

PLACE OF USE: IRRIGATION STORAGE

PLACE OF USE: IRRIGATION

Twp	Rge	Sec	NE				NW				SW				SE				Totals
02S	17E	23	<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>	
				3.8			12.0	25.0	16.0	7.0									3.8

Total Acres: 63.8

PLACE OF USE: STOCKWATER

Twp	Rge	Sec	NE				NW				SW				SE				Totals
02S	17E	23	<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>	
							X												

PLACE OF USE: IRRIGATION FROM STORAGE

Twp	Rge	Sec	NE				NW				SW				SE				Totals
02S	17E	23	<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>	
							12.0	25.0	16.0	7.0									60.0

Total Acres: 60

Method of Determination:

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

<u>ID No.*</u>	<u>Motor Make</u>	<u>Hp</u>	<u>Motor Serial No.</u>	<u>Pump Make</u>	<u>Size</u>
#1 (West Pond Embankment)	N/A	N/A	N/A	N/A	N/A
#2 (East Pond Embankment)	N/A	N/A	N/A	N/A	N/A
#3 (Pasture Diversion)	N/A	N/A	N/A	N/A	N/A

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

D. FLOW MEASUREMENTS

1.

Measurement

<u>Equipment</u>	<u>Type</u>	<u>Make</u>	<u>Model No.</u>	<u>Serial No.</u>	<u>Size</u>	<u>Calib. Date</u>
Swoffer (Current Velocity Meter)						
Fuji Sonic Flow Meter						
Theoretical (Hazen-Williams Formula)						

2. Measurements: See sections E & F Below.

E. & F. FLOW CALCULATIONS & VOLUME CALCULATIONS

Flow Between East and West Ponds-

Swoffer Current Velocity Meter

Total Channel Width		2.20 ft		Average Velocity		1.10 ft/s	
Total Channel Area		0.64 sq ft		Total Discharge		0.70 cfs	
Distance From Initial Point (ft)	Width (ft)	Depth (ft)	Observation depth	Velocity At Point (ft/s)	Mean Velocity in Vertical (ft/s)	Area (sq ft)	Discharge (cfs)
0.2		REW					
0.4	0.3	0.15	0.6	0.06	1.13	0.05	0.051
0.6	0.2	0.25	0.6	0.10	1.88	0.05	0.094
0.8	0.2	0.40	0.6	0.16	1.85	0.08	0.148
1.0	0.2	0.40	0.6	0.16	1.41	0.08	0.113
1.2	0.2	0.40	0.6	0.16	1.00	0.08	0.080
1.4	0.2	0.40	0.6	0.16	0.80	0.08	0.064
1.6	0.2	0.40	0.6	0.16	0.64	0.08	0.051
1.8	0.2	0.40	0.6	0.16	0.67	0.08	0.054
2.0	0.3	0.20	0.6	0.08	0.78	0.06	0.047
2.2		LEW					
						Total	0.70

Flow to Pivot: Fuji Sonic Flow Meter

LOG NAME: CASTLE 60-ACRE PIVOT START :06-02 12:35 END :06-02 12:45 INTERVAL:00:01:00	
06-02 12:35:00 +2.792E+0 ft/s +4.082E+2 gal/m +TOTAL 0000000 gal NORMAL	06-02 12:41:00 +2.751E+0 ft/s +4.022E+2 gal/m +TOTAL 0002443 gal NORMAL
06-02 12:36:00 +2.766E+0 ft/s +4.044E+2 gal/m +TOTAL 0000403 gal NORMAL	06-02 12:42:00 +2.833E+0 ft/s +4.142E+2 gal/m +TOTAL 0002849 gal NORMAL
06-02 12:37:00 +2.794E+0 ft/s +4.085E+2 gal/m +TOTAL 0000810 gal NORMAL	06-02 12:43:00 +2.814E+0 ft/s +4.115E+2 gal/m +TOTAL 0003259 gal NORMAL
06-02 12:38:00 +2.765E+0 ft/s +4.043E+2 gal/m +TOTAL 0001214 gal NORMAL	06-02 12:44:00 +2.727E+0 ft/s +3.987E+2 gal/m +TOTAL 0003665 gal NORMAL
06-02 12:39:00 +2.766E+0 ft/s +4.044E+2 gal/m +TOTAL 0001624 gal NORMAL	06-02 12:45:00 +2.821E+0 ft/s +4.125E+2 gal/m +TOTAL 0004075 gal NORMAL
06-02 12:40:00 +2.806E+0 ft/s +4.102E+2 gal/m +TOTAL 0002035 gal NORMAL	$Q = 407.5 \text{ gpm}$ $= 0.91 \text{ cfs}$

