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WYOMING WATER DEVELOPMENT COMMISSION

FRANNIE RAW WATER LEVEL II STUDY

October 2008
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INTRODUCTION

Aqua Engineering, Inc. (AEI) is under contract with the Wyoming Water Development Commission (WWDC) to provide engineering services for the Frannie Raw Water Level II Study to determine the best alternatives to provide raw water supply for landscape irrigation. The project effort will focus initially on the identification of a suitable raw water supply source for the Town of Frannie (Town). This identification of an appropriate irrigation water source is paramount to the success of this project by establishing the firm basis on which the feasibility study may continue. Following the selection of appropriate water supply sources in Phase 1, preliminary conceptual designs of the water diversion facilities may be developed as Phase 2.

Background

Frannie is a small rural town with about 200 residents located two miles south of the Wyoming and Montana border and situated on the county line between Big Horn and Park Counties on U.S. Highway 310. The Town covers an area of approximately ½ square mile and is surrounded by oil and gas wells. Sage Creek, a tributary of the Shoshone River, flows south from Montana and by the northeastern edge of the Town.

The Town’s raw water irrigation system is currently served by a well known as the Kirk#1 Well, located at the northeast corner of Town and just east of Sage Creek. This well was originally drilled in 1955 as an oil well. However, instead of producing oil, it produced water after the Madison aquifer was penetrated, thereby creating a geothermal artesian flow. The well served the Town for many years as a potable water supply until Frannie was connected to the Shoshone Rural/Municipal Pipeline in 1985, at which time the Kirk#1 Well was converted into a raw water supply source for landscape and lawn watering in the residential areas.

Over the years the well has gradually deteriorated in quality and quantity. The well casing is in poor condition and leaking at the well head. The leakage water is discharged into nearby Sage Creek. Presently, the Kirk #1 Well is also used additionally as a bulk raw water supply at no charge to the public. The Environmental Protection Agency has determined that the water is unsuitable for culinary use or human consumption.
Project Objectives, Scope, and Scope Adjustments

It is desired to maintain and improve the aesthetic appearance of Frannie through continued landscape irrigation to attract economic growth and provide a benefit to residents. Additionally, due to earthquake and potential fire hazard as a result of the Town’s proximity to nearby oil and gas wells and storage tanks, and the fact that Frannie is at end of the Shoshone Rural/Municipal Pipeline, a raw water source may be useful to serve as an emergency supply for non-potable water and for fire-fighting purposes in addition to landscape irrigation.

The objectives to be accomplished in this Level II study are considered in two project phases. In the first phase, various raw water sources will be investigated and evaluated, especially in regard to water rights, development costs, and logistical issues. Identification of irrigation service area and demand projections will also be determined within this phase. If there are viable water supply source alternatives, the project is intended to continue to the next phase which will include inventory of the existing raw water distribution system, recommendations for existing system improvements, evaluation of diversion structures, conceptual system design, cost estimates and payback analysis, project financing, and identification of permit requirements for construction. Completion of these tasks will allow the Town of Frannie to plan and proceed with project recommendations.

At this juncture in September 2008, it should be noted to the reader of this report that Phase 1 work was completed in the fall of 2007, and after consideration of the probable costs associated with development a firm raw water supply plus the marginal opportunity for grants or low-cost money, the Town elected to NOT proceed with Phase 2 work except as was requested by the WWDC. A part of the requested Phase 2 work that has been commissioned is the development of this summary final report which will be more limited in scope than envisioned at the outset. This report will describe the results of Phase 1 work, and the partially completed work of Phase 2 to include this written summary report.

DUAL SYSTEM CONCEPTS

The Town of Frannie has an existing raw water infrastructure or “dual system” to provide water for landscape irrigation. The work described herein evaluates the circumstance of the system, the water supply, and the cost of keeping the existing system in working, viable condition. Frannie has an asset inherent in the existing system, but how is that system to be maintained and operated in the future? Further, what is the cost of repair, replacement, expansion and what is the most suitable water supply source or sources given the deteriorating condition of the Kirk #1 Well?
To answer these questions, it is helpful to review the so called regional dual systems that can be found in other states such as Utah, Idaho, and Washington. Providing a secondary water service is an old tradition in the West -- ditch companies have provided water to urban users within their agricultural districts for at least a century, typically as part of their usual non-pressurized delivery systems. The growth of pressurized secondary supply systems has significantly increased over the last 20 years.

