

# **RATTLESNAKE RIDGE WATER DISTRICT**

## **PHASE 12 - WATER SYSTEM IMPROVEMENTS PRELIMINARY ENGINEERING REPORT**



***RATTLESNAKE RIDGE WATER DISTRICT***

***5302 South State Highway 7***

***Grayson, KY 40372***

***April, 2020***



## SECTION 1 PROJECT PLANNING

### 1.01 LOCATION

The Rattlesnake Ridge Water District (RRWD) was organized in 1961 but did not commence operations until 1983. The existing system consists of approximately 700 miles of water lines with eleven distribution water storage tanks and ten (10) booster pump stations that serve approximately 4,030 customers in Carter, Elliott, Lawrence and Lewis Counties.

The RRWD is located in Northeastern Kentucky in Carter County with the water office a few miles south of the City of Grayson. The RRWD serves all of Carter County that is not served by the City of Grayson, northeastern portion of Elliott County, a small area of western Lawrence County and a small portion of eastern Lewis County. Included in these areas are the communities of Carter City, Hitchens, Willard, Webbville, Ault, and Isonville.

The topography of Carter County and its service area is mountainous with narrow valleys that follow state and county roads. The differences in elevations range from 600 feet in elevation in the valleys to over 1200 feet on the ridges. These divergent elevations are reflective in the ten (10) pressure zones using eleven (11) tanks to provide service to its customers. Elevations of communities within the RRWD service area include Carter City at 680 feet, Willard at 650 feet, Ault at 1150 feet and Isonville at 700 feet. The RRWD service area is rural with scattered residences and limited agriculture.

### 1.02 ENVIRONMENTAL RESOURCES PRESENT

The major environmental features within the proposed area feature a variety of landforms and topographic changes from extremely steep to relatively flat terrain. The steep terrain changes require numerous booster pump stations, and elevated and ground storage tanks. Water pressures range from 30 psi to over 220 psi in sections of the system. Several of the hollows are in floodplains due to the numerous creeks located in all the valleys. No known historic sites are noted in the planning area.

### 1.03 POPULATION TRENDS

The calculated population based on the 2010 Census and the number of customers in each county was 10,054. The Kentucky State Data Center currently projects that all five counties will lose population over the next 35 years. The table below shows the total number of customers by county and the estimate of county population served by Rattlesnake Ridge.

County	Total Population	No. Customers	Population Served
Carter	27,720	2,558	6,421
Elliott	7,852	1,049	2,570
Lawrence	15,860	398	1,003
Lewis	13,870	0	0
Morgan	13,923	24	60
TOTALS:	79,225	4,029	10,054

#### 1.04 COMMUNITY ENGAGEMENT

The RRWD will be holding a public meeting inviting all individuals affected by this project. This meeting will communicate the need for the project and the resulting system improvements that will be accomplished through the project.



## **SECTION 2 EXISTING FACILITIES**

### **2.01 LOCATION**

The RRWD is located in eastern Kentucky near the City of Grayson in Carter County. The RRWD serves all of Carter County outside of the city limits that is served by the City of Grayson and parts of Elliott, Lawrence and Morgan Counties including the communities of Carter City, Webbville, Ault, and Isonville. The City of Olive Hill currently produces their own water. Maps of the project showing the extent of the water system improvements is located at the end of this report (Appendix A).

### **2.02 HISTORY**

The RRWD system was originally organized in 1961 but did not begin service until 1983. The RRWD produces its own water and has the ability to sell water to the Sandy Hook Water District and the City of Olive Hill, if either has emergency situations. Numerous water line extension projects have been developed over the past thirty-seven (37) years to establish the current RRWD customer base which serves approximately 95% of potential customers in the service area of RRWD. Those without service are located in very remote areas or at extremely high elevations of the system that are not financially feasible to serve.

### **2.03 CONDITION OF EXISTING FACILITIES**

RRWD has a 2 mgd water treatment plant that is sourced by the Grayson Lake and was built in 1983. The plant has had some updates in the last twenty years and is generally in good condition.

The 700-mile distribution system consists of 8", 6", 4", 3" and 2" PVC water mains and a limited amount of ductile iron in the extremely high-pressure areas. The existing water mains are generally located in the ditch line of state and county roads due to the difficult topography the District has to navigate. This area is difficult in that it has extremely rock sub-surface areas. Due to the age of parts of the system, the difficult topography and the rocky ground conditions the RRWD does have a high-water loss of approximately 50 percent, thus the need for this project.

