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ETNA DIVERSION DAM PROJECT
LEVEL II STUDY
FINAL REPORT

EXECUTIVE SUMMARY



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Lidstone & Anderson, Inc.

Water Resources and Environmental Consultants

**ETNA DIVERSION DAM PROJECT
LEVEL II STUDY
FINAL REPORT**

EXECUTIVE SUMMARY

PREPARED FOR:

**Wyoming Water Development Commission
Herschler Building
122 West 25th Street
Cheyenne, WY 82002**

and

**Etna Irrigation District
Etna, Wyoming**

PREPARED BY:

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736 Whalers Way, Suite F-200
Fort Collins, CO 80525**

In Cooperation With:

**Forsgren Associates, Inc.
849 Front Street, 2nd Floor
Evanston, WY 82930**

October 31, 1990



EXECUTIVE SUMMARY

Authorization and Purpose

On June 6, 1990 Lidstone & Anderson, Inc. (LA) entered into a contract with the Wyoming Water Development Commission (WWDC) to provide professional services related to the Level II-Etna Diversion Dam Project. During the initial phase (Phase I) of the project, LA was retained to (1) evaluate the existing diversion dam and (2) identify the necessary rehabilitation measures or alternative improvements. The Phase II study included the preparation of conceptual designs and cost estimates associated with the rehabilitation measures and alternative improvements selected for implementation. The results of the Phase I work were submitted to the WWDC on August 23, 1990. The final project report was submitted on October 31, 1990.

Project Location and Summary of Existing Problems

The Etna Diversion Dam is located on the Salt River in the SW 1/4 of the SE 1/4 of Section 35, Township 34 North, Range 119 West, Lincoln County, Wyoming. As indicated on Figure 1, the existing structure is situated approximately one mile downstream of the U.S. Highway 89 bridge and 2.7 miles south of Thayne. Presently, several rock-filled wood cribs are spaced across the Salt River to divert water to the headgate of the East Side Canal. The diversion structure and headgate provide irrigation water for approximately 6,613 acres of land requiring a diversion of approximately 94 cfs (based upon 1 cfs/70 acres).

This project was approved for Level II funding based upon a concern regarding the long-term viability of the existing structure. Historically, the problems associated with the existing structure have included (1) deterioration and periodic replacement of the wooden cribs and (2) the loss of flow to the headgate following a meander cutoff upstream of the diversion structure. The meander cutoff necessitated the construction of a berm to return the main