Volume of East and West Ponds

Notes: The surface area of both ponds was determined from the 2004 NAIP aerial photograph. Although the 2006 NAIP photograph was available, it was taken later in the year when the surface area of the pond had significantly been drawn down:

Calculations:

- Surface area of the West Pond = 1.2 Acres
- Surface area of the East Pond = 3.7 Acres
- Hydraulic Depth (surveyed) West Pond = 7.9 ft
- Hydraulic Depth (surveyed) East Pond = 9.9 ft
- Equation (as per the Field Examiner's Handbook) to determine reservoir capacity in V-shaped reservoirs, lakes, and ponds = Capacity = Surface Area x Maximum Depth x 0.4 =>

$$\text{Capacity West Pond} = 1.2 \text{ Acres} \times 7.9 \text{ ft} \times 0.4 = \underline{3.79 \text{ AF}}$$

$$\text{Capacity East Pond} = 3.7 \text{ Acres} \times 9.9 \text{ ft} \times 0.4 = \underline{14.7 \text{ AF}}$$

Irrigation Storage

Total evaporative loss on pond (based on precipitation deficit, Shoshone, open water, ponds) =
3.7 Acres x 2.38 AFA/acre = 8.81 AFA

Total field requirement for area = 60 acres x 3.5 AFA/acre = 210 AFA

Seepage loss (based on Camas County Soil Survey & Hubble Model, Sandy Loam) =
0.66 ft loss/day x 3.7 acres x 214 days x 50% (Taking into count it is not always full) = 261.3 AFA

Total Required = 8.8 + 210 + 261.3 = 480.1 AFA

Total allowed under Idaho Code 42-202(3) = 60 acres x 5.0 AFA/acre = 300.0 AFA

Recommend the smaller of the two or 300 AFA

Irrigation From Storage

Total field requirement for area = 60 acres x 3.5 AFA/acre = 210 AFA

Irrigation Flow

Total required for pasture = 3.8 x .02 cfs/acre = 0.08 CFS

Total required for pivot = 0.91 cfs

Total recommended is maximum flow or 0.99 CFS

Irrigation Volume (not from storage)

Total field requirement (pivot & pasture) = 63.8 acres x 3.5 AFA/acre = 223.3 AFA

Note: A condition should be present to limit total volume for irrigation, irrigation storage, and irrigation from storage to 300.0 AFA. Another condition should be present to limit all irrigation to 63.8 acres.

Stockwater

Notes: Due to the delivery pipe being buried and the control works being covered in water, it was impossible to take an actual flow measurement on the system. Because of this, a theoretical measurement was used, based on information obtained from the right holder and from the GPS.

Calculations:

Hazen-Williams Formula

$$V = 1.318 \times C_h \times R^{0.63} \times S^{0.54}$$

V = Velocity (ft/s)

C_h = Hazen-Williams Friction Coefficient

R = Hydraulic Radius = Cross Sectional Area / Wetted Perimeter

S = h_f/L = Slope of Energy Grade Line

For 1.5" old/plastic pipe: $C_h = 130$; For Delivery System: S = 0.0186, R = 0.0313; $\Rightarrow V = 2.35 \text{ ft/s}$

$$\underline{\underline{Q = 0.03 \text{ cfs}}}$$

The volume consumed by the number of cows that utilizing the trough:

$$100 \text{ cattle} \times 12 \text{ gpd/cow} \times 214 \text{ days} = \underline{\underline{0.78 \text{ AFA}}}$$

Recreation Storage Volume (West Pond)

The recreation storage component should be limited to the west pond only, where the fish had been planted

