUST
738 COPPER FALLS RD BONNERS FERRY ID 83805-2407
2. Accompanied by: Kendall Bodkin
Phone No: 208-659-4043
Address: Same as above
Relationship to permit Holder: Permit holder - Trustee

3. **SOURCE:**
UNNAMED STREAM

Tributary
SINKS

Method of Determination: Arcmap and DRG.

B. OVERLAP REVIEW

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

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

UNNAMED STREAM SE¼ NE¼, Sec. 23, Twp 65N, Rge 02E, B.M. BOUNDARY County

Method of Determination: GPS. POD is a submerged metal cube (penstock inflow) to 6 inch PVC pipeline located at -116° 09.6251, 48°58.3847.

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	
65N	02E	23			X														

Method of Determination: Beneficial use field examination and Arcmap aerial imagery.

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
UNNAMED STREAM	GRAVITY FLOW				

flow measurement which mirrors the field exam flow measurement taken based on nozzles installed on the low voltage micro-hydro unit (LV800/1500). Due to the approved permit authorizing 0.10 cfs toward developing power beneficial use, I'm only able to recommend **0.10 cfs** for Power toward licensing this permit.

During the exam the irrigation beneficial use was not developed. The applicant intends to stub into the penstock 4" pipeline down-flow of the 4ea nozzle supply hose fittings but had not done so by time of field exam. As such, I have removed the irrigation beneficial use component from the permit during licensing review. Based on flow measurements the applicant's system diverts more than 0.10 cfs; a new application for permit No. 98-8085 has been submitted by the applicant following the field exam. Mr. Bodkin didn't realize there was a nozzle variation in his system as installed and would like to correct the system to install a total of 4ea 1/4-inch nozzles.

The new application for permit is accounting for the diversion of water more than 0.10 cfs in the system & will include irrigation for development in 98-8085's development window if approved. If WR 98-8085 is not approved, the applicant will be required to reduce the nozzle size configuration to 2ea 3/16-inch nozzles & 2ea 1/4-inch nozzles to conform to the recommended 0.10 cfs diversion rate designated to license this permit.

At the hydropower station (POU), the power system is a Low voltage unit capable of producing up to 1,500 watts per hr (LV800/1500) with the system operating at 48 volts. The pressure gauge was broken at time of field exam resulting from the applicant cleaning out the piping with a water hammer in an attempt to clean out the system & determine why one nozzle supply line produced less amps than the other three. Working with Mr. Bodkin, each nozzle was removed from the unit to verify head size, and it was found that one (1ea) was 3/16-inch versus the other 3ea being 1/4-inch. Mr. Bodkin purchased the unit as 4ea 1/4-inch nozzles, and the smaller nozzle size explains the lower producing amps coming from the 3/16-inch nozzle. The pressure gauge was replaced at time of exam and 75-80 PSI was validated for system operating pressure.

Mr. Bodkin asserts the power system runs constant 24/7, year-round and maintains PSI and amp hour generation consistently all year. The annual volume and maximum diversion volume recommended for licensing purposes equals 0.10 cfs x 24 hrs per day x 7 days per week x 356 days per year = **72.4 af**, which is a non-consumptive use. Overflow from the micro-hydro is piped back to the unnamed stream which is situate approximately 15 feet from the power station.

Condition(s) 26A, 236, 932, & R66 were removed from the permit during licensing review. Condition 17H was replaced with R22 at time of licensing. Condition 916 was revised, removing verbiage about the water permit, and maintaining reference solely to the water right license. Condition 027 was added to describe the use of water being non-consumptive. All other conditions on the permit were carried to licensing. There are no overlap concerns for this water right. Future development by the applicant under application for permit 98-8085 shall be considered in course of time for overlap if/when future beneficial use field examination is conducted.

Have conditions of permit approval been met? X Yes No

H. RECOMMENDATIONS**1. Recommended Amounts**

<u>Beneficial Use</u>	<u>Period of Use</u>	<u>Rate of Diversion</u>	<u>Annual Volume</u>
POWER	01/01 to 12/31	0.10 CFS	72.4 AF

Totals: 0.10 CFS 72.4 AF

2. Recommended Amendments

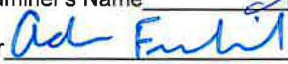
____ Change P.D. as reflected above ____ Add P.D. as reflected above X None

