

FEASIBILITY STUDY

For The

LA FERIA IRRIGATION DISTRICT CAMERON COUNTY NO. 3

PROPOSED 1.0 PIPELINE



Prepared For:

LA FERIA IRRIGATION DISTRICT CAMERON COUNTY NO. 3

Under The Auspices Of:

**TEXAS WATER DEVELOPMENT BOARD AND
TEXAS STATE ENERGY CONSERVATION OFFICE
WATER AND ENERGY CONSERVATION PROJECT
TEXAS WATER DEVELOPMENT PROJECT NO. 2002-484-0004**

Prepared By:

AXIOM-BLAIR ENGINEERING

2711 W. Anderson Lane

Suite 210

Austin, Texas 78757

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EXHIBITS

Exhibit A	Project Study Area
Exhibit B	LFIDCC3 1.0 Pipeline Layout
Exhibit C	LFIDCC3 Existing Service Area Map: 0.6 Pipeline
Exhibit D	LFIDCC3 Proposed Service Area Map: 0.6 and 1.0 Pipelines

APPENDIX

Appendix A	EPANET Input and Output
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1 INTRODUCTION

The following provides a feasibility study for the construction of a 3,593-foot irrigation pipeline located in the La Feria Irrigation District from the Main Canal to the 0.6 Pipeline. Sigler, Winston, Greenwood and Associates, Inc. originally identified the pipeline as part of a potential distribution system improvement project in a 1993 engineering study. The study was performed to update rehabilitation work performed in the 1960's by the Bureau of Reclamation under Public Law 86-357. The intent of the proposed pipeline was to improve the irrigation supply to the 0.6 Pipeline. This feasibility study presents a hydrologic and hydraulic analysis used to design the proposed pipeline and a preliminary cost estimate. The proposed pipeline is referred to in this report as the 1.0 Pipeline. The general location of the proposed pipeline is depicted in Exhibit A.

2 HYDRAULIC ANALYSIS

The proposed pipeline will be modeled in this analysis using EPANET. EPANET is a computer program that performs extended period simulation of hydraulic and water quality behavior within pressurized pipe networks. The creation of the EPANET model involves defining the water supply source, the pipeline layout, the amount of available hydraulic head, the service area, the design flow rates, and the pipeline material and size. These parameters are described in the following sections.

2.1 Water Supply Source

The proposed 1.0 Pipeline will receive irrigation water directly from the District's Main Canal. The Main Canal conveys water from the La Feria Pump Station located on the Rio Grande River north 5.4 miles to the District's 2,000 acre-foot storage reservoir.

2.2 Pipeline Layout

The 1.0 Pipeline will connect to the District's Main Canal approximately one mile north of the La Feria Pumping Plant. The pipeline will extend east approximately 3,593 feet from the District's Main Canal bisecting existing farmland and eventually connecting to the existing 0.6 Pipeline. No easement exists for the proposed layout, which crosses the Kern Tract, the Longoria Subdivision, and the Minnesota-Texas Land & Irrigation Co. tract. The 1.0 Pipeline layout was originally delineated in the 1993 Siger, Winston, Greenwood and Associates, Inc. engineering study. (Refer to Exhibit B).

2.3 Hydraulic Head

The amount of hydraulic head available from the water source is an important variable in determining if the proposed pipeline can be designed and operated using gravity flow. The available hydraulic head represents the difference between the normal irrigation water surface elevation in the water supply and the natural ground elevations at the individual turnouts. A Trimble 5700 receiver was used to determine these elevations. The elevations are based on the NAD 1983 (Conus) datum.

During irrigation, the water surface elevation in the Main Canal is raised through the use of a check structure located just north of U.S. 281. High water marks on the structure indicate water

surface elevations of up to 67.1 feet, 2.4 feet below the top of concrete. However, in this analysis, an irrigation water surface elevation of 64.5 feet was used. This elevation was measured in the canal at a time when one pump producing a flow rate of approximately 50 cfs was running at the pumping plant. Elevations at the turnouts along the proposed 1.0 Pipeline gradually decrease as you move east and ranged from 61.1 feet to 59.8 feet providing 3.5 feet of available hydraulic head. The availability of adequate head eliminated the need for the use of a pump station in the design.