The following three examples illustrate the successful implementation of pressurized secondary supply systems in other states. In each case, a mutual ditch company has recognized the need to adapt to the inevitable encroaching urbanization and find new ways to make their company fulfill the needs of a different kind of user. These examples illustrate many of the concepts and concerns that need to be discussed in the development of secondary supply systems.

**Davis and Weber Counties Canal Company, Utah**

Since the late 1970s, the area surrounding the Davis and Weber Counties Canal Company (D&W) has become urbanized, with about half the acreage under the ditch no longer agricultural. In 1985, the Board of Directors began to investigate potential alternative uses for their irrigation water. The impetus for this was driven by a need to find additional sources of revenue to pay for improvements to the ditch and, in part, by a need to find a way to pay for increased costs to the ditch company caused by the growing urbanization around their canals. At the same time, the State of Utah decided to promote pressurized secondary systems by providing funding for such projects. A feasibility study by D&W resulted in the loan of $37 million by the state for the project.

The fundamental question facing D&W was how to keep the existing water rights attached to their ditch in the face of the fact that the acreage under agricultural irrigation was decreasing. The beneficial use of water decreed for irrigation also included irrigation of landscaped urban areas. However, homeowners wanted sprinklers and drip systems. D&W came to recognize that the development of a pressurized secondary supply system would allow the ditch company to retain much of the acreage under the ditch as irrigated acreage. Therefore, the ditch company could retain ownership of the water rights and not have to undergo a legal change to the status of those water rights. D&W recognized that by supplying this service to the growing urban component they could protect the ownership of the water rights and their traditional irrigation systems.

D&W developed cooperative relationships with local municipalities by including them in the planning process. This enabled the municipalities to recognize the benefits to themselves of keeping the mutual ditch company in their community. There were, and still are, a number of benefits to the municipalities. A primary
benefit is that it saved the municipalities the cost of having to size their treatment and delivery systems to include residential landscape water use. As the municipalities no longer have to accommodate non-potable water requirements in their drought planning, their predictable and firm water supplies are stretched further. In Utah, it has enabled the public utility to earmark higher quality water sources (groundwater) for potable use, and not waste that water in uses which do not require such high quality water. The municipalities were assured that by having an entity with a long history in the community provide this service they were not going to end up by taking over this function in the future. Finally, as the ditch company operates as a non-profit, the municipalities were relatively sure that the cost of service to the residents would not be disproportional to that which would be expected from the utility itself.

A major selling point of this project to the State of Utah was the fact the D&W, up-front, decided to allocate half an acre-foot per share of stock in the company for use in the secondary system. As the service area of the secondary system expanded over time, D&W has required that developers turn over water for non-potable use. Additionally each year a number of shares of ‘floating’ stock are allocated to a water rental pool which provides the company with some flexibility in fulfilling their secondary service deliveries.

D&W developed the secondary system in phases, each phase being allocated a portion of the development money from the State. Each subdivision developer was responsible for the installation of the secondary supply system in that development, but had to conform to D&W’s design guidelines and supervision. The policy of D&W has been to maintain full control of the secondary system development. Eventually the ditch company developed two irrigation systems that are integrated with each other. One is the non-pressurized open ditch system servicing agricultural irrigation and the other is a pressurized system for about 8,000 residences. There is a certain amount of cross-over where the ditch company has been able to provide pressurized service to some of its agricultural users.

D&W and the municipalities agreed that the ditch company would provide water only during the traditional irrigation season. This enabled the legal status of the water rights to remain unchanged. Developers, therefore, were required to provide an exterior connection to the potable water line in case ornamentals required supplemental irrigation during the off-season. However, turf grass remains irrigated from the secondary supply system.