- Actual volume pond = 3.79 AFA
- Total evaporative loss on pond (based on precipitation deficit, Shoshone, open water, ponds) =
1.2 Acres x 2.38 AFA/acre loss = 2.86 AFA
- Seepage loss (based on Camas County Soil Survey & Hubble Model, Sandy Loam) =
0.66 ft loss/day x 1.2 acres x 365 days = 289.1 AFA

$$\text{Total volume required} = 3.79 + 2.86 + 289.1 = \underline{\underline{295.8 \text{ AFA}}}$$

G. NARRATIVE/REMARKS/COMMENTS

Jeff Cooper performed the field examination on May 20, 2008. Corey Skinner also participated due to the large size of ponds associated with the permit. Mr. James Castle, the current owner of the permit, accompanied us during the exam. The permit was issued to provide flow for the following beneficial uses: Irrigation (1.00 cfs), Stockwater (0.03 cfs), and Recreation (1.00 cfs). A preliminary review of the 2006 NAIP aerial photography indicated that two ponds had been built, a pivot had been placed and a pasture developed within the POU. These developments were considered during the field exam.

Considerations:

Although the permit only contained stockwater, recreation, and irrigation, the intent of the applicant was clear in the approved application, and should have had the following components:

- (1) Irrigation Storage and Irrigation from Storage: As per the approved application: "Water will be stored for a few days in the pond, then let out for irrigation. When the pond is empty, water will be stored again before being released for another irrigation."
- (2) Recreation Storage: the approved application had conditions for ice skating and hunting (on the ponds).
- (3) Irrigation: Water diverted from the natural channel of the unnamed stream, east of the irrigation from storage POU.
- (4) Stockwater: For the single stock trough built during the development period.

General system design was as follows:

- The natural channel of the unnamed stream (Unnamed Stream #1) derived from Tom Gooding Spring and a separate spring-fed (Feeder Spring) stream (Unnamed Stream #2) that feeds into the same channel, was impounded with an embankment to form the west pond. The water level was surveyed during the field exam and it was determined that the hydraulic height was approximately 7.9 ft. The area was determined from the 2004 NAIP aerial photograph to be approximately 1.2 acres. Using the formula for a v-shaped reservoir (Surface Area x Maximum Depth x 0.4), the total volume was determined to be 3.79 AF. The pond had been planted with fish for recreation purposes. The embankment for the west pond was determined to be the POD for the recreation storage and stockwater components of the permit. The west pond was determined to be the POU for the recreation component.
- Overflow from the west pond discharged from a 12" diameter steel pipe into an open channel to the east pond. The discharge pipe and open channel allowed for limited measurements. A swoffer current velocity flow meter was used to obtain a flow measurement. A detailed description of the results from the measurement is found in the section above. The flow measurement, determined to be the maximum flow possible, was 0.7 cfs.
- The east pond was determined to have an area of approximately 3.7 acres. The hydraulic height was determined to be approximately 9.9 ft for a total volume of 14.7 AF (using the equation from above). It was indicated by Mr. Castle that this pond was filled during the spring. Once the pond had filled, overflow was returned to the natural channel through a 10 in. steel pipe back to the natural channel and diverted downstream to irrigate a 3.8 acre pasture. Mr. Castle stated that during an optimal year, he would begin draining the pond to irrigate 60 acres with a pivot beginning May 1st and allow the stream to continue to fill the pond through the irrigation season, which he indicated ended on August 15th. A flow measurement was taken on the pivot using a Fuji sonic flow meter and was determined to be 0.91 cfs. The embankment for this pond was determined to be the POD for the irrigation storage and irrigation from storage component. The east pond should be considered the POU for the irrigation storage. The 60-acres under the pivot should be considered as the POU for irrigation from storage.
- A 1½ in. plastic pipe originating at the west pond supplied water to a stock trough located approximately 0.85 miles east of the pond.
- Flow left in the natural channel was diverted further downstream and used to irrigate 3.8 acres of pasture. The point at which the ditch for irrigation was identified as the POD for this irrigation component and the POU was identified as the pasture.