____ Change P.U. as reflected above ____ Add P.U. as reflected above X None

I. AUTHENTICATION

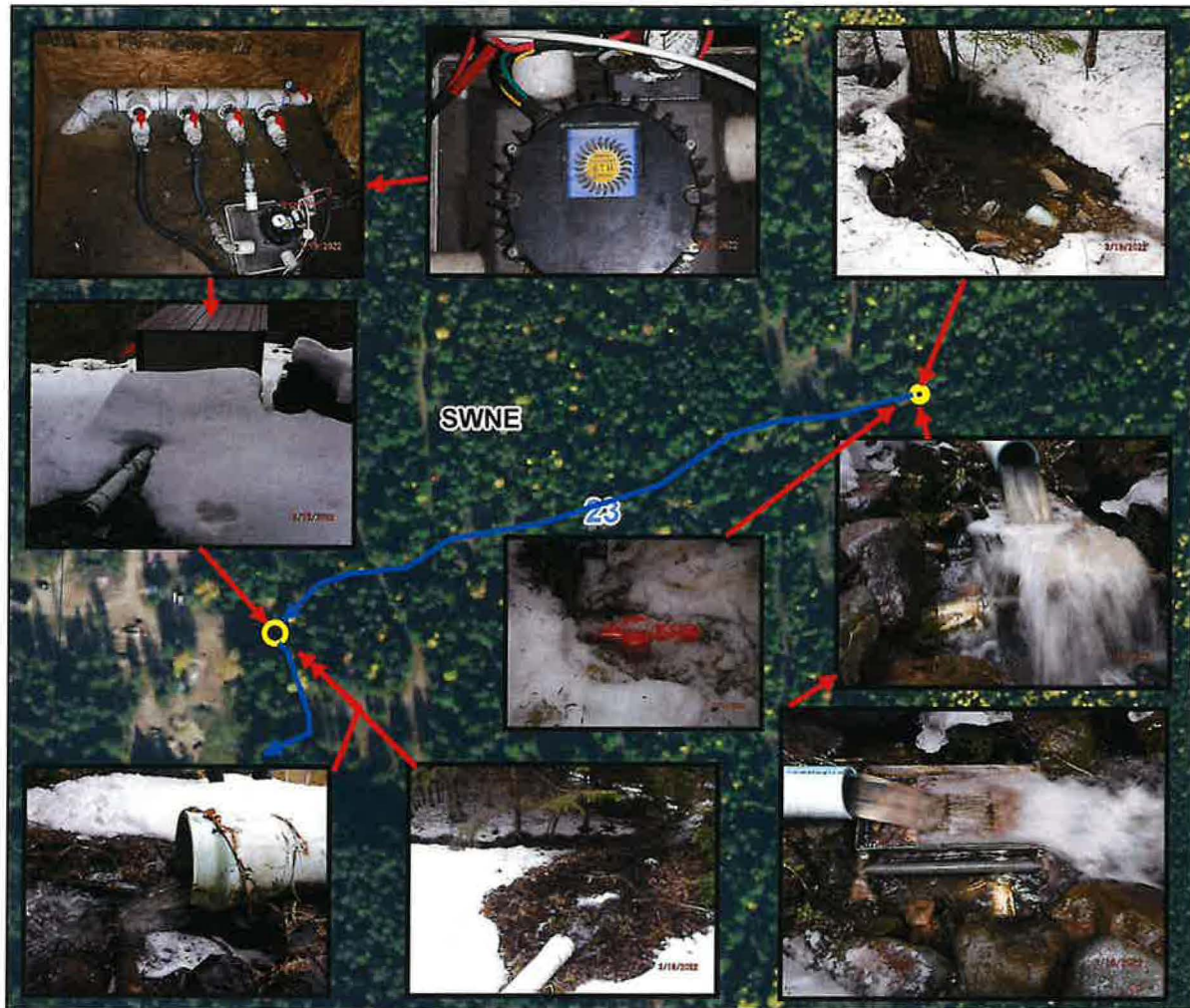
Luke Bates -

Field Examiner's Name  Date 5/4/2022

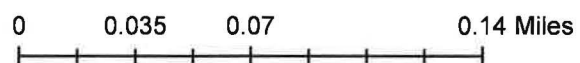
Reviewer  Date 7/21/2022

POWER system diagram.