2.4 Service Area

Approximately 335 acres of farmland south of U.S. 281 and east of the Main Canal currently receive water from the 0.6 Pipeline as shown in Exhibit C. To improve irrigation service in this area, the proposed 1.0 Pipeline will provide irrigation service for 172 acres located in the northern half of the existing 0.6 Pipeline service area. The new pipeline will reduce the service area on the 0.6 Pipeline from 335 acres to 162 acres and thus greatly improving its irrigation service. The proposed service area is depicted in Exhibit D.

2.5 Design Flow Rates

The design flow rates for the 1.0 Pipeline will be determined using the criteria outlined in *Section 2 of the Engineering Report for the 6.0 Canal*. The criteria summarized below are based on the extent of the service area, the required water demand, and the percentage of simultaneous irrigations.

- Every 40 acres of irrigated farmland requires service of 3 cfs per irrigation with a maximum of
 - 1/3 of farmland irrigated at any given time for areas less than 360 acres,
 - 1/4 of farmland irrigated at any given time for areas between 360 and 1,000 acres,
 - 1/5 of farmland irrigated at any given time for areas between 1,000 and 2,000 acres, and
 - 1/6 of farmland irrigated at any given time for areas greater than 2,000 acres.

The 1.0 Pipeline has a service area of 172 acres requiring a flow rate of 6 cfs. The required flow rates for various locations along the pipeline are provided in Exhibit D.

2.6 Pipeline Design Guidelines

The pipeline material will consist of either PVC (poly-vinyl chloride) or RCP (re-enforced concrete pipe). PVC will be used for sizes up to and including 30 inches and RCP will be used for pipe sections equal to or greater than 36 inches and less than or equal to 72 inches. For pipelines requiring pipe diameters larger than 72 inches, open flow canals will be used.

2.7 Pipeline Design

The EPANET model was used to design the proposed 1.0 Pipeline to provide each turnout with a minimum of 3 cfs per irrigation assuming a typical turnout services 40 acres and a maximum of 1/3 of farmers irrigate simultaneously. Table 2.1 below provides the resulting gravity flow pipe network. Refer to Appendix A for the detailed EPANET input and output reports.

Figure 2.1: Schematic of the 1.0 Pipeline

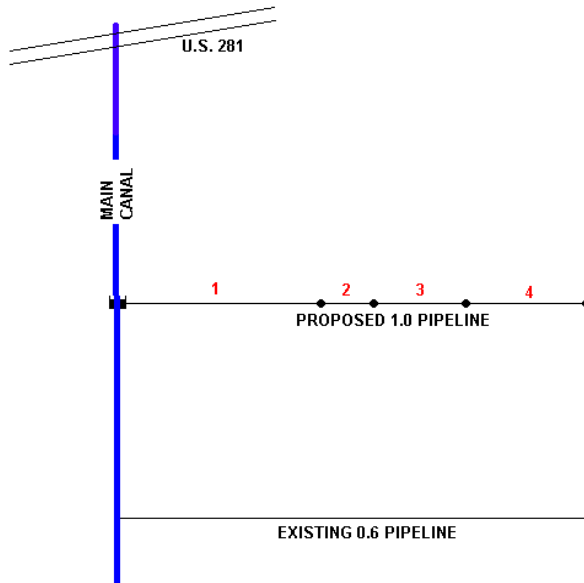


Table 2.1: 1.0 Pipeline Design

Segment I.D.	Segment Length (ft)	Pipe Diameter (inches)	Pipe Material	Manning's "n"	Design Q (cfs)	# of Simult. Irrigations
1	1,558	24	PVC	0.009	6	2
2	435	24	PVC	0.009	6	2
3	886	24	PVC	0.009	6	2
4	714	24	PVC	0.009	6	2

3,593

3 COST ESTIMATE

The following cost estimate consists of the construction costs, the easement acquisition costs, and design costs, which include surveying, and engineering costs. The installation of 3,593 feet of 24-inch diameter PVC pipes represents approximately 63% of the total cost. Financing costs were not included.