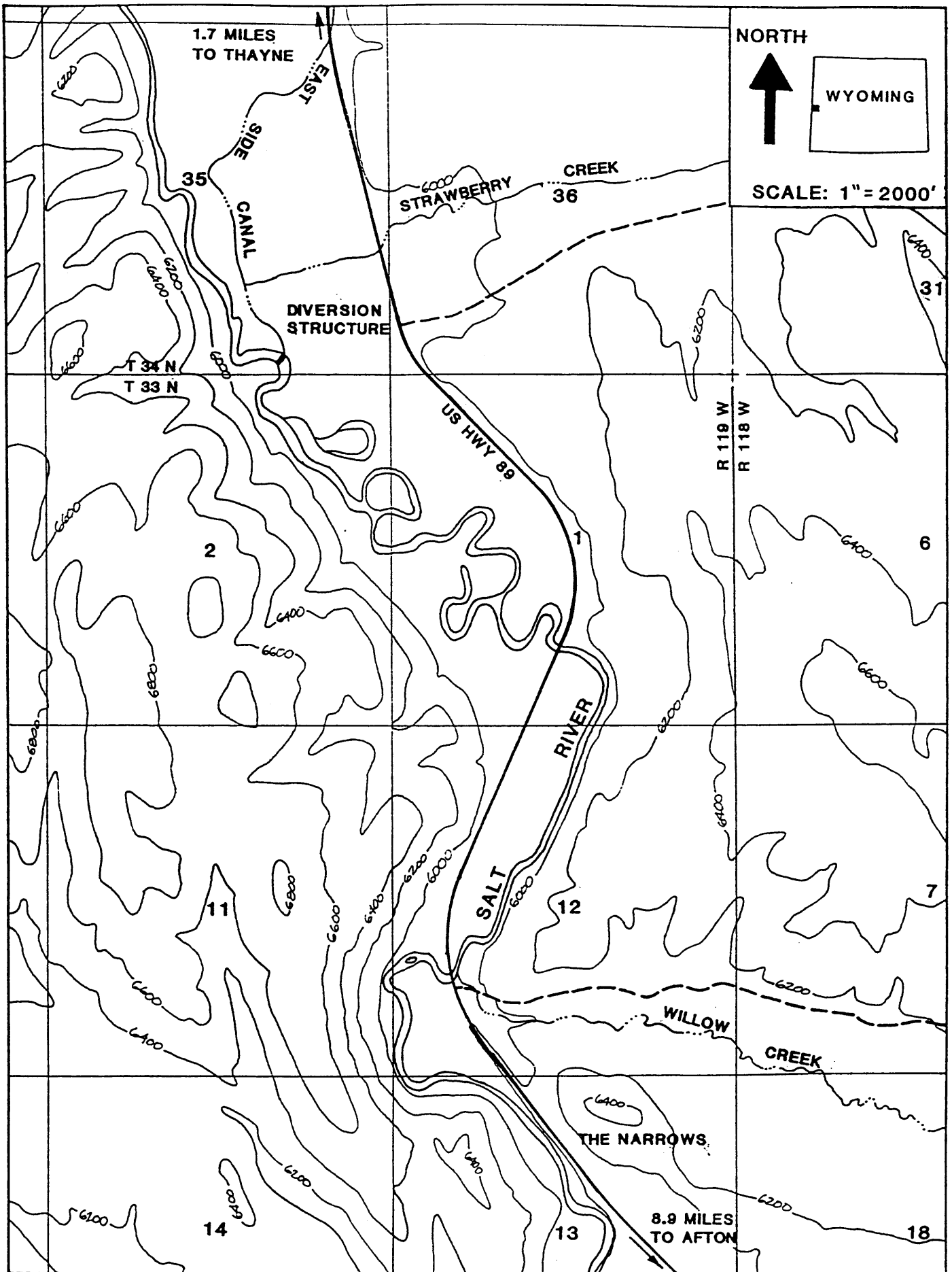


Figure 1 Location Map

river flow to the original channel, thereby allowing the diversion of water to the East Side Canal.

Summary of Phase I Investigation

During Phase I, the condition of the diversion dam was evaluated, the geomorphic stability of the river was assessed, alternative improvements identified and a rehabilitation plan prepared. Alternative improvements identified in the rehabilitation plan were presented to the WWDC and the Etna Irrigation District (EID) in a meeting on August 15, 1990. The input obtained from this meeting was carefully scrutinized and incorporated into the Phase I Report. The project improvements selected by the WWDC and the EID for the Phase II investigation included the following work items:

1. Preparation of conceptual designs and cost estimates related to the replacement of the existing structure with an improved structure consisting of either rock, reinforced concrete or roller compacted concrete (RCC).
2. Investigation into the availability and cost of materials (rock riprap, concrete, RCC) for the diversion structure.
3. Refinement of the location, alignment, and configuration of the diversion structure.
4. Geotechnical investigation of the foundation materials in the vicinity of the diversion structure.
5. Conceptual design and cost estimate associated with the incorporation of a fishway adjacent to the diversion structure.
6. Conceptual design and cost estimate associated with the incorporation of a fish screen in the vicinity of the canal headgate.
7. Evaluation, conceptual design and cost estimate associated with directly diverting the irrigation requirement of the Hemmert Ditch via the East Side Canal.

Summary of Phase II Investigation

The formulation of the conceptual designs was based upon the results of the final hydraulic, geomorphic, geotechnical and water rights investigations. Uncertainty in the availability and cost of materials led to the preparation of conceptual design plans for three diversion dam alternatives (rock, reinforced concrete, and RCC). In addition, conceptual designs were prepared for the bank stabilization measures, fish screen and fishway. Figure 2 presents the general location of the proposed improvements.