65N



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



Permit #: 98-0858

(Performance Specs Provided by Applicant with)
Submission of Statement of Completion

OUTPUT IN WATTS PER NOZZLE FOR LV800 / 1500

Psi	Feet	1/8		3/16		1/4		5/16		3/8		7/16		1/2		9/16		5/8	
30	69	GPM				9.9		15.5		22.3		30.4		39.6		50.2		62.0	
		Efficiency	Watts			40%	49	49%	94	57%	157	56%	211	55%	269	43%	266	36%	280
40	92			6.4		11.4		17.9		25.8		35.1		45.8		57.9		71.6	
				39%	42	55%	103	61%	181	64%	274	63%	365	60%	452	47%	447	39%	466
43	100			6.7		11.9		18.5		26.8		36.5		47.6		60.2		74.4	
				39%	47	56%	119	64%	213	63%	303	65%	429	60%	512	47%	514	40%	539
50	115	3.2		7.2		12.7		19.9		28.8		39.2		51.1		64.7		80.0	
		12%	8	47%	70	61%	160	64%	264	66%	393	66%	534	61%	650	48%	638	40%	668
52	120	3.26		7.3		13.0		20.3		29.3		39.9		52.1		65.9		81.5	
		14%	10	47%	74	60%	169	65%	285	65%	414	63%	540	61%	687	48%	677	41%	713
60	139	3.51		7.9		14.0		21.9		31.6		43.0		56.0		70.9		87.7	
		21%	18	51%	100	62%	216	65%	357	64%	506	62%	662	60%	835	46%	812	40%	869
65	150	3.64		8.2		14.5		22.7		32.8		44.7		58.2		73.7		91.1	
		28%	28	51%	113	63%	245	66%	404	64%	569	62%	750	58%	910	46%	914	39%	962
70	162	3.79		8.5		15.1		23.6		34.1		46.4		60.5		76.6		94.7	
		33%	36	52%	130	62%	271	66%	455	65%	646	61%	829	57%	1005	44%	987	39%	1072
80	185	4.05		9.1		16.1		25.2		36.4		49.6		64.7		81.9		101.2	
		36%	49	54%	165	60%	323	66%	558	63%	770	61%	1004	54%	1170	44%	1213	38%	1292
90	208	4.3		9.7		17.1		26.8		38.7		52.7		68.7		86.9		107.4	
		39%	62	55%	200	60%	382	65%	654	63%	914	60%	1179	53%	1357	44%	1420	36%	1454
100	231	4.52		10.2		18.0		28.2		40.7		55.5		72.3		91.6		113.2	
		41%	78	56%	237	60%	452	65%	761	63%	1067	58%	1346	51%	1539	42%	1596	35%	1627
110	254	4.75		10.7		18.9		29.6		42.7		58.2		75.9		96.1			
		45%	97	55%	270	59%	512	63%	849	62%	1207	56%	1502	49%	1690	30%	1722		

@ Flow
80 PSI

1 ea 3/16" = 9.1 gpm

+ 3 ea 1/4" = (16.1 gpm) x 3 = 48.3 gpm

= 57.4 gpm based on system defined performance output.

Watts

1 ea 3/16" = 165 watts

3 ea 1/4" = (323 watts) x 3 = 969 watts

= 1134 watt per hr.

Theoretic
Flow Rate

Theoretic
Watt hr
Output

Kendall Bodkin
738 copper falls rd
Bonners Ferry, ID 83805
208-569-4043
Kendallbodkin@gmail.com

Permit #: 98-07258

Hipower hydroelectric turbine LV1500 (48 volt)

10-2019	25amps,	1200 watts
11-2019	25amps,	1200 watts
12-2019	25amps,	1200 watts
01-2020	25amps,	1200 watts
02-2020	25amps,	1200 watts
03-2020	25amps,	1200 watts
03-2020	25amps,	1200 watts
04-2020	25amps,	1200 watts
05-2020	25amps,	1200 watts
06-2020	25amps,	1200 watts
07-2020	25amps,	1200 watts
08-2020	25amps,	1200 watts
09-2020	25amps,	1200 watts
10-2020	25amps,	1200 watts
11-2020	25amps,	1200 watts
12-2020	25amps,	1200 watts
01-2021	25amps,	1200 watts
02-2021	25amps,	1200 watts
03-2021	25amps,	1200 watts
04-2021	25amps,	1200 watts
05-2021	25amps,	1200 watts
06-2021	25amps,	1200 watts
07-2021	25amps,	1200 watts
08-2021	25amps,	1200 watts
09-2021	25amps,	1200 watts

Values based
on manufacturer
specs.

