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Mailing Address:

Water Resources Data System
University of Wyoming, Dept 3943
1000 E University Avenue
Laramie, WY 82071

Physical Address:

Wyoming Hall, Room 249
University of Wyoming
Laramie, WY 82071

Phone: (307) 766-6651

Fax: (307) 766-3785

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**LITTLE SNAKE RIVER BASIN PLANNING STUDY
VOLUME II
EXECUTIVE SUMMARY
EVALUATION OF IRRIGATION DIVERSION DAMS
AND PRINCIPAL WATER SUPPLY DITCHES
PART B - PRINCIPAL DITCHES**

November 1992

WESTERN WATER CONSULTANTS, INC.
ENGINEERING • HYDROLOGY
HYDROGEOLOGY
AND
ENVIRONMENTAL CONSULTING

***611 Skyline Road
Laramie, Wyoming 82070
(307) 742-0031***

***701 Antler Drive - Suite 233
Casper, Wyoming 82601
(307) 473-2707***

***1949 Sugarland Drive - Suite 134
Sheridan, Wyoming 82801
(307) 672-0761***



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Prepared For:

Wyoming Water Development Commission
Herschler Building
Cheyenne, Wyoming 82002



Prepared By:

Western Water Consultants, Inc.
611 Skyline Road
Laramie, Wyoming 82070

701 Antler Drive, Suite 233
Casper, Wyoming 82601

1949 Sugarland Drive, Suite 134
Sheridan, Wyoming 82801

Subconsultants:

Mariah Associates
P.O. Box 1048
Laramie, WY 82070

HDR Engineering
303 E. 17th Ave, Ste. 300
Denver, CO 80203-1256

ESA Consultants
2625 Redwing Road
Ft. Collins, CO 80526

States West Water Resources
2424 Pioneer Avenue, Ste 307
Cheyenne, WY 82003

Watts & Associates
1472 N. 5th, Ste. 105
Laramie, WY 82070

INTRODUCTION

In August 1991; the Level I Phase I Little Snake River Basin Planning Study Tasks B and C (Diversions and Canals) report was submitted to the WWDC and the Little Snake River Conservancy District. The Phase I work objectives relative to canals were to:

- * Perform an Inventory and Condition Survey of the First Mesa and West Side Canals.
- * Examine the opportunities for combining other canals with the First Mesa and West Side.
- * Develop feasibility level designs and cost estimates alternatives for rehabilitating the two canals.

After discussions with WWDC and the Project Sponsors concerning the Phase I work, the Project Team was authorized to proceed with Phase II of Task C. The objective of the Phase II work was to prepare conceptual designs and cost estimates for the complete rehabilitation of both canals. This work was completed and submitted in November 1991 along with the report on the other tasks of the planning study.

In February 1992, the WWDC and the Little Snake River Conservancy District requested that a detailed conceptual design and cost estimate be prepared for lining sections of the West Side Canal near the Town of Baggs. The sections were identified as from Station 303+00 to 311+00, 330+80 to 340+00 and 361+00 to 365+00.

The Final Level I Report is a compilation of the findings presented in the previous reports and the more detailed conceptual design and cost estimate (Table 1) for lining sections of the West Side Canal. This summary presents a review of the existing conditions for both the First Mesa and West Side Canals, a preliminary cost estimate to completely rehabilitate each of the canals, and a feasibility level cost estimate to line sections of the West Side Canal near the Town of Baggs.

EXISTING CONDITION OF CANALS

The following section presents a qualitative evaluation of the present condition of the First Mesa and West Side Canals.

FIRST MESA CANAL

General conditions of the canal at normal flows:

- * **Access** - Canal is easily accessible for foot travel or off-road vehicles along most of the canal. This is sufficient for canal inspection and operation but not for necessary maintenance. Swift lane access roads in locations where none exist would improve maintenance operations on canal.

- * **Unstable slopes and slide areas** - No large areas were found except a small slump as noted on the inventory map. This is not a large slump and appears to be related to irrigation of a field above the canal.

- * **Hydraulics** -
 - Velocities appeared adequate through most of the canal except near the beginning and at Cottonwood Creek and Burbank Draw. Silting may be a problem. Dutch Joe has no bypass but has been recently cleaned, silting may also be a problem there.

 - Carrying capacity appears adequate through entire canal.

- * **Vegetation** -
 - Overall most of the canal is lined with trees but is not a problem except for access and the trees providing building material for the beaver.

 - Subsidence from roots has occurred that will require remedial action.

 - Some constriction spots and bank erosion have been created by livestock crossing the canal and pushing in bank material; it was excessive at one site.

- * **Seepage** - No major seepage areas were identified. Two locations showed obvious seepage where the canal bank material was gravelly that could benefit from lining.
- No seepage was found at the location close to a previous washout.

