EXECUTIVE SUMMARY
(CONTRACT FOR SERVICES NO RV052301/F )

TO

WYOMING WATER
DEVELOPMENT COMMISSION

FOR THE

ALPINE SPRING IRRIGATION
SUPPLY PROJECT

OCTOBER, 2001

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CONSULTING ENGINEERS AND LAND SURVEYORS
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INTRODUCTION

Background

The Alpine Water and Sewer District was formed in the early 1970’s and thereafter in 1974 the Mill Creek Springs system was installed to serve as a water source for the town. In the summer of 1998, the water supply was contaminated with E. coli. The EPA required the town to remove the spring from the distribution system unless the spring water was treated. Costs to treat the spring water were determined to be excessive and the town removed the spring from its water distribution system. The town is now looking for ways to put this water to beneficial use by irrigating its 55 acres of parks and other green areas. Use of the spring water would reduce the demand on the town’s current potable water supply and distribution system.

The spring collection system is located at the confluence of two drainages near Little Jenny Lake approximately 1 ½ miles southeast of Alpine. (See Topographic map, Appendix A) Perforated pipes are set in such a manor as to facilitate drainage of the area and to divert the water into a 50,000 gallon concrete tank. The 8-inch PVC transmission line runs from the tank to a fire hydrant located on the Southeast end of the town of Alpine. Elevation drop from the spring area to the fire hydrant is 229 feet, providing a static pressure at the hydrant of 99.1 psi. This point will be the beginning of the irrigation distribution system.

Water flows from the spring vary during the course of the year. During dry periods there will be a need for supplemental water to adequately irrigate the 55 acres of parks and greenways.

Project Objectives

The Rio Verde Engineering (RVE) team focused on those project items that were defined during the scoping meetings on June 20 and on July 12, 2001.

Scoping Meeting Results

1. Rehabilitate Little Jenny Lake to provide wildlife/stock water
2. Use Potable Water System to supplement Raw Water Irrigation Supply from the Spring Area.
3. Look at Fire Flow capabilities from the Spring Area
4. Look at irrigation water supply line to 55 acres of existing and proposed parks and green areas.
SCOPE OF SERVICES

Spring Area

As decided on the July 22 meeting, the RVE team investigated possible improvements of the Little Jenny Lake Area. The existing dike that creates Little Jenny Lake is in poor condition. No principal or emergency spillways exist which causes water from spring snow melts to overtop the dike along the flow line of Mill Creek. Consequently, the backside of the dike is severely eroded and the dike will eventually fail if no action is taken. Further investigation has made it clear that the pond itself is constantly being drained by the collection system. Water from the spring area and the upstream toe of the dam flows to the tank where the excess water over flows back into Mill Creek and thereby bypasses the lake.

The proposed plan involves an improved impoundment structure which will repair the dam, and provide appropriate freeboard, and spillways. A floatation valve system will be installed in the tank on the inlet pipe so that when the tank is full, the inflow will be shut off. Water from the spring area will flow into the lake instead of bypassing through the tank overflow, which will improve the lake’s wildlife value and improve flow into the tank by using the lake area as storage water.

The proposed top of dam will be at elevation 5896.5 which will require the addition of 701 cubic yards of compacted fill material to the existing dam. The emergency spillway width was calculated to be 12 feet in order to handle the 100-year storm runoff. For an emergency spillway crest elevation of 5894.5, 336 cubic yards of excavation will be required for the construction. By setting the water level in Little Jenny Lake at an elevation of 5892, an Agri-Drain water level control structure will flow the peak discharge produced by a 10-year storm. The remaining fill material for the dam will come from a pit located upstream of the dam as shown on the plans. This pit will be lined and covered with one foot of topsoil. The pit will provide water for wildlife regardless of the irrigation system demands.