Local ordinances were developed with the municipalities for the governance of the system. They also serve to protect the ditch company from some liability concerns (for example, if someone drinks the non-potable water and becomes ill). The water rate structure was designed specifically for the secondary supply system and can be adjusted in a manner similar to water rate changes for a public
utility. Presently, the municipalities collect the fees from the residential users and ‘pay’ the ditch company. The fee consists of an initial connection fee, a service fee and an annual water fee (which is collected monthly). The service is not metered as the cost of installing, maintaining and reading meters was considered too expensive. Instead, the annual fee is based on the acreage irrigated, and in some subdivisions, the homeowner can elect to not irrigate landscape at all. The ditch company is responsible for spot-checking that homeowners are not irrigating more land than they agreed to. Participation in the secondary supply system is mandatory in that all homeowners are required to pay the connection and service fees, even if they don’t water their yards.

D&W has been successful in developing this pressurized secondary supply system by obtaining the cooperation of the developers, the local municipalities and the State of Utah. The result is a system that has gained wide acceptance within its communities by both the agricultural and urban users.

**Nampa-Meridian Irrigation District (NMID), Idaho**

Nampa-Meridian Irrigation District (NMID), once a typical irrigation district, is now 90% urbanized. NMID has about 40,000 individual water accounts, the vast majority of which are residential water users and has implemented a pressurized secondary supply system for landscape irrigation.

As so much of the ditch company is now residential, it operates much like a utility, with its own rights-of-way, billing structures, management and planning, and a professional staff similar to what would be expected from a water utility – except that it is providing the non-potable supplies. NMID has been successful in essentially re-inventing itself as an urban utility company by establishing strong ties to the local municipalities who now feel that they have a stake in the continued existence of the irrigation district and by being pro-active in developing covenants and contracts with each residential subdivision in order to protect NMID’s interests and its facilities.

**Kennewick Irrigation District, Washington**

The Kennewick Irrigation District services a combination of agricultural and urban water users with non-potable irrigation water. The concept of Local Improvement Districts (LIDs) has developed in the region. Essentially, a LID is a group of urban water users who have banded together to obtain pressurized non-potable water service. A LID is like a single incorporated lateral, or possibly could be viewed as a homeowner’s association, for the purpose of providing pressurized raw water to their members.

The homeowners make a request to the Kennewick Irrigation District that such an improvement to the non-potable water system be made. Kennewick ID makes
a determination of the feasibility of the project. A vote is then taken of the people in the subdivision who would be affected by this proposed LID. If the resolution passes and the project is feasible, Kennewick ID finances the cost of developing the LID.

Kennewick delivers pressurized secondary water to the subdivision and provides a service connection to each residence. The Kennewick Irrigation District deals only with the LID designated representative, not the individual homeowners. The development and annual costs are paid for by the LID members, pro-rata across the membership, who then repays Kennewick ID. In general, the more members in the LID, the lower the individual cost.

This case demonstrates a different organizational structure. Although there is a single ‘mother’ entity (Kennewick Irrigation District), each secondary system essentially operates independently. The development of the pressurized secondary supply systems has come after the urban development, and development of each LID is voluntary. It is interesting to note that Kennewick ID is currently undertaking an effort to merge 150 LIDs into a single common entity. The intent is to decrease administrative costs for Kennewick ID and to bring more common management and maintenance practices. Further, many small pump stations are to be combined into a single larger pump station when such is feasible.

THE TOWN’S EXISTING SYSTEM

History and Overview

In 2005, the WWDC funded a Level II study of the Kirk #1 Well to determine the feasibility of rehabilitating the well to increase production. Due to the high probable cost of well rehabilitation, the Town began considering the option of using surface waters as an alternative source for raw water supply rather than refurbishing or re-drilling the well.

Currently, Frannie has no formal growth projections. Potential growth in the oil and gas industries in the region may boost the Town’s economy and result in growth. Growth could help pay for expansion of the raw water system or help pay for improvements. The Town’s existing raw water and well facilities appear to be in fair to poor condition and are operational and functional.

The existing raw water distribution system consists of 4-inch diameter and smaller steel pipeline with individual lots served with a spigot. The system is unmetered. There is presently an imposed 4-day operational rotation, managed using the existing system valves. A rotational schedule has been necessary due to pressure concerns in the existing looped pipe system.
The raw water system is shut down and water evacuated during the winter season.

The layout of the raw water distribution system is shown in the following figure. The primary concern with the existing distribution system is flow and pressure. A rotational scheme has been implemented in order to provide individual points of connection to the raw water system a suitable amount of flow and pressure for hose-end irrigation.