Structures

- * **Turnouts** - The majority of turnouts are metal slidegates attached to a concrete headwall or to metal pipe. Most are deteriorated and the gate is inoperable. Almost all the gates were open.
- * **Wasteways** - The first wasteway at the Parshall flume is inoperable, and requires replacement. The Cottonwood wasteway is in adequate condition but would function better with replacement of the bottom stoplogs and with a gate for flushing silt. No other wasteways are on the canal.
- * **Bypass Structures** - Two bypass structures require replacement. Both are old, deteriorated and are restricting flows in canal.
- No bypass on Burbank Draw and Dutch Joe Creek. Silting a problem on Burbank Draw. Both possibly require a bypass to be installed.
- * **Measuring Devices** - Few are in use at the turnouts, those being Parshall flumes. The 10-foot Parshall Flume used to measure the canal appears inaccurate. The flume is in a bend and appears submerged.
- * **Pipelines** - Two turnouts directly into pipeline to individual fields. These pipelines replaced the Bennett-Aylesworth diversion.
- * **Pumps** - Five pumping points on the canal. No problems noted.

- * Crossover Flumes - None
- * Wastegate - A manually operated wastegate located above a deep draw was found leaking a high quantity of water (3-4 cfs). Replacement may be necessary.

WEST SIDE CANAL

General condition of the canal at normal flows:

- * Access - Access to many areas of canal is limited by lack of roads, fences, gates and the presence of trees. Many turnouts lack culverts. Some roads may be necessary for maintenance and surveillance.
- * Unstable Stops - Some slope problems were noted.
 - Slump areas - Some work has already been done on these locations. Existing problem spots are small and isolated.
- * Hydraulics - Velocities adequate through most of canal except west of Highway 789. Velocity slows in this section with some silting problems present.
 - Carrying capacity is adequate with only a short section near the state line with low freeboard.
 - No excessive deep or shallow areas.
 - No evidence that the canal had been overtopped.
- * Vegetation - The stretch of canal generally to the south and west of Baggs is heavily overgrown with trees on the downslope bank. The remainder is generally clear.
- * Seepage - Visible seepage areas are found along the majority of the canal. No failure points are obvious. No slumping was associated with any of the seepage areas.

Structures

- * **Turnouts** - There is an overall need for replacement. Concrete is old and in deteriorated condition. Most metal slidegates are inoperable and wood slidegates inadequate. No measuring devices except at a few locations. Only 5 locations have check structures. Some repair work has been done to a few of the structures. Most gates were open.

- * **Wasteways** - Three wasteways on canal. First one before Willow Creek is deteriorated and a safety hazard. The other two wasteways are in adequate condition but the age of the structures may warrant replacement. No wasteway in Willow Creek.
 - The three wasteways are stoplog structures, two leak. Replacement of some of the lower stoplogs with a concrete wall and new stoplogs would stop much of the leakage.

- * **Wastegates** - No manually operated gates on canal.

- * **Bypass Structures** - The one bypass structure located under a wasteway may necessitate replacement if the pipe is corroded. No other areas were noted that required bypass structures.

- * **Measuring Devices** - The primary measuring devices used are Parshall Flumes. The 10 foot flume measuring the canal flow appeared submerged and possibly not level. A water user commented that it may be undercut downstream. Other small flumes at the turnouts were either not being used or were not level. None appeared to be functioning accurately.

The original turnouts on the West Side were constructed to accommodate submerged orifices, but none are in use nor were any found in the vicinity of the gates. Only a staff gage in a check at the stateline.

- * **Pipelines** - No pipelines out of canal.
- * **Pumps** - Two pumps out of canal had intake structures in canal and one with check structure.
- * **Flumes** - Inspection was done on the Four Mile Draw flume and found the structure to be sound and inadequate condition. The concrete inlet and outlet structure may require replacement due to age. The capacity of the flume also limits the canal.