□ During field exam, observed

26 amps on gauge

observed $26 \text{ amps} \times 48 \text{ volts} = 1,248 \text{ watts/hr}$

Referr to Attached Output in Watts Per Nozzle for LV800/LV1500

Turbine has ~~4~~ - ~~1/4~~ in nozzles 3ea - ~~1/4~~ nozzles, 1ea - ~~3/16~~ nozzle

✓ Water pressure is approximately 80 pounds

Turbine is using approximately 16.1 GPM per nozzle for ~~1/4~~ nozzle, 9.1 gpm for ~~3/16~~ nozzle.

Turbine generates approximately 323 Watts per nozzle for ~~1/4~~ nozzle, 165 Watts for ~~3/16~~ nozzle.

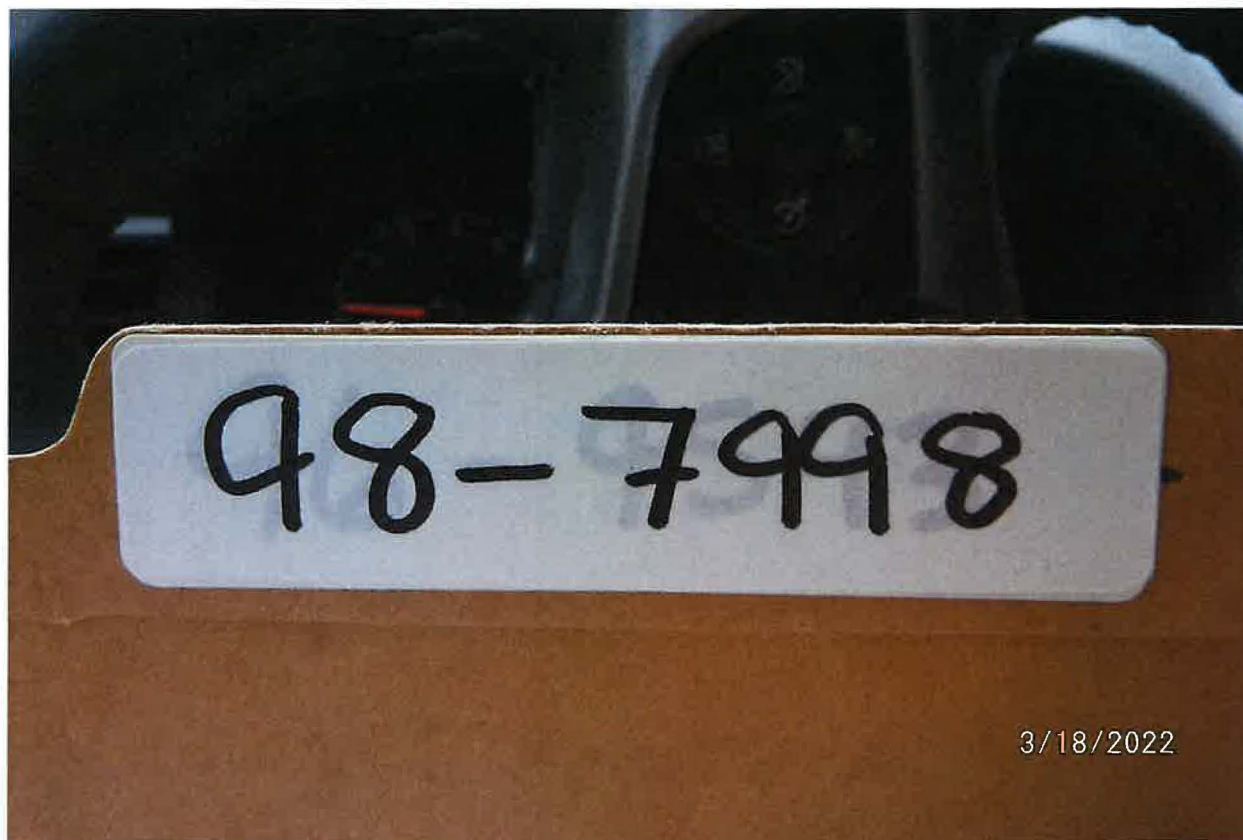
Total GPM for turbine is ~~64.4~~ ~ 57.4 gpm due to variance in nozzle configurations.

Total Watts for turbine is ~~1292~~ formulated on specifications = 1134 watts per hr.

Total Amps for turbine is 26.9. → verified 26amps per hour.