### **2.04 FINANCIAL STATUS OF ANY EXISTING FACILITIES**

The financial condition of the District is reasonable and has been improving in recent years. Annual audits will be submitted to Rural Development as required by the RD bond issue. A customer breakdown will be provided in the Summary Addendum.

As with the majority of utilities across the country, the RRWD has seen its operating expenses rise over the past several years. Electric costs and health insurance are the expenses that have seen the largest increase.



## SECTION 3 NEED FOR PROJECT

### 3.01 HEALTH, SANITATION, AND SECURITY

The proposed project is designed to reduce water loss therefore, RRWD will replace approximately 4000 existing meters with new radio read meters. A large portion of these meters are old and are probably reading in the 90% to 95% accuracy range. Replace approximately 700 existing service lines between the existing main and the existing meter that have been very problematic for the District, that were installed over thirty years ago. A leak on a ¾" service line can result in large water loss numbers and thus remove much needed revenue from the District. The project will also include installing fourteen (14) master meters within the RRWD system. These master meters will be located in the ten different pressure zones and other strategic areas that will allow thru the use of telemetry up to date monitoring of different areas of the system. Along with coding of the customers meter locations will provide the District valuable information in a timely manner on leaks within their system. These numerous leaks require boil water advisories, flushing, and subsequent water quality testing of the repaired water lines and can become a health issue during the process.

The District will also install a limited number of new water mains in areas that currently do not have potable water service. These areas currently rely on wells that are many times not tested for water quality by the home owner, and can cause serious health issues over time if not corrected.

The proposed project will help to improve the overall service from a water quality and reliability standpoint to the Rattlesnake Ridge Water District customers.

### 3.02 AGING INFRASTRUCTURE

The existing water service lines to be replaced with this project are over thirty (30) years old and have been problematic for a long time. Due to the age of these water mains the District has experienced continued operational issues that only become worse as time goes on. These issues include breaks and leaks of the water service lines which create financial strains on the District through the allocation of its resources. Additionally, this aging infrastructure adds to the District's burden of maintaining a low water loss rate in its distribution system.

### 3.03 REASONABLE GROWTH

The Kentucky State Data Center currently projects very little to no growth in the next thirty-five years. However, the existing customers will pay a heavy price financially in the cost of water if this water loss issue is not resolved in the near future.



## SECTION 4 ALTERNATIVES CONSIDERED

### 4.01 Description

Alternatives considered included using a land-based radio read meter system instead of a drive by system, but the cost was prohibitive due to the difficult topography that would require numerous antennas and repeaters that would have to be located throughout the system. An analysis of the land-based radio read meter was completed previously, and it was determined only 60 percent of the meters could be integrated into the programing. An additional alternative considered was to only replace the service lines as they deteriorate to the point of failure. This is cost prohibitive for the RRWD and does not benefit the customers by providing a safe, dependable, high quality product.

### 4.02 Design Criteria

The design criteria that will be used on the project include hydraulic analysis of the existing system to determine that adequate pressures, and water loss are realized and analyzed throughout the distribution system along with examining flushing velocities. By properly sizing the distribution mains to be installed the District will provide improved service to its customer base while also maintaining potable water of high quality.

### 4.03 Map

Maps of the project showing the service line replacement areas, locations of the new master meters, and the new water main extensions are located at the end of this report (Appendix A). The meter replacements are system wide.

### 4.04 Environmental Impacts

An environmental report detailing the potential impacts of the project may be undertaken with this project. Once the report is finalized any potential impacts will be taken into consideration and any necessary remediation measures will be taken to avoid any negative impact to the environment.

### 4.05 Land Requirements

Land requirements associated with this project will include the need for easements and encroachment permits, both public and private, for the installation of the new water mains. Those easements and permits will be obtained prior to any construction beginning. The new master meters will be installed on existing water mains within existing easements.



#### **4.06 Potential Construction Problems**

The service line and meter replacement will have each customer out of water temporarily while the transition is made from the old service to the new service. The installation of the master meters will also have temporary interruption of service during the installation, but these can be planned in advance with momentary outages of service. This problem is considered during the design of the project and all precautions are taken to limit this potential risk.

#### **4.07 Cost Estimates**

A preliminary project cost estimate is included at the end of this report (Appendix B).

