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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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SUMMARY REPORT

***RIVERTON VALLEY DIVERSION
MODIFICATIONS***

LEVEL II STUDY

Prepared for the

Wyoming Water Development Commission
Cheyenne, Wyoming

Prepared by

**Apex Surveying, Inc.
407 West Adams Ave.
Riverton, WY 82501**

in association with

**States West Water Resources Corporation
August, 2003**

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RIVERTON VALLEY DIVERSION MODIFICATIONS

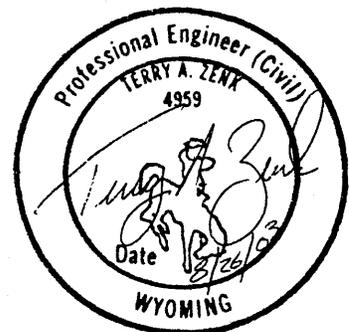
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SUMMARY REPORT

This report summarizes the findings of a Level II Study to determine the feasibility of Alternative Diversion Options for the Riverton Valley Irrigation District (RVID) should RVID lose its lease at the present diversion location. Two alternatives were studied to divert water to the present RVID Canal. The study addressed the diversion options in three phases as follows:

Phase 1. Building a pumping plant on the Big Wind River downstream of the existing RVID Diversion to pump water from the Big Wind River to the RVID Canal.

Phase 2. Enlarging approximately 15 miles of the LeClair Irrigation District's (LID) Canal and Diversion to carry RVID water to a point where the RVID Canal can be supplied by pipeline.

Phase 3. This phase of the study addresses the summary, comparison costs and benefits.

A. Phase I-Diversion Through a Pumping Plant

1. Project Meetings:

A project meeting was held on July 31, 2002 with representatives present from Apex Surveying, RVID, LID, Landowners, Wyoming Water Development Commission and City of Riverton.

2. Pumping Plant Site Evaluations:

A pumping plant site was selected after visual inspections and a detailed survey to determine land ownership relative to location of the present river channel. Factors considered in the site selection were distance from the canal, pumping head, flooding conditions, land ownership and power

supply. A site was selected approximately 1.2 miles downstream from the present diversion, on private land. The land status map and pump station site survey are shown in drawings, Appendix A, page 38 of the final report.

3. Permits and land acquisition required to change the RVID Canal Diversion to a pumping plant:

Permits will be required from the State Board of Control and State Engineers Office for change in Point of Diversion and Means of Conveyance. A permit from the Army Corp. of Engineers will be required for work in the river.

The Pumping Plant Site would be purchased from the landowner. Access is along the present canal bank. An easement would be obtained for a power line extension to the site.

4. Conceptual Designs and Cost Estimate Pump Plant:

The pump plant will require a diversion dam, which will check up the river during low flow conditions. Sediment and debris should be passed by the pump station. The Diversion should not cause the river to exceed bank full stage. Based on the above, a diversion structure was designed approximately 4 feet high and 150 feet long with a low flow section 50 feet long with "Obermeyer" overflow gates. Sediment build-up would be controlled by a 10 foot wide sluiceway controlled by a radial gate. The conceptual design of the diversion dam is shown in drawings 1 of 4 and 2 of 4, Appendix B, page 39 of the final report.

The pump plant would be located on the riverbank and be designed to pump a maximum of 190 CFS against a static lift of 14 feet. A pumping range of 75 CFS to 190 CFS will be required. Four pumps would be installed with three being utilized in operation and one on standby for maximum flows. Each pump would be designed to pump 28,500 GPM

(63.5 CFS) against 20 feet of head requiring 200 HP motors. A 60 inch diameter steel pipe will be required for discharge to the canal. Flow measurement from the pump station would be done with an in line meter in the 60 inch pipeline. Conceptual design of the pumping plant and discharge pipeline is shown in drawings 3 of 4 and 4 of 4, Appendix B, page 39 of the final report.

The cost estimate for the pump station, diversion and discharge pipeline is \$3,800,000.00. A detailed cost estimate is contained in the final report following page 10.

5. Conceptual Design and Cost Estimate Power Supply:

The power supply will require installation of a 14.4 KV distribution line and 3-phase transformer. It is proposed to rebuild the existing distribution line from Riverview Road to the Crofts ranch house and extending service to the pump station. Conceptual design is shown in drawing power supply map sheet 1 of 1, Appendix B of the final report.

The cost estimate for the power supply line is \$26,400.00, which has been incorporated in the cost estimate for the pump station. A detailed cost estimate is contained in the final report, page 11.

6. Economic Analysis/Ability to Pay:

The standard WWDC funding package is a 50% grant and 50% loan @ 6% interest. With a project cost of 3,800,000.00 the annual cost to the District is \$138,033.00. In addition the following yearly costs are anticipated:

Pump Station Maintenance	\$ 15,000.00/Yr.
Pump Inspection and Maintenance	\$ 15,000.00/Yr.
Fund for Pump Replacement	\$ 30,000.00/Yr.
Electric Power Cost	\$ <u>69,000.00/Yr.</u>
Subtotal	\$129,000.00/Yr.