HYDROPOWER

- 1) SYSTEM PSI 80 *Gauge broken at time of exam*
- 2) HEAD PRESSURE _____ RISE _____ RUN _____
- 3) FLOW MEASUREMENT approximately 40 gpm *measured at 57 gpm*
- 4) DAILY HOURS OF OPERATION 24 SEASONAL OPERATION _____ year around _____
- 5) ANNUAL HOURS OF OPERATION 8760 *2417*
- 6) ARE POWER RECORDS MAINTAINED SHOWING HISTORY OF USE? no
- 7) WHAT DOES THE HYDRO SYSTEM GENERATE POWER FOR? _____ home and shop _____
- 8) DOES THE LOCAL AREA ELECTRICAL UTILITY COMPANY PROVIDE POWER TO THE SAME USES AS THE HYDRO POWER SYSTEM? no IF YES, NAME OF UTILITY N/A
- 9) SYSTEM DATA
- a. MAKE/MODEL OR STYLE Hipower lv1500
- b. No. OF HEADS / SIZE OF HEADS 1 *is a head the same as nozzle? 3 1/4"*
- c. HOW MANY HEADS OPERATE AT ONE TIME? 1 *4* *3 1/2"*
- d. SIZE OF PIPING 4 inch
- e. RISE OVER RUN FROM PENSTOCK TO UNIT (FT) _____
- f. STORAGE SIZE (IF ANY) none
- g. OUTPUT POWER WITH UNIT RUNNING approximately 25 amps