## **SECTION 5 SELECTION OF AN ALTERNATIVE**

### **5.01 Life Cycle Cost Analysis**

In the selection of the preferred alternative for this project the life cycle cost of the materials to be utilized has been considered. The main material to be utilized is the water service line and the water main. The water service will be of HDPE material and the water main will be of PVC material. Recent studies estimate a service life of both the HDPE and the PVC up to one hundred years. This length of service life provides for lower operating and maintenance costs to be realized by the District. Both the service meters and the master meters will be of the latest technology.

### **5.02 Non-Monetary Factors**

The non-monetary factors considered are the ability to provide reliable service to the existing customer base. With new water mains the existing customer base will have improved service and a higher quality product due to the elimination of problematic service lines and the increased reliability of accurate meter readings.

**SECTION 6 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)**

**6.01 Preliminary Project Design**

The proposed project and recommended alternative are directly related to reducing water loss for the Rattlesnake Ridge Water District. The project will consist of replacing approximately 4000 meters with new radio read drive-by meters and software. Replacement of approximately 700 customer meter assembly’s and old, problematic service line. Also included will be the installation of approximately 14 new master meter vaults strategically located about the ten different pressure zones within the system. The addition of the master meters and RTU’s will provide the District with hourly information about the inconsistent water usage in various zones of the system to better monitor potential leaks. The District is also proposing the installation of new water main extensions on the following roads.

<u>Location</u>	<u>Distance</u>	<u>Customers</u>	<u>Cost/Customer</u>	<u>Total Cost</u>
KY 1704	3600 LF	6	\$11,666	\$70,000
Appaloosa Dr.	4400 LF	4	\$13,250	\$53,000
Lick Falls Branch	2500 LF	3	\$12,666	\$38,000
Lick Creek	5600 LF	4	\$18,750	\$75,000
Blaines Trace	<u>5400 LF</u>	<u>6</u>	<u>\$12,833</u>	<u>\$77,000</u>
	21,500	23	\$10,433	\$313,000

Additionally, should project funds be available the project will include the updates of existing pump stations, control valves, and upgrades of existing water main on Little Huff Road and Mayhew Flats and the reconnection of existing meters. Another area that does not have water service is Halfway Branch Road. This area has the potential to serve approximately 23 customers in 21,000 LF, but due to the high elevation would require a pump station and limited line replacement on the suction side of the pump station which drives the cost higher than those lines previously referenced.



## 6.02 Project Schedule

The proposed project schedule is:

1. Secure Letter of Conditions from USDA RD – September, 2020
2. Secure Land/Easement/Encroachment Permits – September 2020
3. Division of Water Submittal – July 2020
4. Advertise for Bids – November 2020
5. Contract Award/Initiate Construction – February 2021
6. Substantial Completion – August 2021
7. Final Completion/Initiation of Operation – September 2021

## 6.03 Permit Requirements

The project will include the need for Division of Water Approval and other potential permits to be identified within the environmental report.

## 6.04 Total Project Cost Estimate (Engineer's Opinion of Probable Cost)

A preliminary project cost estimate is included at the end of this report (Appendix B).