The primary concern with the Kirk #1 Well is dramatically reduced flow from the time when the well was first drilled.

Landscape Water Requirements

Landscape water requirements have been evaluated for the existing landscape plus an allowance for future anticipated growth. Aerial photographs were used to estimate the extent of currently irrigated areas.

The following figure shows sub blocks of irrigated areas within the Town with the estimated irrigated area in each. The total estimated irrigated area is about 26 acres including parks and a ball field. Because the population of Frannie is expected to grow by approximately 9% over the next decade, the future irrigated area on which a dual system would be needed is estimated to be 30 acres.

It is not desirable to irrigate landscapes during the daylight hours in the case of automated irrigation systems. Realistically though, much of the landscape in the Town is irrigated with hose end sprinklers and this irrigation is likely to occur whenever residents are home and available to irrigate. For conservative analysis, if irrigation were confined to a 12-hour time period at peak season (late June and July), then the preferred flow rate to meet the turf grass water requirements is a total of 604 GPM.

The assumptions associated with this are shown in the following table:
Existing Raw Water System Layout, Frannie, Wyoming
### PEAK SEASON DESIGN AND ANNUAL WATER REQUIREMENTS

Aqua Engineering, Inc.  
4803 Innovation Drive  
Fort Collins, Colorado 80525

August 29, 2007  
Project Name: Frannie Raw Water Level II Study  
Location: Town of Frannie  
Prepared By: DT

<table>
<thead>
<tr>
<th>BLUEGRASS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA, acres</td>
<td>30</td>
</tr>
<tr>
<td>PEAK SEASON DESIGN</td>
<td></td>
</tr>
<tr>
<td>IRRIGATION REQUIREMENT, inches/day</td>
<td>0.24 (3)</td>
</tr>
<tr>
<td>OPERATING LOSS, inches</td>
<td>0.16</td>
</tr>
<tr>
<td>TOTAL DAILY APPLICATION REQUIREMENT, inches</td>
<td>0.40</td>
</tr>
<tr>
<td>TOTAL DAILY APPLICATION REQUIREMENT, acre-ft</td>
<td>1.00</td>
</tr>
<tr>
<td>TOTAL DAILY APPLICATION REQUIREMENT, gallons</td>
<td>325,000</td>
</tr>
<tr>
<td>SEASONAL IRRIGATION REQUIREMENTS, inches</td>
<td>35</td>
</tr>
<tr>
<td>SEASONAL EFFECTIVE PRECIPITATION, inches</td>
<td>2.8</td>
</tr>
<tr>
<td>TOTAL SEASONAL IRRIGATION APPLICATION, inches</td>
<td>32.2</td>
</tr>
<tr>
<td>TOTAL SEASONAL IRRIGATION APPLICATION, acre-ft</td>
<td>60.5</td>
</tr>
<tr>
<td>TOTAL SEASONAL IRRIGATION APPLICATION, gallons</td>
<td>26,241,000</td>
</tr>
<tr>
<td>IRRIGATION FLOW REQUIREMENT WITH AN IRRIGATION WINDOW OF 6 HOURS, (gpm)</td>
<td>1.207</td>
</tr>
<tr>
<td>IRRIGATION FLOW REQUIREMENT WITH AN IRRIGATION WINDOW OF 8 HOURS, (gpm)</td>
<td>905</td>
</tr>
<tr>
<td>IRRIGATION FLOW REQUIREMENT WITH AN IRRIGATION WINDOW OF 12 HOURS, (gpm)</td>
<td>804</td>
</tr>
</tbody>
</table>
The acreage irrigated by site type, and considering the projected flow rates by area, is shown in the table below:

<table>
<thead>
<tr>
<th>Site</th>
<th>Irrigated Area (Acres)</th>
<th>Design Flow (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Area</td>
<td>22.7</td>
<td>457</td>
</tr>
<tr>
<td>Old Elementary School</td>
<td>0.3</td>
<td>6</td>
</tr>
<tr>
<td>Town Hall Park</td>
<td>1.4</td>
<td>29</td>
</tr>
<tr>
<td>Fleming Park</td>
<td>0.37</td>
<td>7</td>
</tr>
<tr>
<td>Baseball Field</td>
<td>1.23</td>
<td>25</td>
</tr>
<tr>
<td>Additional Future Expansion Area</td>
<td>4</td>
<td>81</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>30</strong></td>
<td><strong>604</strong></td>
</tr>
</tbody>
</table>