FIELD EXAM DATE 3/18/2022



POD - 8 INCH, 10 FT RUN STORM PIPE TO SCREENED INTAKE



AT POD – SCREENED INFLOW TO PENSTOCK – 4 INCH PVC PIPE IN STREAM





HYDRO POWER PENSTOCK – 4 INCH PVC PIPE WITH 181 FT OF HEAD



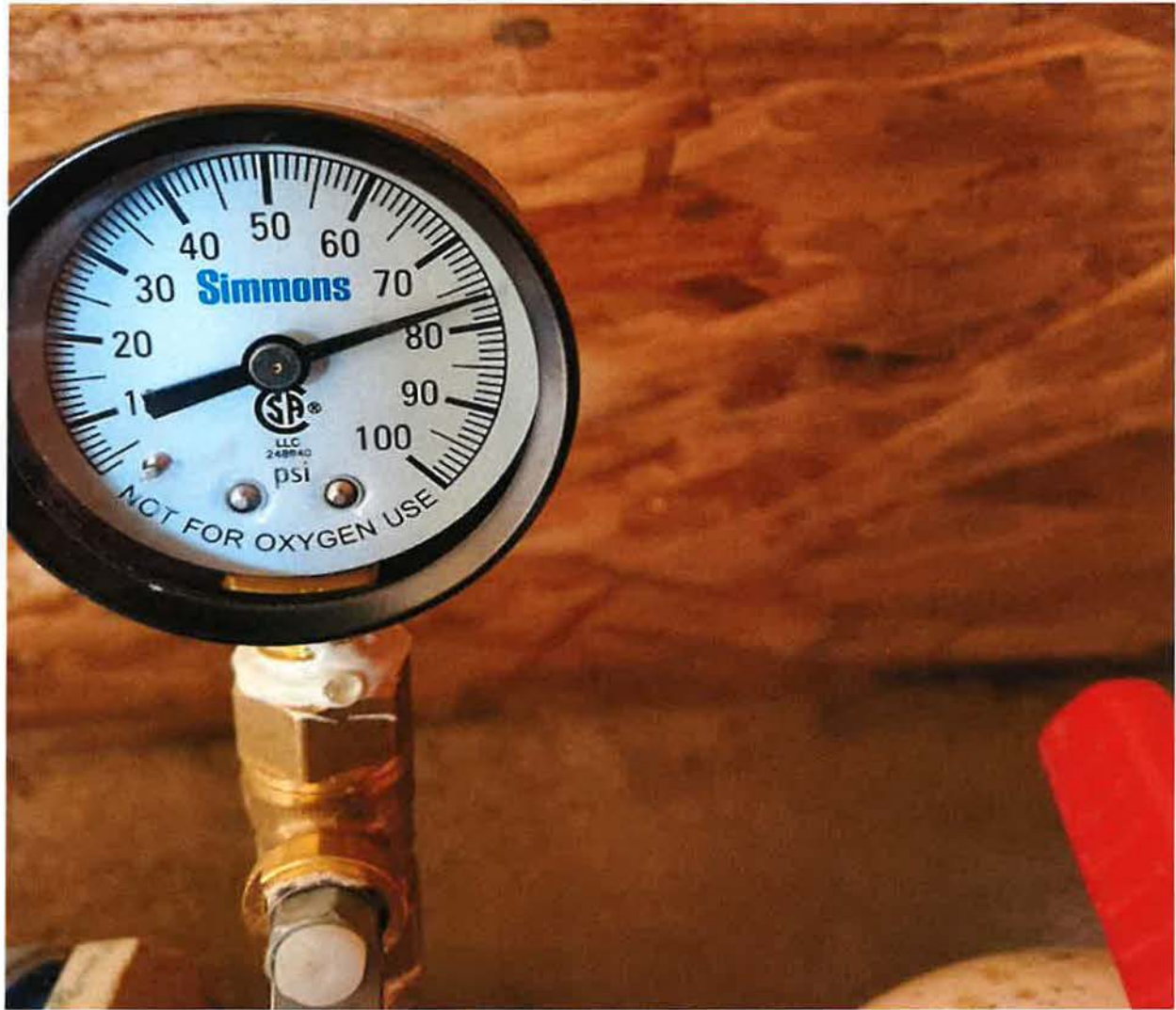
MANUAL SHUTOFF VALVE LOCATED AT PENSTOCK LOCATION ALONG SIDE STREAM



DOWNSTREAM VIEW FROM POD



