

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 74-15065

Exam Date: 5/22/2012

1. Current Owner: STATE OF IDAHO
IDAHO FISH & GAME COMMISSION
PO BOX 25
BOISE ID 83707-0025
(208)334-3700
2. Accompanied by: Larry Weeks
Phone No: (208) 756-6022
Address: Region 7, PO Box 1336, Salmon, ID 83647
Relationship to Permit Holder: Easement Specialist

3. **SOURCE**

HAYDEN CREEK

TRIBUTARY

LEMHI RIVER

B. OVERLAP REVIEW

1. Other water rights with the same place of use: NONE
2. Other water rights with the same point of diversion: 74-985, 74-1066Am, 74-1066B, 74-1067, and 74-1068

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

HAYDEN CREEK NE1/4SE1/4 Sec. 22, Twp 17N, Rge 23E, B.M. LEMHI County

Method of Determination: Visual Inspection and Existing Spatial Data information

2.

PLACE OF USE: FISH PROPAGATION

Twp	Rge	Sec	NE				NW				SW				SE				
			<u>NE</u>	<u>NW</u>	<u>SW</u>	<u>SE</u>	<u>NE</u>	<u>NW</u>	<u>SW</u>	<u>SE</u>	<u>NE</u>	<u>NW</u>	<u>SW</u>	<u>SE</u>	<u>NE</u>	<u>NW</u>	<u>SW</u>	<u>SE</u>	<u>Totals</u>
17N	23E	14												X					

Method of Determination: Visual Inspection and GIS

3. YES Delivery System Diagram Attached (required). Indicate all major components and distances between components. Indicate weir size/pipe as applicable.
YES Aerial Photo Attached (required for irrigation of 10+ acres).
YES Photo of Diversion and System Attached

4.

Well or Diversion Identification No.*	Motor Make	Hp	Motor Serial No.	Pump Make	Pump Serial No. or Discharge Size
Canal Headgate	NONE				Open Ditch

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

D. FLOW MEASUREMENTS

1.

Measurement Equipment	Type	Make	Model No.	Serial No.	Size	Calib. Date

2. Measurements: The system was set up with a standard orifice that is used on all of the fish screens in the Salmon River and Lemhi River area. This orifice has been checked for accuracy and found to be reliable. Please see Cory Skinner's memo dated 8/24/2011.

E. FLOW CALCULATIONS X Additional Computation Sheets Attached

Measured Method:

Measurement = 0.72 cfs
 Permit allowed = 0.80 cfs

License recommend for 0.72 cfs.

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:

0.72 cfs X 215 days in irrigation season X 1.9835 = 307.06 af of use per year.

G. NARRATIVE/REMARKS/COMMENTS

Water from Ditch is diverted from Hayden Creek through a ditch that travels approximately 4125 feet northeast to the fish screen. At the fish screen the majority of the water continues down the ditch to supply water to the other water rights using this diversion. A maximum of 0.72 cfs is diverted through a 10 inch pipe back to the creek to prevent fish kills in the creek. The water going back to the creek is run through a 4 inch orifice for measurement purposes. The existing spatial data point describes this diversion as HC-11. Idaho Fish and Game refer to this diversion point as LHC-11. It must also be noted that the fish screen (place of use) has also been GPS'ed and the spatial data point also calls it HC-11. The point of diversion listed for this permit is the correct HC-11.

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>
FISH PROPAGATION	04/01 to 11/01	0.720 CFS	307.00 AF
	<u>Totals:</u>	0.720 CFS	307.00 AF

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 Daniel A. Nelson – Staff Hydrologist