Cost Estimates

For the three diversion dam alternatives, the cost of the project components and final cost estimates are presented in Table 1. It is important to note that the repayment responsibility has not yet been determined for the costs associated with the fishway and the fish screen. Additional funding for these components may be available from organizations such as Trout Unlimited. In addition, further coordination with the Wyoming and Idaho Game & Fish Departments may produce a significant reduction in the installation cost of the fish screen. To accommodate these possibilities, costs for the fishway and fish screen are itemized separately in Table 1. Due to the level of uncertainty involving their cost and installation, however, the financial plan subsequently prepared does not include a repayment schedule for the fishway and fish screen.

The cost associated with the Hemmert Ditch turnout structure was also itemized separately. To be eligible to receive future funding from the WWDC, the Hemmert Ditch will need to become a part of the EID. Alternatively, the EID may opt to assume the project costs associated with the Hemmert Ditch turnout structure and negotiate a separate repayment schedule. An alternative financial plan was prepared assuming the cost of the Hemmert Ditch turnout structure was incorporated into the overall project costs.

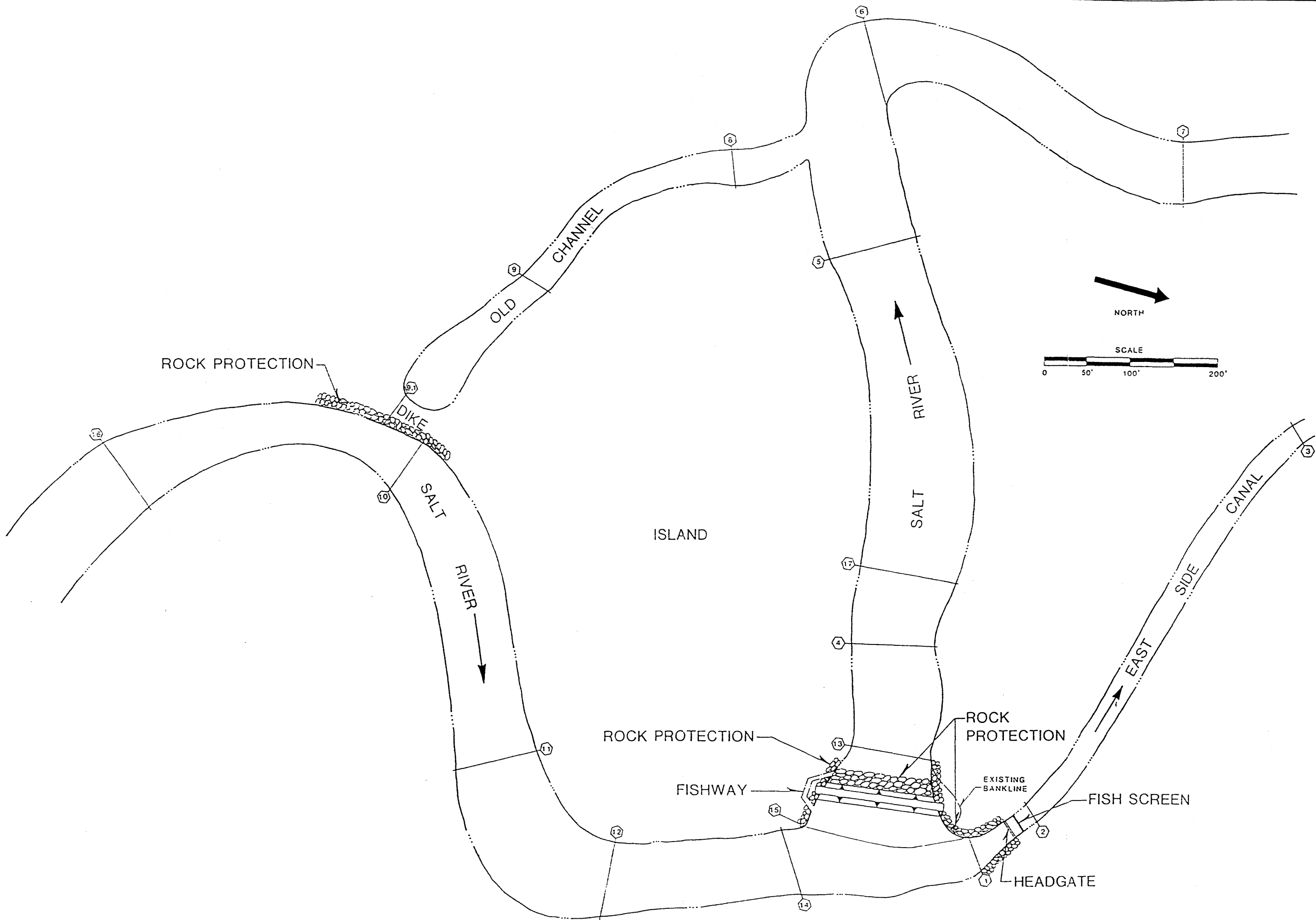


FIGURE 2
LOCATION OF PROJECT COMPONENTS

PROJECT NO.	WY-WDC-01
DATE	10/15/90
DESIGN	BAK
DRAWN	TCH
CHECKED	BAK
REVISORS	

TABLE 1 COST OF PROJECT COMPONENTS AND FINAL COST ESTIMATES

ITEM	ROCK STRUCTURE						CONCRETE STRUCTURE						RCC STRUCTURE					
	COST (\$)						COST (\$)						COST (\$)					
	EID ¹		TU/WG&F ²		HEMMERT ³		EID ¹		TU/WG&F ²		HEMMERT ³		EID ¹		TU/WG&F ²		HEMMERT ³	
Remove Existing Structure	6,500						6,500						6,500					
Breach Berm, Construct Dike	3,000						3,000						3,000					