Table 3.1: 1.0 Pipeline Cost Estimate

Item Description	Number	Unit	Unit Cost	Total Cost
Construction Cost				
Mobilization	1	EA	\$ 3,000.00	\$ 3,000.00
Clearing and Grubbing	3,593	LF	\$ 0.25	\$ 898.25
Field Engineering	1	EA	\$ 1,000.00	\$ 1,000.00
24" PVC	3,593	LF	\$ 17.00	\$ 61,081.00
Location of Existing Utilities	1	EA	\$ 1,000.00	\$ 1,000.00
Pipeline Inlet Boxes	1	EA	\$ 2,000.00	\$ 2,000.00
Turnout Connection Boxes	7	EA	\$ 1,250.00	\$ 8,750.00
Line Gates	1	EA	\$ 425.00	\$ 425.00
QC for Preparation	3,593	LF	\$ 0.10	\$ 359.30
QC for Pipeline Installation	3,593	LF	\$ 0.10	\$ 359.30
Contingencies	5	%		\$ 3,943.64
Construction Cost Total				\$ 82,816.49
Easement Acquisition Costs				
Land Acquisition	1.6	AC	\$ 5,000.00	\$ 8,000.00
Condemnation	2	EA	\$ 5,000.00	\$ 10,000.00
Subtotal				\$ 18,000.00
Design Costs				
Survey	0.7	MI	\$ 8,000.00	\$ 5,440.00
Engineering (% of Constr. cost)	10	%		\$ 8,281.65
Subtotal				\$ 13,721.65
Total Cost				\$ 96,538.14

4 SUMMARY

The proposed 1.0 Pipeline would consist of 3,593 feet of 24-inch PVC pipe. The pipeline would replace inadequate irrigation service to 172 acres and improve service to an additional 162 acres south of Highway 281 and east of the Main Canal. The 1.0 Pipeline would provide an improved service of 3 cfs per individual turnout. This service is based on the assumptions that a typical turnout services 40 acres and 1/3 of farmers irrigate simultaneous. The proposed pipeline was designed under gravity flow conditions and will not require a pump station. The total cost of \$96,500 for the 1.0 Pipeline includes construction costs, easement acquisition costs, and design costs.