Seasonal landscape irrigation requirements in inches for turf grasses are estimated as follows:

<table>
<thead>
<tr>
<th>Lawn Grass</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consumptive Use</strong></td>
<td>3.61</td>
<td>5.20</td>
<td>6.27</td>
<td>7.48</td>
<td>6.6</td>
<td>3.90</td>
<td>2.16</td>
<td>34.98</td>
</tr>
<tr>
<td><strong>Effective Precipitation</strong></td>
<td>0.25</td>
<td>0.64</td>
<td>0.64</td>
<td>0.36</td>
<td>0.31</td>
<td>0.37</td>
<td>0.20</td>
<td>2.77</td>
</tr>
<tr>
<td><strong>Net Irrigation Requirement</strong></td>
<td>3.37</td>
<td>4.56</td>
<td>5.63</td>
<td>7.12</td>
<td>6.05</td>
<td>3.53</td>
<td>1.96</td>
<td>32.21</td>
</tr>
</tbody>
</table>

**WATER SOURCE EVALUATION**

This report, being confined mostly to reporting Phase 1 results, is largely about water sources. The sources described here, or some combination of sources, appear to be inclusive of all known options. After vetting these options within the project team and with the Town at a public meeting, some options can be eliminated.

Generally, the following types of sources were investigated and evaluated:

**Existing water supplies and rights included:**
- Kirk #1 Well.
Existing Irrigated Areas, Frannie, Wyoming
Town of Frannie water rights.

- Shoshone Municipal Pipeline System.

**Transfer of irrigation rights included:**

- Sage Creek.
- Shoshone Project.

**Other sources included:**

- Kirk #1 Well leakage water recovery.
- Purchase of water from Buffalo Bill Reservoir.
- Reuse of waste water for direct use or exchange.
- Acquisition of a well or wells from nearby oil fields.

The specific details of the water source investigations are presented below in an outline format with options identified in green highlighting. The numbered options correlate with the options as presented in the public meeting in Frannie in the fall of 2007.

The intent of this report section is to provide a summary of the legal and technical issues related to the various identified alternatives developed to address the raw water supply issues facing the Town of Frannie.

Basic assumptions of this part of the investigation are that the Town needs to secure a water supply of approximately 600 GPM, or 1.34 CFS, for the irrigation of about 30 acres of landscape located throughout the Town around homes and the local recreation fields. On a seasonal basis, that estimate results in a total need of about 80.5 acre-feet per year, or 26,000,000 gallons per year.

Water sources, both existing and potential, can be summarized as follows:

1. **Existing Water Supplies and Water Rights**
   a. **Kirk No. 1 Well**
      i. Description – This well provided municipal water to the Town of Frannie for many years. After construction of the Shoshone Municipal Pipeline system, however, the town converted its domestic and municipal potable water supply to the new system, and maintained a separate raw water delivery system through the town for the irrigation of lawns, gardens, recreation areas and related raw water demands.
These continuing demands for raw water have been partially met through water withdrawn from the Kirk No. 1 Well.

ii. Technical and Legal Considerations

Water Rights – The Kirk No. 1 Well has an adjudicated groundwater right (Permit No. U.W. W.R. 406) for 500 gpm for municipal purposes with a priority date of October 18, 1955.

1. Rehabilitation of the Well – because of the poor condition of this existing well, (and the reported current production of less than 50 gpm) prior studies have evaluated the possibility of rehabilitating this well back to its original condition and withdrawal production rates.