Irrigation Requirements

Local soil characteristics are the critical factor in efficient irrigation. According to the 1976 Soil Conservation Service Soil Survey for the Star Valley Area, most of the soil in
the area is classified as Hobacker gravelly loam. This soil provides moderate permeability, slow runoff, and a slight erosion hazard. Hobacker soils are typically highly drained and have a low soil moisture holding capacity. The most effective way to irrigate these types of soils is through sprinkler irrigation. Highly drained soils require short interval and short duration applications.

Using design information from SCS Wyoming Irrigation Guide the irrigation requirement is 1.15 inches every 5 days. Required flow per square foot and per acre was calculated for durations of 6 hours, 10 hours and 15 hours.

**Distribution System Alternatives**

The irrigation requirements provide demands that can be used as input to the distribution modeling software, WATERCAD. With the town map displayed in AutoCAD, the distribution system schematic can be drawn over the town map, which provides a scaled schematic ensuring accurate pipe lengths.

Using the 5 day irrigation interval and longer application durations, it was evident that the areas to be irrigated would need to be divided into zones in order to achieve reasonable pipe sizes and pressures. The town was divided into 7 irrigation zones. Zones were chosen based on geographic location within the town limits so that each zone had approximately the same area to be irrigated (See Appendix A). Using 7 zones, a 5-day irrigation interval, and application durations of either 6 hours or 10 hours, several distribution scenarios were developed that would provide adequate flows and pressures at all of the junctions.

Three feasible distribution alternatives were presented to the Town of Alpine.

1. **10-inch Main Line** - (this alternative is the one shown and color coded on the map in Appendix A). Physical Characteristics – 10-inch main line, 4-inch secondary lines and 8-inch lines for future expansions. 10-inch lines would need to be buried 6-feet or more to help prevent freezing in winter and still provide fire flow. Hydraulic Characteristics - provides hydraulic flexibility, allows zones 1, 2, 3, and 7 to be irrigated using 6-hour durations and zones 4, 5, and 6 to be irrigated using 10 hour durations. All pressures at discharge locations are 40 psi or greater.
Allows for fire flows at junctions throughout the main line from 1100 gpm to 1300 gpm while maintaining a system pressure of not less than 20 psi.

2. 6-inch Line Throughout – Physical Characteristics - All lines from the existing fire hydrant throughout the system are 6-inch lines. Lines to be set to drain in winter with a minimum of 3 feet of cover. Hydraulic Characteristics - provides required flows and adequate pressures at all discharge points. This alternative does not allow for fire flow.

3. 8-inch Main Line - Physical Characteristics - 8-inch main line and 6-inch secondary lines set to drain in the winter. Hydraulic Characteristics - the most hydraulically flexible of the alternatives other than it does not allow for fire flow.

On September 18, 2001 the RVE team presented each of these three alternatives along with associated costs using three different types of pipe material to the Alpine Town. The town chose Alternative One with HDPE pipe. Primary reasons for selecting Alternative One are extra fire flow capabilities would be beneficial, hydraulic flexibility, could be installed in phases, and would provide for future expansion.

**Final Distribution Model and Supplemental Supply**

Using the Town’s alternative selection of a 10-inch HDPE main line with 4-inch HDPE secondary lines, a new model was developed. Using the new model schematic, an extended period simulation was run using a 5 day period and 7 zones with their associated junction demands. Each zone’s irrigation duration was spread out through the 5-day irrigation interval in such a manner as to irrigate at night and to allow time between zones for the tank to recharge.

The extended period model allows the modeler to evaluate the tank status. As expected, the tank water level decreases due to the high flows required to irrigate the larger areas. Many variables are involved in the tank’s recovery.

First, recovery depends on the actual amount of flow required to irrigate the Town’s acreages. Irrigation water demands were calculated based on peak consumptive uses in July. Consequently, the irrigation requirements will be less late in the growing season and irrigation applications should be cut back accordingly.
Secondly, the flow rate coming from the spring collection system into the tank will determine the tank’s ability to recover and supply irrigation. There is a need for supplemental water supply during times of high irrigation use or times of low flow into the tank. Planned improvements of Little Jenny Lake should increase flow to the tank. However, during dry periods, there will be a shortage.