Field Examiner's Name



Date

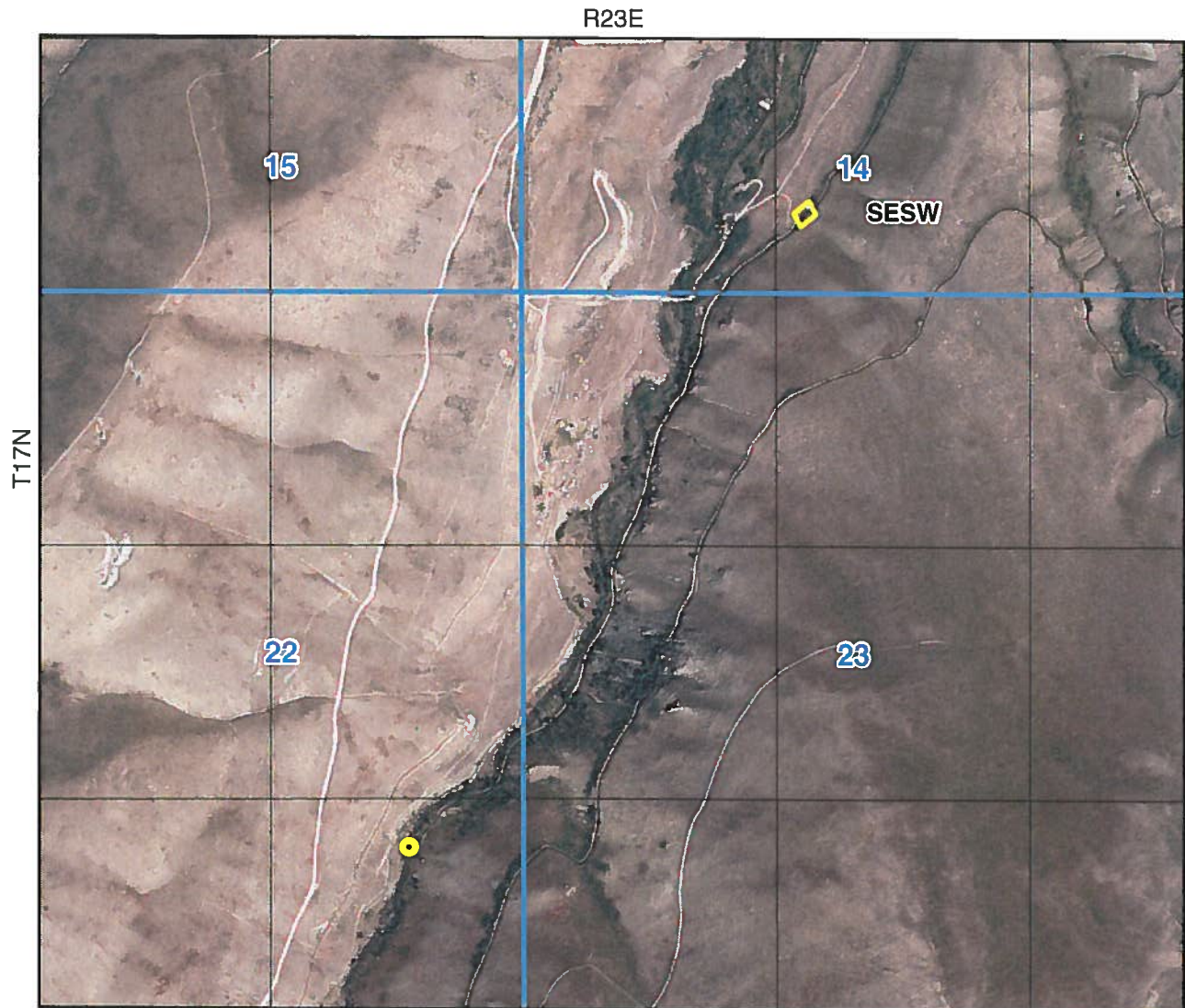
12-12-12.