2. Capping the Abandoned Well – the current well is leaking and water is reaching Sage Creek. If the Town desires to no longer use this well or to rehabilitate the facility to its original capacity, it should be properly abandoned pursuant to the laws and regulations of the State, including those under the jurisdiction of the State Engineer’s Office and Department of Environmental Quality. Capping and abandoning the well is expensive, providing some motivation towards rehabilitation.

iii. Action Items – Refine and summarize the cost estimates for the rehabilitation and/or the capping and abandonment of the well on a permanent basis.

iv. Fatal Flaws – No fatal flaws with respect to water rights were identified for these alternatives. There are no limitations currently placed upon the Town’s ability to rehabilitate its well to recover the original 500 gpm capacity.

b. Surface Water Right – Deaver Irrigation District (6.1 acres) identified as Option 1.

i. Description – As part of our analysis, the water rights attached to lands located within the exterior boundary of the Town of Frannie were researched. That research resulted in the discovery of a water right for a 6.1 acre parcel of land, in the SE ¼, NE ¼ of Section 36, T 58 N, R 98 W, which is located just west of the county line and between Highway 310 (Ash Street) and the railroad tracks. This parcel of land appears to be where the baseball and nearby related recreational fields are located.
ii. Technical and Legal Considerations

Water Rights – The 6.1 acre parcel has a surface water right for irrigation, domestic and stock water purposes under Permit No. 2111, for the Frannie Canal, a major lateral of the Garland Canal, diverting from the Shoshone River with a priority of May 22, 1899. This water right is adjudicated in the name of the Deaver Irrigation District on behalf of the individual landowners, which includes the Town of Frannie.

1. Assessment Payment History – This water right is a small portion of a very large irrigation system water right that is served through the Deaver Irrigation District. As such, it is likely that the Town has been assessed annual fees for the annual operation and maintenance expenses of the irrigation delivery system. The records for the District should be reviewed to verify these payments, as well as any records of delivery and use.

2. Means of Conveyance – This water right diverts from the Shoshone River at the Garland Diversion Dam approximately 10 miles upstream from the City of Powell, and is delivered through the Garland Canal by the Shoshone Irrigation District, and then the Frannie Canal by the Deaver Irrigation District. It is not clear from the information we have been provided which smaller lateral or ditch is used to deliver water to these specific lands.

iii. Action Items –

1. The assessment records of the Deaver Irrigation District should be reviewed to determine historic payment of the Town’s assessments.

2. Complete a detailed review of the means of conveyance from the primary District’s delivery irrigation canals to the laterals serving this parcel of land. This is a valid adjudicated water right for irrigation purposes, and as such, is available to the Town for the irrigation of up to 6.1 acres of land within the described area, which appears to include the Town’s baseball and recreational fields. Use of this supply of water should reduce the amount of water needed to meet the other raw water needs of the Town.

iv. Fatal Flaws – We do not believe there are fatal flaws in pursuing this alternative; however, there may be some
practical issues with the delivery system in conveying water to these permitted lands.

**c. Shoshone Municipal Pipeline System – identified as Option 2.**

i. **Description** – Since the completion of the Shoshone Municipal Pipeline system, the domestic and commercial potable water needs of the Town of Frannie citizens have been met through this large regional municipal water system. This system treats raw water from Buffalo Bill Reservoir, near the City of Cody, and delivers it through a treated water pipeline that transcends the area between Cody, Powell, and Lovell, and the smaller communities of Deaver, Byron and Frannie, as well as serving some intervening rural water district areas.

ii. The water right records contained in the State Engineer’s Office were researched and confirm that the entire area within the boundary of the Town of Frannie is covered by the municipal water rights associated with the regional water system. These water rights divert from the Shoshone River and include Permit No. 19858, as well as a series of senior priority date irrigation use water rights (a total of seven appropriations), that were changed to municipal purposes and changed in point of diversion to the Shoshone Municipal Pipeline via proper petition to the State Board of Control.

2. **Transfer of Irrigation Rights**

a. **Sage Creek – identified as Option 3.**

i. **Description** – This alternative would require the purchase and transfer of another surface water right located along Sage Creek, the small stream that traverses along the Town’s eastern boundary. Such a water right could be moved to a new diversion/pump point along the creek in the vicinity of the Town of Frannie.

ii. **Technical and Legal Considerations** - There are very few existing water rights that are permitted and adjudicated from Sage Creek, primarily because of its limited supply of water. Sage Creek is primarily fed through irrigation return flows resulting from the application of water within the Deaver Irrigation District within the upper and middle reaches of the basin near Frannie, and from return flows from the Sidon Canal in the lower reaches of the drainage. The only Sage Creek water right that could be considered is the Zeller No. 1 Ditch, a supplemental supply ditch located many miles downstream from the Town near the mouth of Sage Creek.
It would be very difficult to change the location of this water right so many miles upstream.