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>
RECREATION STORAGE	01/01 to 12/31		295.8 AF
IRRIGATION STORAGE	01/01 to 12/31		300.0 AF
IRRIGATION	04/01 to 10/31	0.990 CFS	223.3 AF
STOCKWATER	04/01 to 10/31	0.030 CFS	0.78 AF
IRRIGATION FROM STORAGE	04/01 to 10/31		210.0 AF
<u>Totals:</u>		1.00 CFS	595.8 AF

2. Recommended Amendments

☒ Change P.D. as reflected above ☒ Add P.D. as reflected above ☐ None

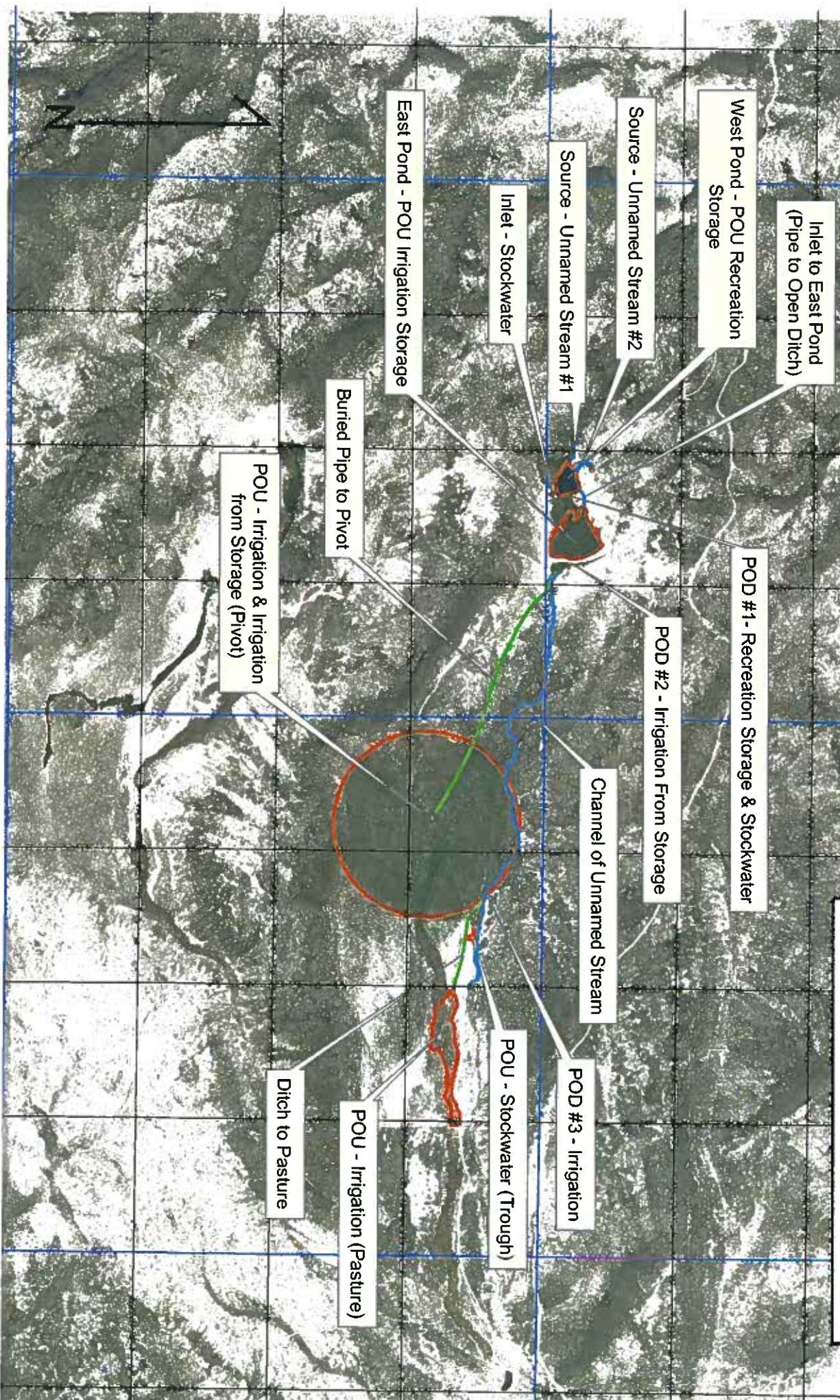
☒ Change P.U. as reflected above ☒ Add P.U. as reflected above ☒ Other – nature of use as reflected above