Reviewer

Date

State of Idaho
Department of Water Resources
Field Exam Map
74-15065

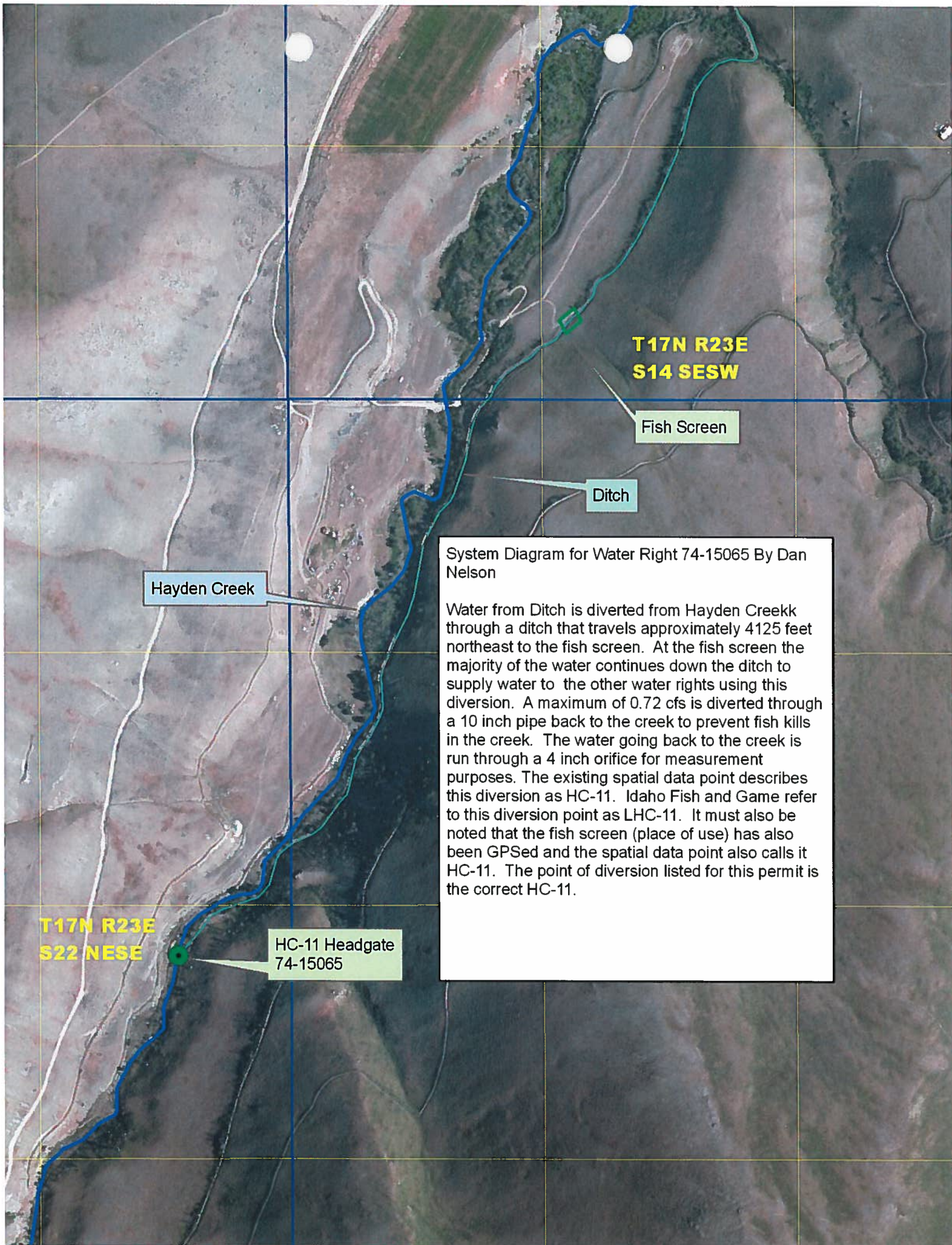
This map depicts the FISH PROPAGATION place of use boundary for this water right at the time of this approval and is attached to the approval document solely for illustrative purposes.



0 0.1 0.2 0.4 Miles

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





**T17N R23E
S14 SESW**

Fish Screen

Ditch

Hayden Creek

System Diagram for Water Right 74-15065 By Dan Nelson

Water from Ditch is diverted from Hayden Creek through a ditch that travels approximately 4125 feet northeast to the fish screen. At the fish screen the majority of the water continues down the ditch to supply water to the other water rights using this diversion. A maximum of 0.72 cfs is diverted through a 10 inch pipe back to the creek to prevent fish kills in the creek. The water going back to the creek is run through a 4 inch orifice for measurement purposes. The existing spatial data point describes this diversion as HC-11. Idaho Fish and Game refer to this diversion point as LHC-11. It must also be noted that the fish screen (place of use) has also been GPSed and the spatial data point also calls it HC-11. The point of diversion listed for this permit is the correct HC-11.

**T17N R23E
S22 NESE**

HC-11 Headgate
74-15065

Field Exam Flow Rate Calculation Sheet for Fish Screen Orifices

Water Right Number: 74-7337
Field Examiner: Daniel Nelson
Date of Exam: 5/21/2012

Discharge from a tank through an orifice (see attached memo from water right 72-16754 by Corey Skinner for a formula and orifice coefficient.

Formula = $C_d A_o (2gh)^{1/2}$

Where C_d = coefficient of discharge
 A_o = Area of orifice opening in Square feet
 $g=32.2$ feet per second²

h = Measured head above center of orifice opening in feet

Orifice Diameter in inches =	4
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$$A_o = (\pi r^2) / 144 = \text{Square Feet}$$

$A_o =$ 0.087

Head above center of orifice in Inches =	28
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(Measured to High Water Mark)

$h=$ 2.333

Coefficient of Discharge for Orifice* =	0.67
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Total Diversion Rate = 0.72

* Per Cory Skinner's memo for Basin 71 and 72 IDF&G Fish Bypass Permit Files dated August 24, 2011, the Coefficient for round edge orifice should be 0.67.