iii. Action Items - none

iv. Fatal Flaws – Because of the very limited opportunity for the transfers of a senior priority water right this alternative should not be considered further. In addition, officials with the Town have reported that the water quality of Sage Creek is poor, and many residents have objected to the use of the creek for the lawn watering purposes.

b. Shoshone Project – identified as **Option 4**.

   i. Description – This alternative considers the acquisition and transfer of other irrigation water rights within the entire Shoshone Project; which include the Deaver Irrigation District, in the area around the Town of Frannie.

   ii. Technical and Legal Considerations – This concept proposes transferring or re-describing the place of use of other existing irrigation water rights from their existing locations within the irrigation district, and placing them on the lands to be irrigated within the boundaries of the Town. This concept would build upon the fact noted above, that there are 6.1 acres of water rights currently on the lands described within the Town, by adding additional acreage of water rights for delivery and use within the raw water system. This is legally possible under state law, but will also require the approval the irrigation districts and the US Bureau of Reclamation (USBR). First, a willing seller would need to be identified. After the water right is purchased, a variety of legal, administrative processes and approvals would need to be sought with the Town working in cooperation with the Deaver and/or Shoshone Irrigation Districts and USBR. Once the legal rights and uses are established, the Town would need to develop the means to divert and deliver the water to the existing raw water system. It is possible for the Town to divert these new irrigation supplies by either diverting them from Sage Creek or through a lateral from the Deaver Irrigation District.

iii. Action Items

   1. Investigate the details of the administrative steps required of the irrigation districts and USBR.
   2. Seek authorization by the Town to obtain water rights from a willing landowner.
   3. Obtain consent and approval of the District and USBR.
iv. Fatal Flaws – The processes required by the District and USBR may be burdensome and expensive.

c. Town of Frannie Irrigation Rights

i. Description – The records of the State Engineer’s Office show the only water right attached to Town lands is the 6.1 acre portion of the Frannie Canal irrigation water right described in detail above. As discussed above, further research on the practical implementation of the Town’s use of this water right should be explored.

ii. Technical and Legal Considerations – These water rights are legally attached to the described property. The Town, in cooperation with the Deaver Irrigation District, should evaluate the existing conveyance facilities to deliver the irrigation water rights of the Town to the described property.

iii. Action Items

1. The assessment records of the Deaver Irrigation District should be reviewed to determine historic payment of the Town’s assessments.

2. Means of Conveyance – This water right diverts from the Shoshone River at the Garland Diversion Dam approximately 10 miles upstream from the City of Powell, and is delivered through the Garland Canal by the Shoshone Irrigation District, and then the Frannie Canal by the Deaver Irrigation District. It is not clear from the information we have been provided which smaller lateral or ditch is used to deliver water to these specific lands.

iv. Fatal Flaws – We do not believe there are fatal flaws in pursuing this alternative, however, there may be some practical issues with the delivery system in conveying water to these permitted lands.

3. Capture of Leakage Water from Existing Well – identified as Option 5.

a. Pump it Back to Raw Water Supply System

i. Description – This alternative would capture the leakage from the existing Kirk No. 1 Well as it flows along the surface and shallow subsurface from the well towards Sage Creek. This would be accomplished by constructing a small pond to intercept the seepage/leakage from the well, and re-pump it back to the raw water irrigation system.

ii. Technical and Legal Considerations

1. Leakage flow is reported to be a minimal (20-30 gpm) amount of water. As such, it may be
difficult to design a collection pond and pump-back system that would operate efficiently.