I. AUTHENTICATION

Field Examiner's Name  Date 5/20/2008

Reviewer _____ Date _____

System Diagram for Permit 37-8182
James & Patricia Castle
Examiner: J Cooper Date: 5/20/2008



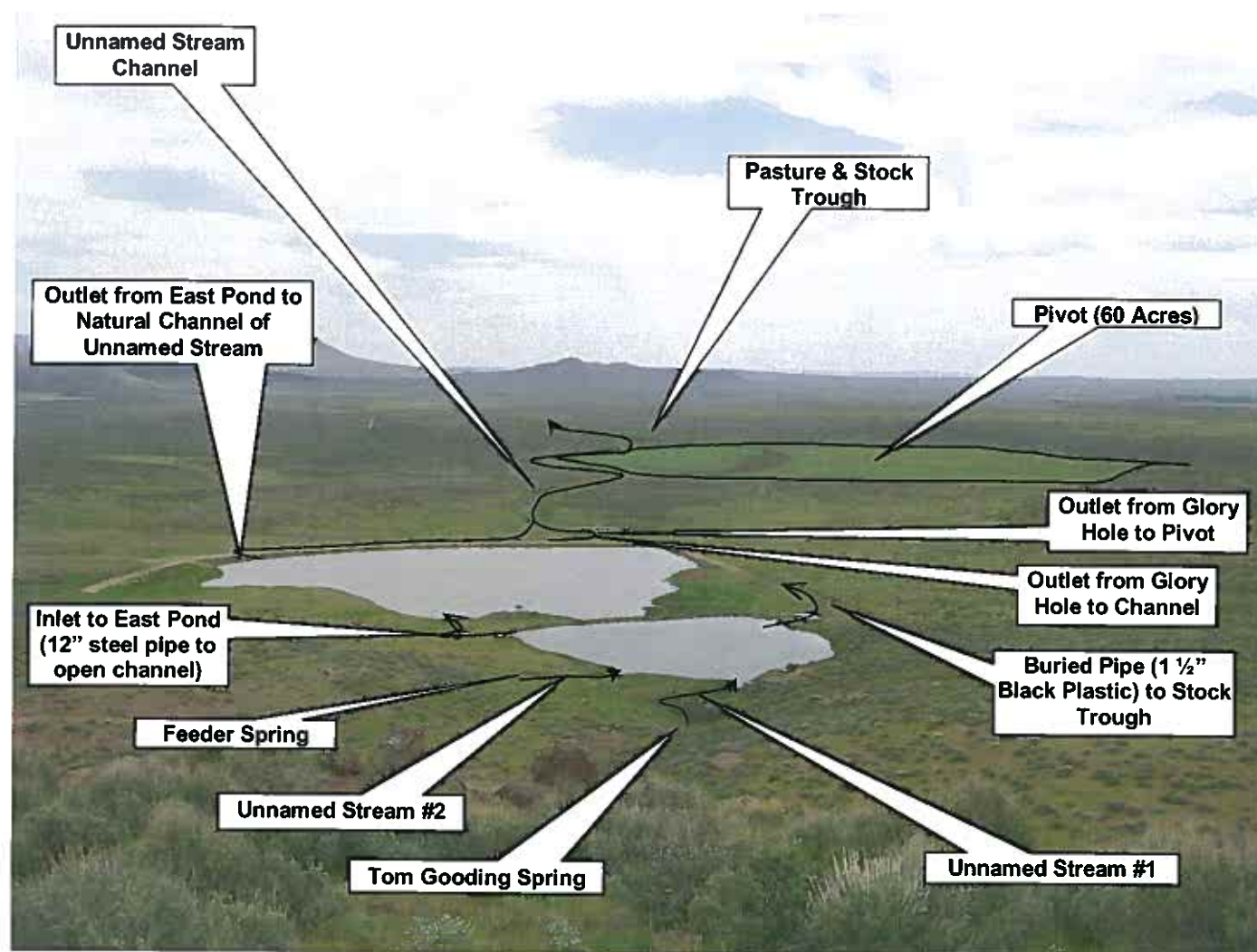


Figure 1. Eastward view of system for Permit 37-8182. Details described in narrative.