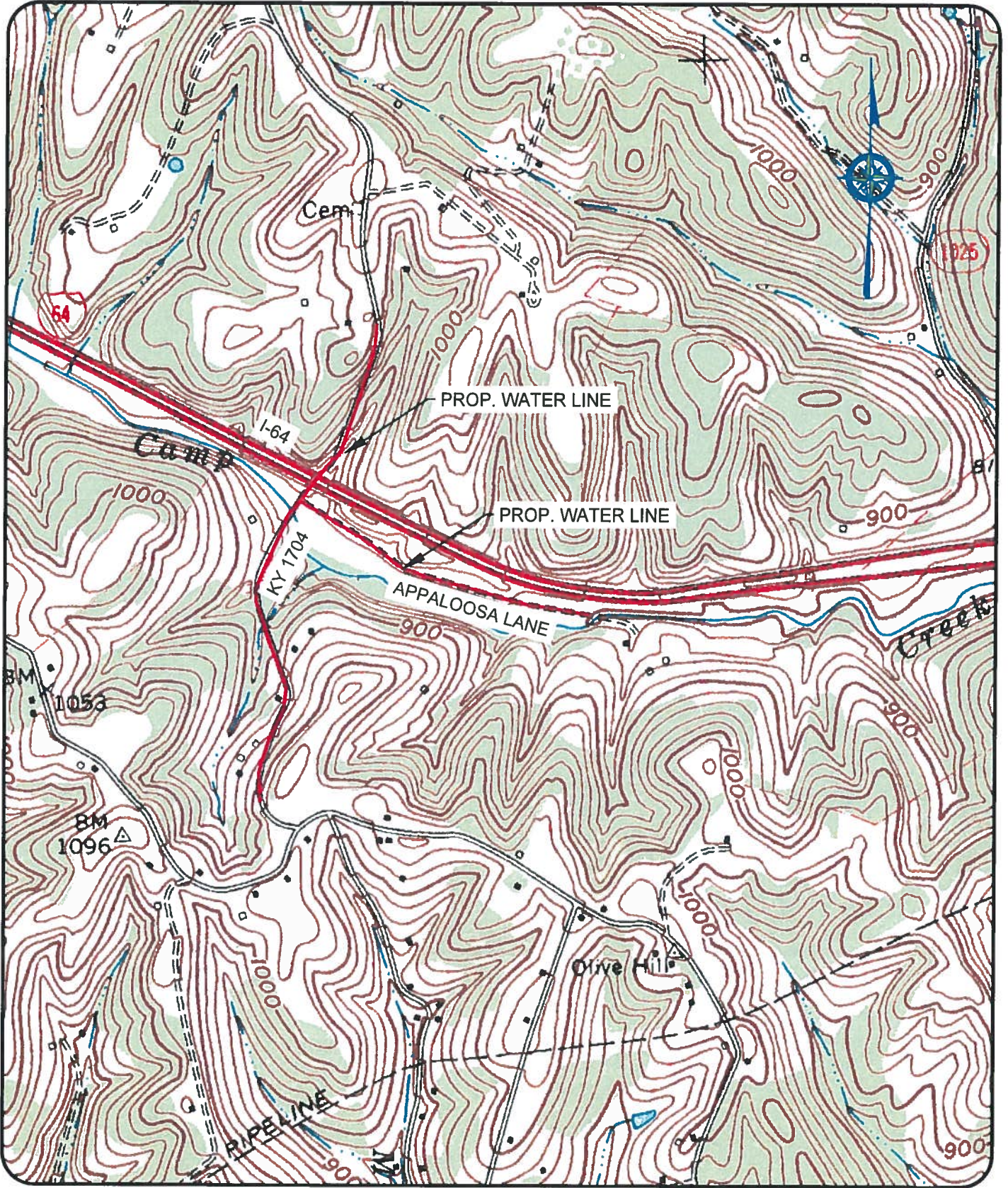
## 6.05 Annual Operating Budget

A Summary Addendum will be prepared for the project which will examine the District's current and future financial position. Included within the Summary Addendum will be an analysis of the District's current income, annual O & M costs, current and future debt repayments and current reserves. This Summary Addendum will propose a suggested rate for the District in order to meet its current and future debt obligations.

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**APPENDIX A      PROJECT MAPS**