TABLE 1
FIRST MESA AND WEST SIDE CANAL REHABILITATION
SUMMARY OF CONSTRUCTION COST ESTIMATES

ITEM	UNIT	UNIT COST	FIRST MESA QUANTITY	FIRST MESA COST	WEST SIDE QUANTITY	WEST SIDE COST
RIPRAP	CY	\$50	45	\$2,250	32	\$1,600
EXCAVATION	LF	\$4			1400	\$5,600
CANAL BANKS	LF	\$3	400	\$1,200	900	\$2,700
LINING	LF	\$15	1700	\$25,500	2580	\$38,700
ACCESS ROAD	LF	\$2	24800	\$49,600	14800	\$29,600
FENCING						
-4 B.W. WOOD	LF	\$2	400	\$800		
-GATES	EA	\$150	13	\$1,950	8	\$1,200
BYPASS						
-18 IN. CMP	LF	\$40	25	\$1,000		
-24 IN CMP	LF	\$45	150	\$6,750		
-60 IN. CMP	LF	\$80	40	\$3,200		
WASTEWAY						
-REPLACE	EA	\$9,000	2	\$18,000	2	\$18,000
-REPAIR/ALTER	EA	\$1,000			3	\$3,000
DIVISIONS	EA	\$10,000	1	\$10,000	1	\$10,000
CHECKS						
-6 FT	EA	\$2,000	5	\$10,000		
-8 FT	EA	\$2,500	14	\$35,000	8	\$20,000
-10 FT	EA	\$4,000	14	\$56,000		
-14 FT	EA	\$5,000			9	\$45,000
-16 FT	EA	\$6,500			10	\$65,000
TURNOUTS						
-W/O CULVERT	EA	\$2,500	25	\$62,500	21	\$52,500
-W/ CULVERT	EA	\$3,500	14	\$49,000	14	\$49,000
CULVERTS						
- 6 FT ARCH	EA	\$1,500	1	\$1,500		
-12 FT ARCH	EA	\$15,000	2	\$30,000		
-14 FT ARCH	EA	\$14,000	1	\$14,000		
PIPE DROPS						
-FOURMILE	LF	\$105			75	\$7,875
-CARRUTHERS	LF	\$22			2400	\$52,800
-REED	LF	\$13			2150	\$27,950
FLUME	EA	\$5,000			1	\$5,000
MISC	L.S.			\$1,000		
1 CONSTRUCTION COST SUBTOTAL				\$379,250		\$435,525
2 ENGINEERING COSTS(10% OF #1)				\$37,925		\$43,553
3 SUBTOTAL (#1 + #2)				\$417,175		\$479,078
4 CONTINGENCY (15% OF #3)				\$62,576		\$71,862
5 CONSTRUCTION COST TOTAL (#3+#4)				\$479,751		\$550,939
6 FINAL DESIGNS & SPECS (10% OF #5)				\$47,975		\$55,094
7 PERMITTING AND MITIGATION				\$0		\$0
8 LEGAL FEES				\$0		\$0
9 AQUISION OF R.O.W.				\$0		\$0
10 PROJECT COST TOTAL (#5+#6+#7+#8+#9)				\$528,000		\$606,000

WEST SIDE CANAL PVC LINING

There are sections of the West Side Canal near the Town of Baggs which seep water. The seepage wastes water and causes a threat to the stability of the Canal. At the request of the WWDC and the Conservancy District, a detailed conceptual design and cost estimate was prepared for lining several reaches of the West Side Canal using PVC sheeting.

During Phase II work, seepage and stability problems were noted in sections 303+00 to 311+00, 330+80 to 340+00 and 361+00 to 365+00, or approximately 2,580 lineal feet of canal. It was concluded that PVC lining these sections would be the most satisfactory way to alleviate the noted problems.

The West Side canal has a capacity of about 146 cfs along the defined sections. The selected design provides a trapezoidal channel with a 12 foot bottom width and 3:1 side slopes lined with a PVC membrane buried 2 feet. PVC membranes are typically buried to preclude damage by livestock and wildlife and to prevent deterioration by ultra violet light. The conceptual design includes fencing which also helps to eliminate PVC liner damage. Three to one side slopes are typical for PVC lined canals. Steeper slopes can cause material to slide on the smooth membrane.

Table 2 is a detailed conceptual design cost estimate for PVC lining the above mentioned canal sections. The estimated Total Project Cost for the lining installation is \$121,000.

**Table 2 - Construction Cost Estimate
For PVC Lining Sections of West Side Canal**

<u>Description</u>	<u>Units</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Cost</u>
1. Mobilization	L.S.	1	10%	\$ 9,000
2. Access Road Improvement	L.S.	1	\$2,000	\$ 2,000
3. Canal Clearing	AC	2	\$1,000	\$ 2,000
4. Excavation for Liner Installation	C.Y.	7800	\$ 2.50	\$19,500
5. PVC Liner Installation	C.Y.	13700	\$ 2.00	\$27,400
6. Install Earthen Protective Cover	C.Y.	6000	\$ 2.50	\$15,000
7. Fence Canal (Include Gates)	L.F.	5000	\$ 2.00	\$10,000
8. Revegetate Disturbances	AC	2	\$1,000	\$ 2,000

1.	Construction Cost Subtotal	\$ 86,900
2.	Engineering Costs (10% of #1)	\$ 8,700
3.	Subtotal (#1 + #2)	\$ 95,600
4.	Contingency (15% of #3)	<u>\$ 14,400</u>
5.	CONSTRUCTION COST TOTAL (#3 & #4)	\$110,000
6.	Prepare Final Designs and Specs. (10% of #5)	\$ 11,000
7.	Permitting and Mitigation	\$ -0-
8.	Legal Fees	\$ -0-
9.	Acquisition of Access and R.O.W.	<u>\$ -0-</u>
10.	PROJECT COST TOTAL (#5 + #6 + #7 + #8 + #9)	\$121,000