Idaho Dept of Water Resources
Field Exam Notes – System Source

Date: 5-20-2008

File: 37-8182

Prepared by Jeffrey S. Cooper



Figure 2. View looking downstream of channel of Unnamed Stream (#1) from Tom Gooding Spring.



Figure 3. Upstream view of channel of Unnamed Stream (#1) from Tom Gooding Spring.



Figure 4. Upstream view of channel of Unnamed Stream (#2) from Feeder Spring.



Figure 5. Downstream view of channel of Unnamed Stream (#2) from Feeder Spring.

Idaho Dept of Water Resources
Field Exam Notes – Pond Delivery System

Date: 5-20-2008

File: 37-8182

Prepared by Jeffrey S. Cooper



Figure 6. View of conveyance system from west pond to east pond. Pipe is 12" Steel, open discharge to a channel leading to the east Pond. Measurements were taken using swiffer current velocity meter.



Figure 7. Upstream view of open channel from west pond to east pond.



Figure 8. Overflow (spillway) flowing back into the natural channel of the unnamed stream. Overflow is constructed in the embankment of the east pond.

Idaho Dept of Water Resources
Field Exam Notes – Irrigation from Storage System

Date: 5-20-2008

File: 37-8182

Prepared by Jeffrey S. Cooper



Figure 9. Control works (screw gate) located in the east pond for pivot.

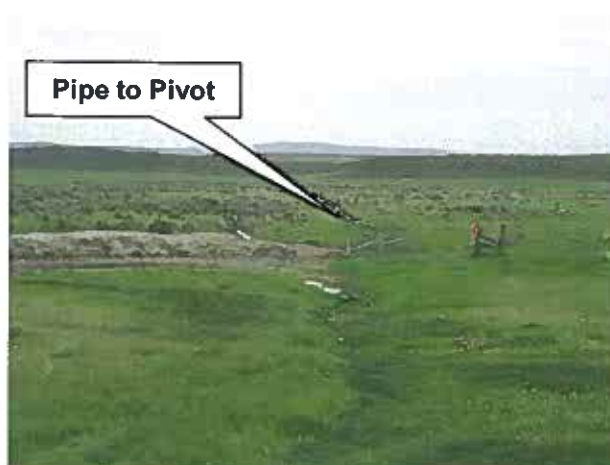


Figure 10. Downstream view of pipe from control works to pivot.



Figure 11. View of pivot which covers a 60-acre field currently planted in Tritacale.

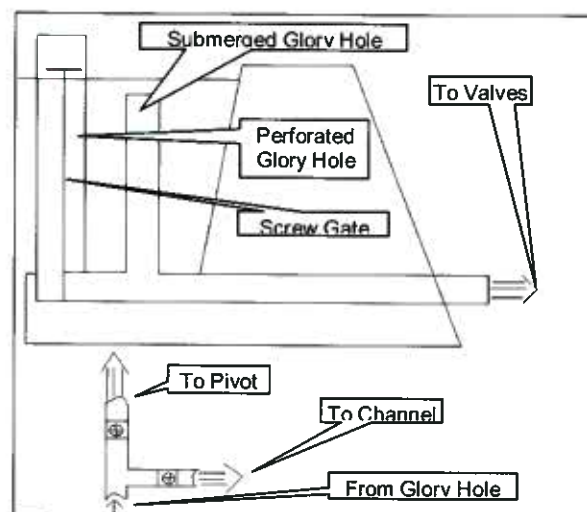


Figure 12. Diagram of control works in east dam.

Idaho Dept of Water Resources
Field Exam Notes – Stockwater System

Date: 5-20-2008

File: 37-8182

Prepared by Jeffrey S. Cooper



Figure 13. Location of buried pipe supplying stock trough. Pipe is 1 ½", plastic black pipe. Pipe is controlled by valve (currently underwater).



Figure 14. Stock Trough, located east of pivot, supplied by pipe described in Figure 12. Trough is 500 gallons and controlled by a float valve.

Idaho Dept of Water Resources
Field Exam Notes – Irrigation System (Pasture)

Date: 5-20-2008

File: 37-8182

Prepared by Jeffrey S. Cooper



Figure 15. POD for irrigation to pasture. Ditch was excavated from the natural channel of the Unnamed Stream.



Figure 16. View looking east of ditch to the pasture



Figure 17. View looking west of the pasture.