Clear/Grub/Native Backfill	3,500						3,500						3,500					
Construct Diversion Dam	37,200						76,300						40,900					
Install Bank Protection	27,000						27,000						27,000					
Site Clean-up	5,500						5,500						5,500					
Berm Replacement/Raise	4,000						4,000						4,000					
Mobilization/Demobilization	4,000						4,000						4,000					
Hemmert Ditch Turnout					3,000						3,000						3,000	
Fish Screen			20,000						20,000						20,000			
Fish Ladder			17,225						17,225						17,225			
COST OF PROJECT COMPONENTS	90,700		37,225		3,000		129,800		37,225		3,000		94,400		37,225		3,000	
Engineering Costs (10%)	9,070		3,725		300		12,980		3,725		300		9,440		3,725		300	
SUBTOTAL	99,770		40,950		3,300		142,780		40,950		3,300		103,840		40,950		3,300	
Contingency (15%)	14,965		6,140		500		21,420		6,140		500		15,580		6,140		500	
TOTAL CONSTRUCTION COST		114,735		47,090		3,800		164,200		47,090		3,800		119,420		47,090		3,800
Final Plans & Specs		11,475		4,710		380		16,420		4,710		380		11,940		4,710		380
Permitting & Mitigation		2,000		---		---		2,000		---		---		2,000		---		---
Legal Fees		---		---		---		---		---		---		---		---		---
Access & Right of Way		1,000		---		---		1,000		---		---		1,000		---		---
TOTAL PROJECT COST		129,210		51,800		4,180		183,620		51,800		4,180		134,360		51,800		4,180

- 1) EID - ETNA Irrigation District
- 2) TU/WG&F - Trout Unlimited/Wyoming Game and Fish Department
- 3) Hemmert - Hemmert Ditch

Financial Plan and Economic Analysis

Presently, the annual budget for the EID is approximately \$19,800 which is based upon a \$3.00 per acre assessment on 6,613 acres. Annual costs for operation and maintenance activities have ranged from \$990 to \$1,980. With the project improvements, some reduction in the annual operation and maintenance costs will be realized. For the purposes of the economic analysis, an annual savings of \$450 was assumed.