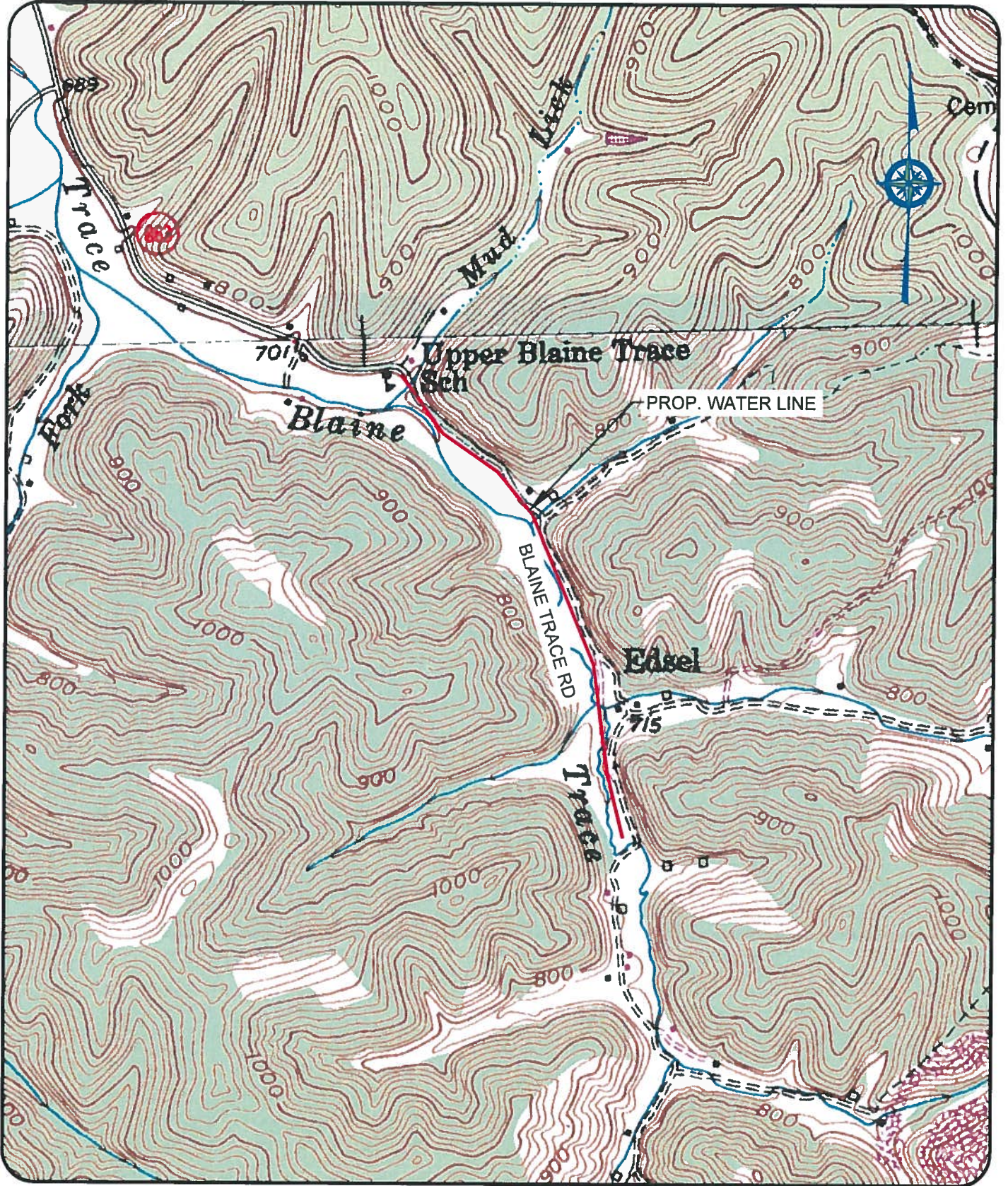




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KY 1704 & APPALOOSA LN  
PHASE 12  
RATTLESNAKE RIDGE WATER DISTRICT