Loan	<u>\$138,000.00/Yr.</u>
Total	<u>\$267,000.00/Yr.</u>

With the District having approximately 8,452 acres the annual cost per acre would be \$31.60/acre.

B. Phase 2-RVID Diversion through the LeClair Diversion and System

1. Evaluate the Present Diversion Structure and Canal Capacity:

The existing LID canal normally carries approximately 250 CFS with flows as high as 400 CFS reported. RVID normally carries approximately 120 CFS with historical flows as high as 190 CFS. As a general design consideration the canal will have to carry a maximum of 600 CFS with normal flows of 370-400 CFS.

A detailed survey was done on the present LID diversion structure, headgate and canal. The present diversion is in reasonable working condition, but not sufficient for additional flows required for RVID.

The LID canal was surveyed for location and alignment in March of 2002 and this survey used as a base for design recommendations. The survey detailed a total canal length from diversion to the RVID pipeline drop of 80,181 ft. (15.2 Miles). For maps of the canal refer to LeClair Riverton No. 2 Canal Modification sheets 1 of 8 through 6 of 8, Appendix D of the final report.

A drive-through evaluation of the canal and appurtenant structures was done in September of 2002 with the results tabulated as LeClair canal evaluation between pages 14 and 15 of the final report.

Apparent throughout the canal length is a lack of

maintenance and uniform cross section.

Cross sections were surveyed at various comparable areas along the canal. The highwater line and canal grade were then used to determine the maximum flow. The section was then modified to carry an additional 200 CFS. As a general design standard the canal level was raised 1.5 feet throughout.

2. Locate a Site to Drop the RVID Water to the RVID Canal:

A site was selected along the east side of Section 30, T.1N., R.4E., which was the shortest distance available where right-of-way could be obtained. The area is relatively free from construction impediments and by passes only one diversion from the RVID Canal. The length of the pipeline would be approximately 4500 feet with a vertical drop of 160 feet.

3. Permits and Land Acquisition Required to Change the RVID Point of Diversion to the LeClair System Diversion:

All appropriations under the RVID Canal would have to be petitioned through the State Engineers Office and State Board of Control to change the point of Diversion and means of conveyance.

The construction and modification of the diversion would have to be permitted through the Army Corp. of Engineers.

Easements would be obtained from landowners along the drop pipeline and LID canal diversion.

4. Conceptual Design and Cost Estimates Diversion and Canal Modifications:

A combined diversion dam would be constructed at the site of the existing headgate and diversion. The existing buried concrete diversion structure would be utilized as a base for the new

structure.

The new diversion structure would check the river to a depth to get water to the canal under low river flows, and would be designed to not exceed bank full stage and be economical and user friendly.

The diversion dam would be approximately 250 feet in length with an overflow section 50 feet in length with 4' high "Obermeyer" gates.

To increase headgate capacity a new headgate structure would be constructed slightly upstream of the existing headgate. The proposed new headgate structure would incorporate three 60 inch slide gates and is designed to pass 190 CFS. The total capacity of the diversion would be 420 CFS under low river flow and 600 CFS under high water conditions.

As an option the existing headgate could be modified to better exclude sediment and debris. This is presented as Option 2 in the following cost estimates.

Conceptual design for the diversion and headgate are shown on drawing sheets 1 of 4 through 4 of 4, 2. LeClair diversion dam plans, Appendix C of the final report.

Cost Estimates for the combined diversion structure are: Option 1, \$750,000.00 and Option 2 with modifications of the existing headgate, \$820,000.00. Detailed cost estimates are contained in the final report pages 20, 21 and 22.

Modifications to the existing LID Canal to increase capacity to carry additional RVID water would be along the existing canal from headgate to the piped drop a distance of 80,181 feet (15.2 miles).

Present flows to the high water line of canal sections were calculated and the grades and sections modified to carry an additional 200 CFS. Cleaning and excavating the canal to a trapezoidal cross section will in most areas accommodate the extra 200 CFS needed for RVID. As a general design criteria

the canal would be raised 1.5 feet throughout.

A raise of 1.5 feet in the water level of the canal throughout its length will improve the diversion of water to areas that are high in relation to the existing canal elevation.

The canal bank road will be raised in some areas to accommodate the 1.5 foot raise in the canal.

As a general rule the canal will be widened on the north or left side if required. This will leave the lateral headgates in place along the south or right side.

Structures along or in the canal consisting of bridges, sand trap, under-drains, check structures, over-drains and flumes will be removed, replaced or modified to accommodate the higher flows.

The spreadsheets located between page numbers 22 and 23 of the final report enumerate the maximum flows computed from surveyed cross sections, the flows based on raising the canal water level 1.5 feet and the flows after modifications in the canal channel. The spreadsheets located between pages 23 and 24 of the final report enumerate the cut and fill yardage required to modify the existing channel and to provide adequate canal bank.

Sheets 1 of 8 through 8 of 8, Appendix D of the final report show the location and conceptual design of structures required for the enlargement of the LID canal.

The cost estimate for modification of the LID Canal is \$1,050,000.00. A detailed cost estimate is contained in the final report page 27.