MEMORANDUM

TO: Basin 71 and 72 IDF&G Fish Bypass Permit Files

FROM: Corey Skinner

DATE: August 24, 2011

SUBJECT: Methodology for Flow Measurements

Recently Benny Walker and I conducted several licensing exams for IDF&G bypass permits in Basins 71 and 72. In general, these permits are for an amount of non consumptive flow that is diverted from a stream through existing diversions. The diverted water flows down a ditch, into a fish screen structure, and then flows through a bypass pipe back to the original stream source at a point downstream of the original diversion. The purpose of this flow is to flush fish back to the stream that may otherwise be trapped in the ditch. The fish screen structures include a slide gate plate with an opening that allows water to flow through the plate into the bypass pipe back to the stream. Due to the variability in diverted flows, difficulty in measuring flows for certain structures due to the way they were constructed, distance between structures, and other variables a methodology is needed to estimate maximum flows that are diverted and utilized by the IDF&G bypass permits.

After examining several of the structures and bypass systems and examining several different sources of water measurement literature, it was determined that the most appropriate method would be to utilize an orifice flow equation that is typically used to estimate flow through orifice openings in tanks. Attachment "A" discusses the equation, and the associated orifice coefficient, in particular C_d (coefficient of discharge). The equation is as follows...

$$Q = C_d A_o (2gh)^{1/2}$$

Where C_d = coefficient of discharge for orifice

A_o = Area of orifice opening in feet²

g = 32.2 ft per second²

h = measured head above center of orifice opening (in feet)

All variables can be measured in the field except for C_d (coefficient of discharge). Based on water measurement literature, this particular coefficient can vary from numbers around 0.6 to approximately 1.0 as shown in Table 3.10 in "Attachment A". In addition, the exact geometry of the opening (orifice) in the various slide gate plates that Benny and I observed is not shown in Table 3.10 in "Attachment A". Examination of various sources of water measurement literature and websites on the internet did not reveal much more in the way of appropriate C_d (coefficient of discharge) values. One reputable published source indicated that " C_d values can vary, but are generally around 0.70".

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Basin 71 and 72 IDF&G Fish Bypass Permits Memo
August 24, 2011

Due to the uncertainty in the possible C_d values, but considering the similarity in the opening (orifice) in the various slide gate plates and the overall bypass systems that Benny and I observed, it was determined that if an accurate measurement of the actual flow through a bypass system could be obtained, and using the orifice area and head reading at the time of measurement, the orifice discharge equation could be used to obtain an actual C_d (coefficient of discharge) value for the openings (orifices) in the various slide gate plates Benny and I were observing. This calculated C_d (coefficient of discharge) value could then be used in the same equation, for other similar bypass systems, and would result in more accurate calculated results. In addition, the equation could be utilized to estimate maximum flows through the bypass systems by measuring high water marks on the fish screen structures even if very little, or even no, flow was flowing through the bypass at the time of the exam.

Yesterday, Benny and I found a fish screen bypass system that we felt could be accurately measured and was very typical of the various systems. This system was located on Fourth of July Creek, and happened to be one of the permits, 71-10909, that needed to be examined for licensing. A Sparling Meter, mounted in a pipe section (State of Idaho ID# 4335) that could be mounted on the bypass discharge pipe was utilized to obtain flow measurements at a given head reading. Two separate, timed, measurements were conducted with both measurements resulting in measured flows of 0.68 cfs.. The following photo shows one of these measurements being conducted...



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Basin 71 and 72 IDF&G Fish Bypass Permits Memo
August 24, 2011

Using this measured flow, the orifice discharge equation, an orifice measurement, and head measurements, finds that the C_d (coefficient of discharge) is calculated to be 0.67 as shown below...

$$Q = C_d A_o (2gh)^{1/2}$$

Where C_d = coefficient of discharge for orifice

A_o = 0.087 feet² (based on measured 4 inch diameter orifice opening)

g = 32.2 ft per second²

h = 2.125 feet (measured at 25.5 inches)

$$0.68 \text{ cfs} = C_d (0.087 \text{ ft}^2) [2(32.2 \text{ ft per second}^2)(2.125 \text{ ft})]^{1/2}$$

$$C_d = 0.67$$

It is appropriate to use a C_d (coefficient of discharge) value of 0.67 and the orifice discharge equation to estimate the maximum flow for the permits for IDF&G bypass permits in Basins 71 and 72.

PHOTOGRAPHER AND DATE OF PHOTOS DANIEL A NELSON 5/22/2012

FILE NUMBER 74-15065



The photo above shows the fish screen for this permit.