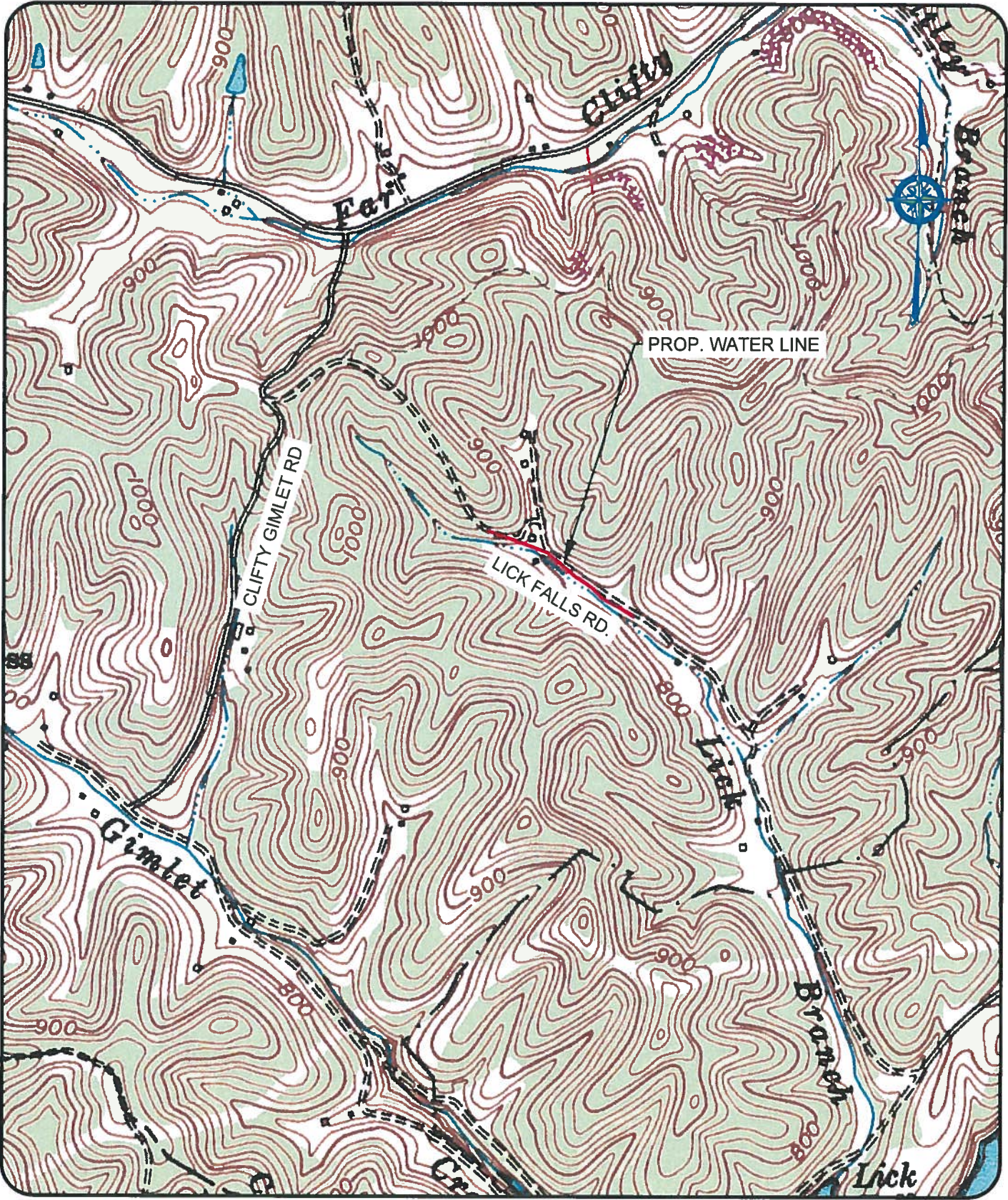
Project No.	20002
Date	JAN. 2020
Dwg. No.	1