La Feria Irrigation District

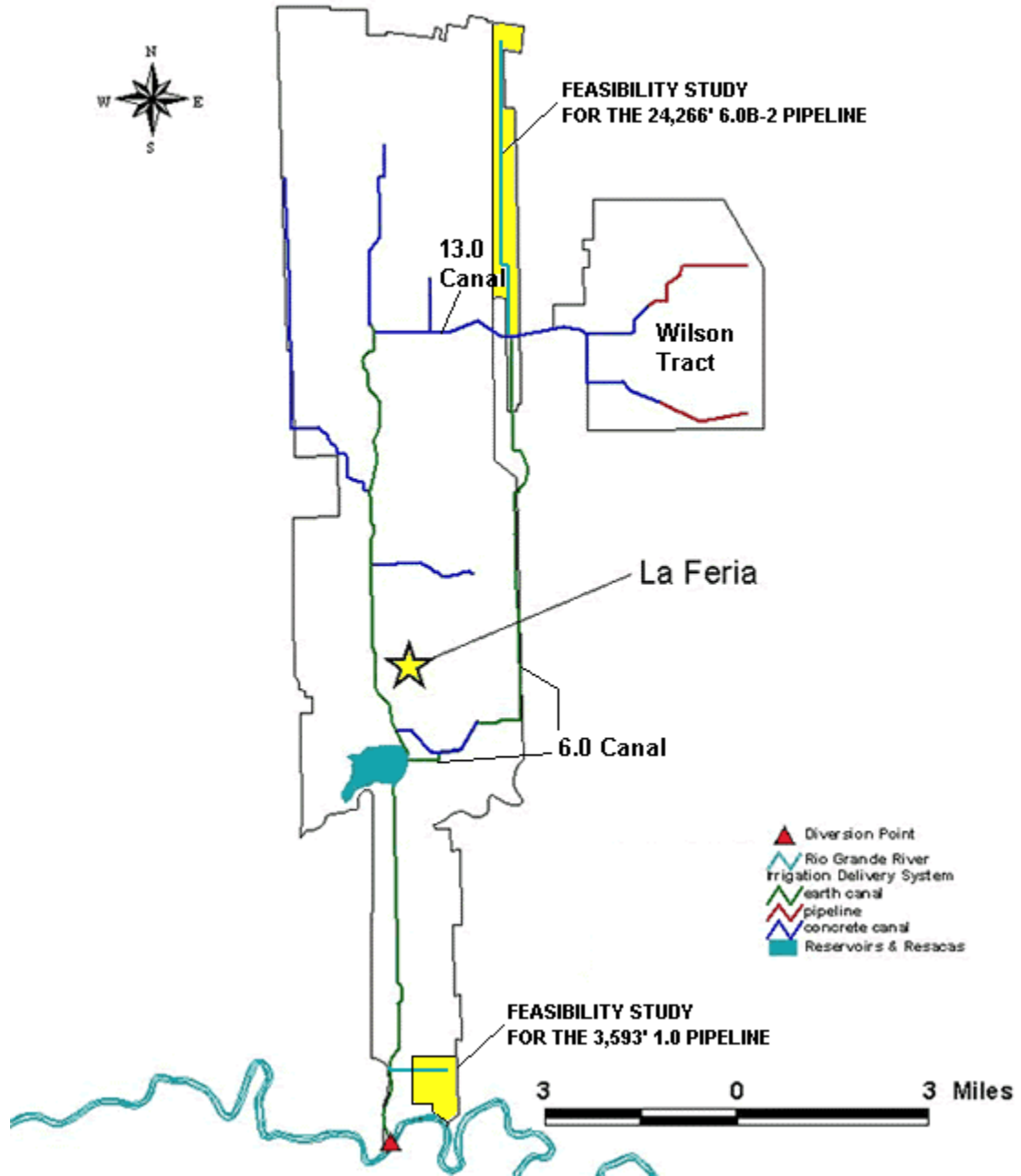
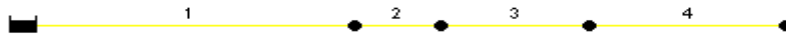
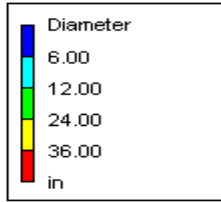


EXHIBIT A: PROJECT STUDY AREA

APPENDIX A

EPANET INPUT AND OUTPUT



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*                               *
*           E P A N E T         *
*       Hydraulic and Water Quality   *
*       Analysis for Pipe Networks    *
*           Version 2.0              *
*                               *
*****

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Input File: 1.0Pipeline.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
1	MainCanal	1	1558	24
2	1	2	435	24
3	2	3	886	24
4	3	4	714	24

Node Results:

Node ID	Demand CFS	Head ft	Pressure psi	Quality
1	0.00	63.98	1.25	0.00
2	0.00	63.83	1.18	0.00
3	0.00	63.53	1.05	0.00
4	6.00	63.30	1.51	0.00
MainCanal	-6.00	64.50	0.00	0.00 Reservoir

Link Results:

Link ID	Flow CFS	Velocity fps	Unit Headloss ft/Kft	Status
1	6.00	1.91	0.34	Open
2	6.00	1.91	0.34	Open
3	6.00	1.91	0.34	Open
4	6.00	1.91	0.34	Open