5. Conceptual Design and Cost Estimates-Piped Drop:

The conceptual design phase of the piped drop consists of diversion at the LID canal, conveyance of water to the RVID canal and discharge into the RVID canal.

The design flow to the RVID canal is 190 CFS. The calculated historical flow for the LID canal at the point of diversion is 175 CFS. The modified LID canal will carry 500 CFS at the point of diversion.

The diversion from the LID canal will consist of a combination side spillway and headgate. Flow measurement would be by an in-line flow meter.

The pipeline will be 4560 feet in length with 165 feet of vertical drop. The possibility of a future hydropower installation at Station 20 + 00 was not considered in this study other than pipe size. If an in-line hydropower station were to be inserted, the pipe would be sized at 42 inches. If a hydropower station is not an option, the pipe would be sized at 36 inches. Two types of pipeline material could be used, epoxy coated welded steel or fused joint high-density polyethylene. Steel would be used if a future hydropower station is anticipated.

A stilling basin would be installed at the discharge to the RVID canal.

1330 feet of 6-inch pvc pipe would be installed from a tap in the main pipeline to service one upstream user of the RVID canal.

Conceptual design for the drop pipeline is shown on sheets 1 of 5 through 5 of 5 1. LeClair to Riverton Valley pipeline, Appendix E, page 41 of the final report.

Cost estimates for the following Options are:

Option No. 1A-42 inch welded steel pipe-	\$1,130,000.00
Option No. 2A-36 inch welded steel pipe-	\$1,016,000.00
Option No. 2B-36 inch HDPE pipe-	\$ 953,000.00

Detailed cost estimates for the various options are contained in the final report, pages 32, 33 and 34.

6. Economic Analysis-Ability to Pay:

The standard WWDC funding package is a 50% grant and 50% loan at 6% interest.

It is assumed that the operational and maintenance cost would be absorbed by LID with no additional costs.

The diversion modifications, canal modifications and pipeline would be a direct benefit to RVID, which would absorb the cost.

The following alternatives are considered:

Alternative 1:

LID Diversion Dam	
Option 1	\$ 750,000
LID Canal	
Modifications	\$1,050,000
LID to RVID Pipeline	
No. 2B	<u>\$ 953,000</u>
TOTAL	\$2,753,000

With a total construction cost of \$2,753,000 and a 30-year loan of \$1,376,500 at 6% the yearly cost to the District is as follows:

Loan Payback	\$100,051.00/year
Operation and Maintenance	<u>\$ 0.00/year</u>
TOTAL	\$100,051.00/year
Assessment Per Acre	\$ 11.84/year

Alternative 2:

LID Diversion Dam	
Option 2	\$ 820,000

LID Canal	
Modifications	\$1,050,000
LID to RVID Pipeline	
Option No. 1A	<u>\$1,130,000</u>
TOTAL	\$3,000,000

With a total construction cost of \$3,000,000 and a 30-year loan of \$1,500,000 at 6% the yearly cost to the District is as follows:

Loan Payback	\$109,023.00/year
Operation and Maintenance	<u>\$ 0.00/year</u>
TOTAL	\$109,023.00/year
Assessment Per Acre	\$ 12.90/year

C. Summary

1. Pumping plant alternative.

With a construction cost of \$3,800,000.00 a yearly loan payment of \$138,000.00 and yearly operation and maintenance costs of \$129,000.00 resulting in a yearly assessment of \$31.60 per acre. The conclusion of this summary is that the pumping plant alternative is impractical.

2. LID diversion and canal enlargement with pipeline drop alternative.

With a alternative 1 construction cost of \$2,753,000.00, a yearly loan payment of \$100,051.00, no additional operation and maintenance costs and a yearly RVID assessment of \$11.84 per acre this alternative is the most practical.

3. Future considerations.

At the time of writing this report, the right-of-way problems experienced by RVID have been resolved.

Consideration should be given to not only long-term right-of-way problems but efficiency in operation which could result in one canal serving the Riverton Valley area.

This study has addressed the diversion enlargement and the reconstruction and enlargement of the first 15+ miles of the LID canal to carry the additional RVID water. Under a one canal system the proposed pipeline drop would be downsized to handle only water needed in the immediate area. Multiple pipeline drops would be used to serve the remaining RVID lands and lower lands of the LID system. Much of the RVID system could be served by gravity pressurized sprinkler systems. As a one canal system would benefit the whole Riverton Valley, the yearly assessment would be spread over approximately 23,000 acres. The yearly assessment for the diversion modifications and first 15 miles of canal reconstruction would be approximately \$3.00 per acre.

As part of the final study an attorney's opinion, which is contained in Appendix F of the final report, was obtained. The opinion reviews potential right-of-way problems, which may exist with enlargement of the LID canal. The opinion states the following:

“Should water users request to be included in LeClair district, then LeClair has the authority to widen, deepen or repair those facilities when necessary. Therefore, if RVID users were to be included within the district, then it is possible the district could enlarge the canal without permission of the landowners.”

It is recommended that a study be done on the remaining portion of the LID canal with a view toward the benefits to be gained throughout the Riverton Valley from a one-canal system.