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BLAINE TRACE RD.  
 PHASE 12  
 RATTLESNAKE RIDGE WATER DISTRICT

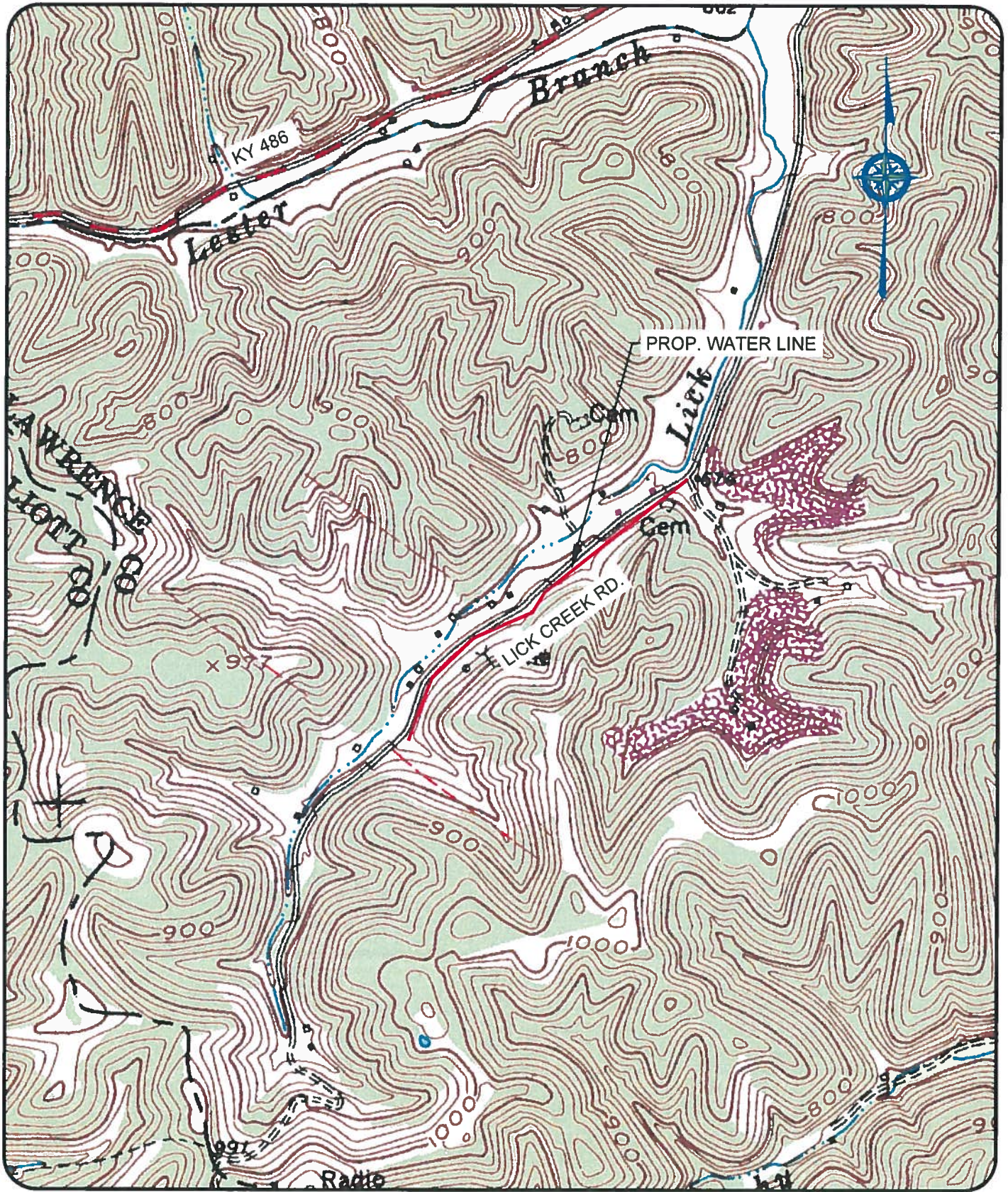
Project No.	20002
Date	JAN. 2020
Dwg. No.	6



LICK FALLS RD.  
PHASE 12  
RATTLESNAKE RIDGE WATER DISTRICT

Project No. 20002
Date JAN. 2020
Dwg. No. 3





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LICK CREEK RD.  
PHASE 12  
RATTLESNAKE RIDGE WATER DISTRICT

Project No.	20002
Date	JAN. 2020
Dwg. No.	4

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**APPENDIX B**      PRELIMINARY PROJECT COST ESTIMATE





Client: Rattlesnake Ridge Water District  
 Project: Phase 12 - Water System Improvement  
 Date: 4/07/2020 (Revised)

Construction Costs					
Item #	Description	Quantity	Unit	Unit Cost	Item Cost
1	Vehicle Based Station Package and Fees	1	EA	\$25,000	\$25,000
2	Sensus Software Installation and Training	1	EA	\$1,500	\$1,500
3	1perl 5/8" x 3/4" meter with small battery	4000	EA	\$260	\$1,040,000
4	Labor to Install Meters in Boxes and Drill Lids	4000	EA	\$40	\$160,000
5	4" and 6" Master Meter Vaults with RTU	14	EA	\$40,000	\$560,000
6	10" Master Meter Vault at Plant w/RTU	1	EA	\$75,000	\$75,000
7	Replace Tandem Setter, IPRV, Box/Lid, and 3/4" Srv. Line	650	EA	\$1,000	\$650,000
8	Replace Setter, Box/Lid and 3/4" Service Line	50	EA	\$950	\$47,500
9	Additional 3/4" Service Line	1000	LF	\$5	\$5,000
10	Water Main Extensions/Pump Station Rehab	1	LS	\$400,000	\$400,000
<b>Total - Construction Cost</b>					<b>\$ 2,964,000</b>
Non-Construction Costs					
Contingencies					\$ 296,000
Administrative Expenses (interest)					\$ 35,000
Legal Expenses					\$ 25,000
Land, Appraisals, Easements					\$ 10,000
Planning (CDBG Admin)					\$ 40,000
Engineering Fees - Design					\$ 169,000
Engineering Fees - Construction Administration					\$ 42,000
Engineering Fees - Inspection					\$ 116,000
Engineering Fees - Other					\$ 25,000
<b>Total - Non-Construction Costs</b>					
<b>Total - Project Costs</b>					<b>\$ 3,722,000</b>