During the original scoping meeting with the Town of Alpine, it was decided that the Town Potable Water System would be used as the supplemental irrigation water supply. A cross-connection between the two systems will be required in order to use potable water to supplement the raw water for the irrigation water supply.

Knowing the elevation of the tank and the physical properties of the pipeline this system was included in the model. The Town’s Potable Water System needed to be modeled with the Spring Irrigation Distribution System to make sure that the two systems were compatible. The model showed that both systems produced adequate flows and pressures for the irrigation demands.

A series of control valves installed in a control building or vault will be necessary to facilitate the continuous operation of the system. When the pressure at the Existing Fire Hydrant falls to a certain level, indicating that the tank is empty, valves will activate to allow the Town’s Potable Water System to supply the irrigation system until the pressure at the Existing Fire Hydrant regains its maximum static level indicating that the tank is full. Control valves were also modeled using WATERCAD.

**Cost Estimates**

The cost estimate for the proposed Little Jenny Lake Spring Area improvements is $41,526.85. (See Appendix B for cost breakdown) Page 3 of Appendix A is a drawing of the proposed Little Jenny Lake Spring Area improvements.

The cost estimate for the proposed Spring Irrigation Distribution System is $731,461.60. (See Appendix B for cost breakdown) Page 2 of Appendix A is a drawing of the proposed Spring Irrigation Distribution System.
Permit Requirements

In order to rehabilitate the dam at Little Jenny Lake, wetlands will need to be filled which will require a Corps of Engineer's (COE) permit. Restoration of an existing dam falls under Wyoming State Permit 9701. Preliminary calculations indicate that between 0.1 and 0.2 acres of wetlands will be filled.

A review of the water rights indicates that no storage in Little Jenny Lake was included in the first enlargement filed with the State Engineer's office. A separate water rights filing on the water storage in Little Jenny Lake would be our recommended approach. A separate filing would not affect current water rights, yet would allow the town the right to drain all but the pit through their spring collection system.

Several permit requirements will need to be addressed for the Spring Irrigation Distribution System project. Highway department, water rights, NPDES, and DEQ construction permits will need to be obtained. Wetlands are not an issue and the USFS Lease/Use Agreement is covered in below.

Analysis of USFS Lease/Use Agreement

United States Forest Service issued a Special-Use Permit on October 21, 1976 to the Alpine Water and Sewer District. The last Special-Use Permit was issued (transferred) to the Town of Alpine on January 12, 1996 which expires on December 31, 2016. This permit was issued for the purpose of construction and maintenance of a water system for the Town of Alpine.

Analysis of the current Special-Use Permit indicates that construction of either the Little Jenny Lake Spring Area Improvements or the Spring Irrigation Distribution System Project will require that a new permit or a permit amendment be obtained.

Economic Analysis and Project Financing

The following contacts were made in regards to funding possibilities for this project:

- Wyoming Water Development Commission (WWDC)  
  Chris Abernathy  307-777-7626
- Office of State Lands and Investments (OSL)  
  Brad Miskimins  307-777-7331
- Western Wyoming Resource Conservation & Development Area (RC&D)  
  Kirk Heaton  307-382-3982
- Wyoming Department of Environmental Quality (DEQ)
Both projects are eligible for funding by the WWDC. Funding would be 50 percent grant and 50 percent loan for the eligible portions of the projects. Note that fire hydrants are not eligible for WWDC funding. The loan portion has an interest rate of 7.25 percent for a period of 20 or 30 years.