A comparative analysis was conducted to determine the cost of maintaining the existing diversion dam for the next 50 years (Do Nothing Alternative). Rehabilitation and possible replacement of the existing structure is presently warranted. Furthermore, given the 50-year design life associated with the project improvements, it is anticipated that this type of structure will need to be replaced, partially or totally, within 30 years. For this analysis, the replacement cost assumes the inflation rate is zero and that available funds can be invested at a rate of return equal to 3.5% above the inflation rate. A 50-year life cycle cost was assumed. The estimated present worth cost without the project improvements is:

Present Rehabilitation Costs:	\$40,800
Future 30-yr Replacement Costs:	<u>14,700</u>
Total	\$55,500

This results in an estimated annual cost of \$2,370 or an increased assessment of \$0.36 per acre.

The annual cost to the EID of implementing either of the three alternatives was based upon the total costs provided in Table 1. The financial plan was based upon receiving a 50% grant - 50% loan from the WWDC. The loan would be repaid in 50 years at 4% interest. With this information, the annual cost and increased assessment becomes:

	<u>Rock</u>	<u>Reinforced Concrete</u>	<u>RCC</u>
Project Costs	\$129,210	\$183,620	\$134,360
Annual Payment	\$ 2,557	\$ 3,824	\$ 2,677
Payment/yr/acre	\$ 0.39	\$ 0.58	\$ 0.40

Based upon the above information, the annual per acre assessment to water users would be increased from \$3.00 to \$3.39 with implementation of the rock structure, \$3.58 for the reinforced concrete structure and \$3.40 for the RCC structure.

Assuming the cost of the Hemmert Ditch turnout structure is incorporated into the EID project costs, the annual cost and increased assessment becomes:

	<u>Rock</u>	<u>Reinforced Concrete</u>	<u>RCC</u>
Project Costs	\$133,390	\$187,800	\$138,540
Annual Payment	\$ 2,655	\$ 3,921	\$ 2,775
Payment/yr/acre	\$ 0.37	\$ 0.55	\$ 0.39

Permitting

Prior to construction, the EID will be required to obtain certain permits, rights-of-way and easements. The following information was obtained regarding the permitting requirements.

1. U.S. Army Corps of Engineers

The Corps of Engineers (COE) considers the project a rehabilitation of an existing irrigation structure. Consequently, it is exempt from regulation by the COE.

2. Wyoming DEQ, Water Quality Division

Since a 404 permit is not required by the COE, the DEQ does not require a 401 authorization.

3. Wyoming State Engineers Office

Plans and specifications detailing the rehabilitation project must be filed with the State Engineers Office.

4. U.S. Bureau of Land Management

A right-of-way will be required for any access roads which cross BLM land. If new BLM land is disturbed by road building or any construction activities, cultural clearance will be required.

5. U.S. Forest Service

Riprap sources in the Star Valley area are generally limited to the U.S. Forest Service lands. A Special Use Permit will be required to obtain riprap from a source located upon Forest Service property. In addition, a permit will be required from the Wyoming DEQ Land Quality Division to open a new quarry.

6. Property Owners

Where applicable, permission should be negotiated for the right of access across private property for all construction activities.

Conclusions and Recommendations

Based upon the results of the Level II study, the following conclusions and recommendations are provided:

1. Given the costs associated with the "do nothing" alternative, either a rock or RCC diversion dam is feasible and cost competitive. Maintenance costs may be less with an RCC diversion dam. The reliability of the unit costs is better for rock riprap than for RCC since RCC is not only dependent upon the quantity of RCC, but also upon the timing of the project and the experience of the local contractor.

2. It is most cost effective to the EID, if the costs associated with the Hemmert Ditch turnout structure are incorporated into the overall project costs. This assumes that the assessed acreage is increased by the 480 acres under irrigation by the Hemmert Ditch. Coordination will be necessary to either (1) incorporate the Hemmert Ditch into the EID or (2) assume the costs for the turnout structure into the overall project costs and negotiate a separate repayment schedule between the EID and the Hemmert Ditch.

3. Funding for the fishway and fish screen will need to be further investigated prior to implementation of final design. Additional coordination will be necessary to determine the feasibility of allowing the Idaho Game & Fish Department to fabricate and install the fish screen.

4. In conjunction with the installation of a fish screen in the East Side Canal, it is recommended that a flow measuring device be installed at this location. This will be increasingly important given the installation of a turnout structure to the Hemmert Ditch.