POWER POU – POWER STATION WITH OVERFLOW DISCHARGE 8 INCH STORM PIPE

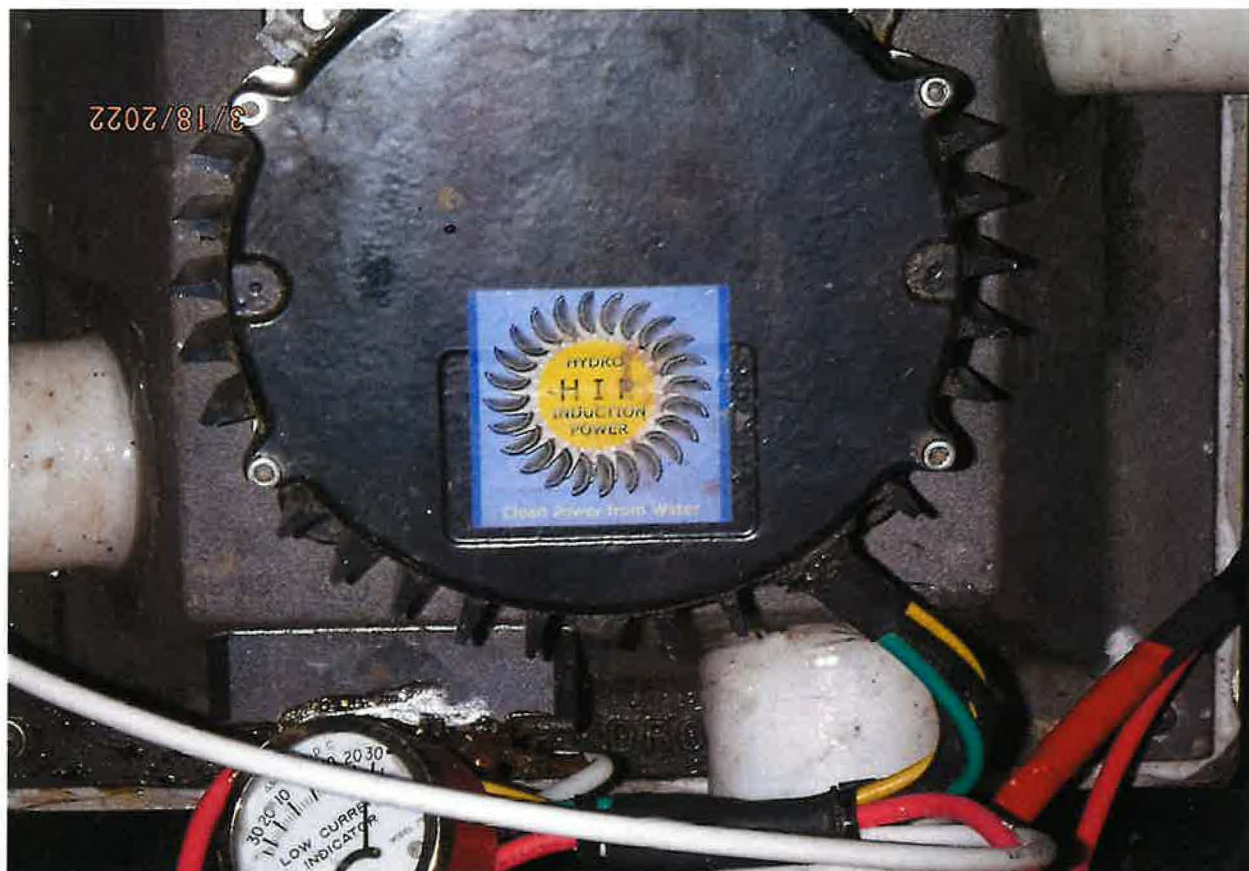


HYDRO SYSTEM PSI = 75-80, VALIDATED 77 PSI AT TIME OF EXAM.

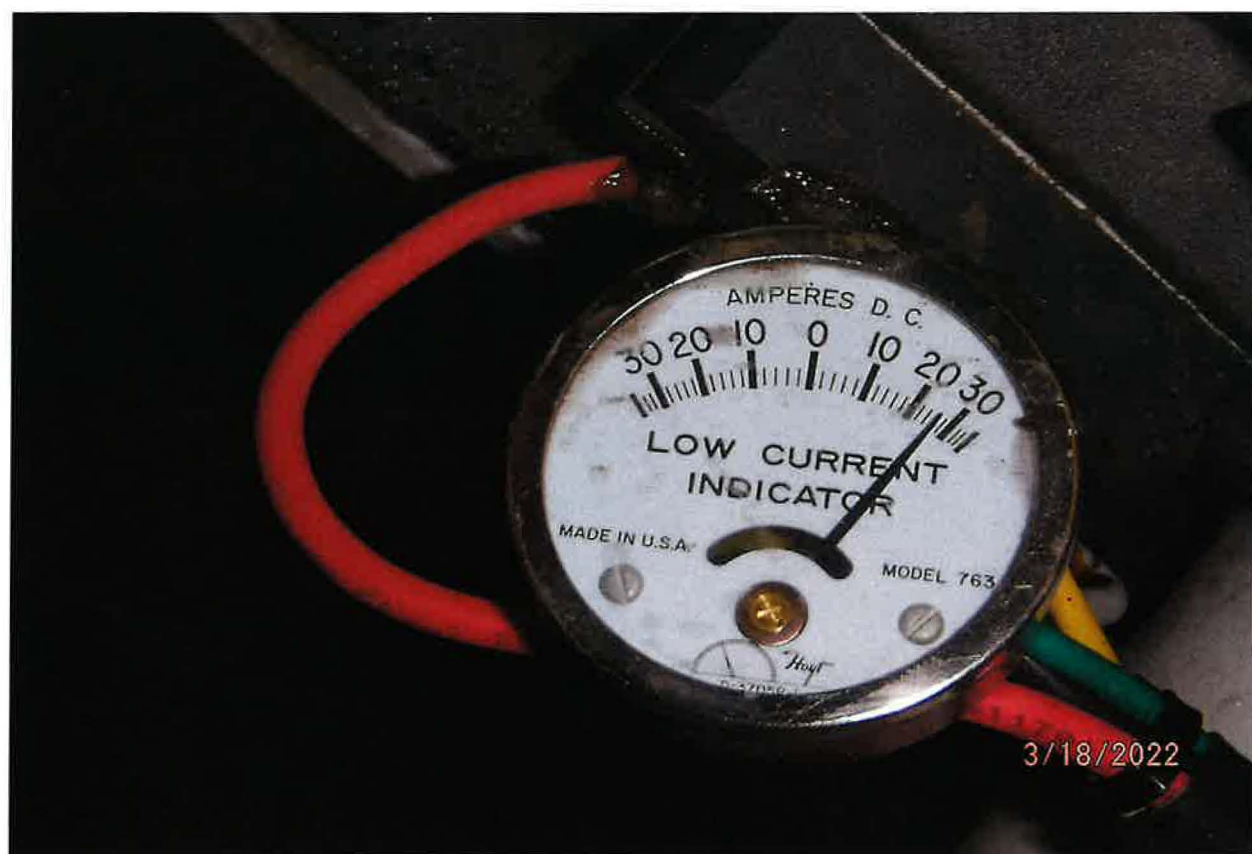


POWER POU – HIPOWER HYDROELECTRIC TURBINE LV1500; 1EA 3/16 INCH NOZZLE & 3 EA 1/4 INCH NOZZLES





HYDRO POWER UNIT WITH 4 HEADS OPERATING 24/7, 365 DAYS A YEAR.