**Project Financing**

Costs Projected to 2003 dollars at 5.00% per year

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<th>Project</th>
<th>Estimated Cost 2001</th>
<th>Estimated Cost 2003</th>
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<th>20 Yr Pymt Per Month</th>
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**Totals**

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Fire hydrants are not eligible for WWDC funding, but funding should be available through other sources since the Town of Alpine can show a need for fire protection. The interest rate is dependent on what funding source is used. If the town acquires a 50/50 grant/loan on the fire hydrants, the payment for a thirty year loan at 7.25% on 50% of $38,587.5 (2003 dollars) is $131.62 per month.

**Operations and Maintenance (O&M)**

O & M for the Little Jenny Lake Spring Area and the Spring Irrigation Distribution System is estimated at $200 per month

**Tap Fee**

Each current water user’s monthly bill of $25 will need to be increased by $10.36 to cover the monthly payments and the O & M costs that the town will incur upon completion of this project. This figure is based on the number of the Town’s current
water user accounts of 300, a monthly payment of $2775.20 for the Spring Irrigation Distribution System and Little Jenny Lake Spring Area improvements, a monthly payment of 131.62 for the fire hydrants and a $200 per month O & M cost. This fee assumes that all water used is from the Spring System. Adjustments may need to be made to the user fee once a track history is created on the amount of potable water required to support the Spring Supply.

Environmental Report

Separate letters were sent for the Little Jenny Lake Improvements and the Alpine Spring Irrigation Supply Project to the following State and Federal regulatory agencies:

- State Historic Preservation Office
- U.S. Fish and Wildlife Service
- Natural Resources Conservation Service
- USFS - Bridger Teton National Forest
- DEQ, Water Quality Division
- DEQ, Air Quality Division
- Wyoming Game and Fish Department

Sample letters were supplied, with contact names and addresses, by Chris Abernathy, WWDC. Letters were not sent to the Local Flood Plain Administrator because flood plains are not an issue with either project.

Answers to the letters have produced the following agency comments.

- The State Historical Preservation Office (SHPO) indicated that a cultural resource survey and mitigation would be required. The Astorian Monument is located within the proposed project boundary. Prior to any ground disturbing activity, an on-site cultural resource survey should be conducted.

- The DEQ, Water Quality Division mentioned three permits that are required for the Spring Irrigation Distribution System. They are Temporary Discharge Permit, Storm Water Associated with Construction Activities and Permit to Construct. The Little Jenny Lake Spring Area improvements will require a Section 404 permit, which is required by the COE.

- Wyoming Game and Fish has no concerns regarding the Spring Irrigation Distribution System. They support the construction of the Little Jenny Lake
Spring Area improvements as long as construction takes place between May 15 and August 31 to minimize wildlife disturbance.

Summary

**Little Jenny Lake Spring Area**

Project involves improvement of the pond and spring area to provide wildlife habitat and to improve efficiency of the spring-tank system.

Project cost is $41,526.85

**Spring Irrigation Distribution System**

Project involves 9570 feet of 10” HDPE pipe, 1470 feet of 8” HDPE pipe and 7610 feet of 4” HDPE pipe to distribute irrigation water to the Town of Alpine’s parks and green areas.

Project cost is $731,461.60.
ZONE DELINEATION

ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
ZONE 6
ZONE 7

IRRIGATION DISTRIBUTION MODEL

SCALE: 1" = 800'
Little Jenny Lake Spring Area

Preparation of Final Designs and Specifications $900.00
Water Rights $1,500.00
Permitting and Mitigation $969.00
Legal Fees $100.00
Acquisition of Access and Rights-of-Way $500.00

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Subtotal = $29,690.00
Eng. 10% = $2,969.00
Subtotal = $32,659.00
Cont. 15% = $4,898.85
Const. Cost Total = $37,557.85
Total Project Cost = $41,526.85
Spring Irrigation Distribution System

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Eng. 10% = $53,744.00  
Subtotal = $591,184.00  
Cont. 15% = $88,677.60  
Const. Cost Total = $679,861.60  
Total Project Cost = $731,461.60