Meas. No. _____

Comp. by -----

Checked by

Sta. No. _____

Date Party

Width ----- Area ----- Vel. ----- G. H. ----- Disch. -----

Method No. secs. G. H. change in hrs. Supp.

Method coef. Hor. angle coef. Susp. coef. Meter No.

CAGE READINGS

Type of meter _____

[illegible]

Date rated for rod. other.

Meter ft. above bottom of weight.

Spin before meas. ----- after -----

Meas. plots ---- % diff. from rating -----

Wading, cable, ice, boat, upstr., downstr., side

bridge ----- feet, mile, above, below

page, and

Check-bar, found _____

changed to _____ at _____

Correct

Levels obtained

Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section _____

Flow ----- Weather -----

Other _____ Air _____ °F@ _____

Gage Water °F@

----- Record removed ----- Intake flushed ^U_L-----

Observer _____

Control _____

Remarks -----

G. H. of zero flow ----- ft.

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at—

Angle cor- rected	Dist. from initial point	Width	Depth	Observa- tion depth	Rev- olu- tions	Time in sec- onds	VELOCITY		Adjusted for hor. angle or -----	Area	Discharge	
							At point	Mean in ver- tical				
	.2	.2	.15				NA	1.13				.80
	.6		.25				1.58					.85
	.8		.4				1.85					
	1.0		.4				1.41					.90
	1.2		.4				1.0					
	1.4		.4				.8					.92
	1.6		.4				.64					.94
	1.8		.4				.67					.96
	2.0		.2				.78					.97
	2.2		.2				NA					.98
												.99
⊙												1.00
												.99
												.98
												.97
												.96
												.94
												.92
												.90
												.85
												.80

.0 .10 .20 .30 .40 .50 .60 .70 .75

Sta. No.:	_____	Meas. No.:	_____ 1
Name:	Caste Permit 37-8182	Comp. By:	jc
Personnel:	J. Cooper	Checked by:	_____
Date:	6/2/2008		
G.H.	_____ Start time 11:30 AM	Spin Test Before Meas.	ok
G.H.	_____ End Time 12:00 PM	After Meas.	ok
M. G.H.	_____		
Meter:	Swoffer		
SUMMARY:			
TOTAL CHANNEL WIDTH:	2.20 Ft.	AVERAGE VELOCITY:	1.10 Ft/Sec
TOTAL CHANNEL AREA:	0.64 Sq. Ft.	TOTAL DISCHARGE:	0.70 CFS

[illegible]

LOG NAME: CASTLE 60-ACRE PIVOT
START :06-02 12:35
END :06-02 12:45
INTERVAL:00:01:00

06-02 12:35:00
+2.792E+0 ft/s
+4.082E+2 gal/m
+TOTAL 0000000 gal
NORMAL

06-02 12:36:00
+2.766E+0 ft/s
+4.044E+2 gal/m
+TOTAL 0000403 gal
NORMAL

06-02 12:37:00
+2.794E+0 ft/s
+4.085E+2 gal/m
+TOTAL 0000810 gal
NORMAL

06-02 12:38:00
+2.765E+0 ft/s
+4.043E+2 gal/m
+TOTAL 0001214 gal
NORMAL

06-02 12:39:00
+2.766E+0 ft/s
+4.044E+2 gal/m
+TOTAL 0001624 gal
NORMAL

06-02 12:40:00
+2.806E+0 ft/s
+4.102E+2 gal/m
+TOTAL 0002035 gal
NORMAL

06-02 12:41:00
+2.751E+0 ft/s
+4.022E+2 gal/m
+TOTAL 0002443 gal
NORMAL

06-02 12:42:00
+2.833E+0 ft/s
+4.142E+2 gal/m
+TOTAL 0002849 gal
NORMAL

06-02 12:43:00
+2.814E+0 ft/s
+4.115E+2 gal/m
+TOTAL 0003259 gal

06-02 12:44:00
+2.727E+0 ft/s
+3.987E+2 gal/m
+TOTAL 0003665 gal
NORMAL

06-02 12:45:00
+2.821E+0 ft/s
+4.125E+2 gal/m
+TOTAL 0004075 gal
NORMAL

Q = 407.5 gpm
= 0.91 cfs