1EA 3/16" & 3 EA 1/4" NOZZLES PRODUCING 26-27 Amps (48 volt system)



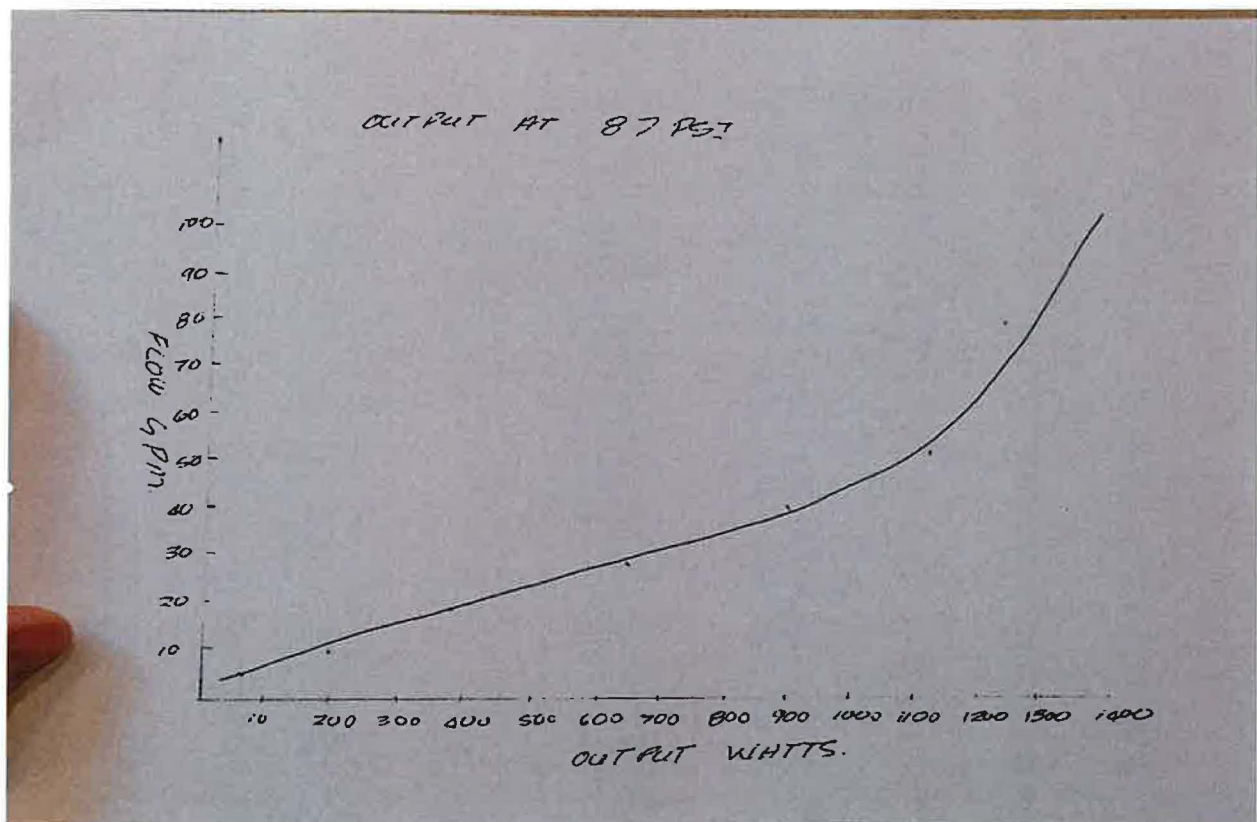
1ea 3/16" NOZZLE – MISMATCHED IN SYSTEM ASSUMED TO BE 1/4"; MICROMETER MEASUREMENT VALIDATED.



OVERFLOW DISCHARGE WITH 4EA HEADS GENERATING POWER



OVERFLOW DISCHARGE AREA HAND DUG TO ALLOW MULTIPLE 5-GAL BUCKET MEASUREMENTS



RUDIMENTARY POWER PERFORMANCE CURVE PROVIDED BY HYDRO UNIT INSTALLATION COMPANY (NOTE 87 PSI)