2. If a pond is constructed, a water right permit from the State Engineer’s Office would be required.

   iii. Action Items - None

   iv. Fatal Flaws – This alternative does not supply a sufficient amount of water to meet the Town’s needs and is, therefore, not recommended for further evaluation.

b. Exchange for Surface Right from Sage Creek – identified as Option 6.

   i. Description – This alternative is a slight modification of the above alternative. It proposes to collect the seepage/leakage from the well as it approaches Sage Creek, measure the quantity of water as it is discharged to the creek, and exchange that amount for an equal quantity to be pumped from Sage Creek at another nearby location. While this concept would avoid the construction of a pond, it would require measurement of the water from the well, and the construction of a new diversion and pump station from the creek.

   ii. Technical and Legal Considerations – As described above, this alternative would require the establishment of a collection and measurement system, which could be difficult due to the minimal quantities of water involved and the diffused nature of the leakage. To legally establish and protect the exchange of water, a petition to the State Engineer is necessary.

   iii. Action Items - None

   iv. Fatal Flaws – As mentioned previously, there are some objections to the use of water from Sage Creek due to its poor water quality. While this alternative is legally possible, the technical issues of collection and measurement of the minimal quantities of seepage and leakage from the well will require further engineering and construction of the necessary facilities. It appears this alternative is not cost effective when you consider the small and insufficient quantity of water to meet the Town’s raw water demands.

4. **Purchase Water from Buffalo Bill Reservoir** – identified as Option 7.

   a. Description - This alternative is to purchase a portion of reservoir storage water contained in Buffalo Bill Reservoir that is contractually managed by the Wyoming Water Development Office (WWDO) on behalf of the State of Wyoming. This purchased
storage water could then be conveyed to and through the Garland Canal and then the Frannie Canal and into Sage Creek, for re-delivery or pumping from the creek by the Town for the raw water irrigation purposes.

b. Technical and Legal Considerations
   1. The staff from the WWDO has confirmed that they do have contractual authority for a portion of storage water in Buffalo Bill Reservoir that can be purchased for this raw water purposes.
   2. Once purchased, arrangements must be made for the conveyance of this contract storage water through the USBR constructed facilities now managed by the Shoshone and Deaver Irrigation Districts.
   3. The large existing capacity of the irrigation delivery systems appears sufficient to convey the small volume of water required for this project.

c. Action Items – Initiate discussions with WWDO, USBR and the Districts to fully capture the costs and approval procedures for the purchase and conveyance of the storage water.

d. Fatal Flaws – None identified. This alternative deserves further evaluation

5. **Waste Water – identified as Option 8.**
   a. Direct re-use
      i. Description – This alternative proposes to make use of the wastewater discharge from the Town of Frannie that is collected and treated at the Town treatment lagoons. A number of towns in Wyoming have evaluated the re-use of the wastewater derived at their existing treatment systems.
      ii. Technical and Legal Considerations – The initial review of this alternative determined that the volume of wastewater returns to the lagoon treatment system is not sufficient to meet the raw water needs of the Town. The current lagoon system is also designed as a low flow non-discharging treatment system. Therefore, the raw water supply from this source would be of questionable quality for the purposes intended, which could require further treatment.
      iii. Action Items - None
      iv. Fatal Flaws – Since there is an insufficient quantity and the potential for high costs associated with treating this source of water, it is recommended this alternative not be pursued further.
b. Exchange – identified as **Option 9**.
   i. Description – This alternative is a slight modification of the above alternative and would use the available wastewater supply from the Town’s lagoons through an exchange with water from Sage Creek.
   
   ii. Technical and Legal Considerations – Because the lagoons are non-discharging, implementation of this alternative would require the construction of an outfall discharge pipeline and measuring system from the wastewater lagoons to Sage Creek. By introducing this new source of water to Sage Creek, the Town could, through an exchange, then divert an equal amount of water from Sage Creek at an upstream point and use for raw water purposes. This alternative would likely require additional treatment of the wastewater before it could be discharged from the lagoon to Sage Creek, depending upon the requirements imposed by DEQ. Further, under the exchange, water diverted from Sage would be used to meet the raw water needs, and as mentioned previously, due to the low streamflow conditions in Sage Creek some residents and officials of the Town have objected to the use of the creek water for the purposes of this study.
   
   iii. Action Items - None
   
   iv. Fatal Flaws – Since there is an insufficient quantity of water an due to the potential high costs for treating the wastewater or the creek water, further consideration of this alternative is not recommended.

6. **Purchase of Water from Nearby Oil Fields** – identified as **Option 10**.

   a. Description – This alternative considered the purchase and transfer of groundwater from nearby oil wells to the Town for use in the raw water irrigation system. Reportedly, several oil wells were drilled in the vicinity and were not successful finding oil, but rather water. The concept was to see if these reports were true and, if so, see if the companies were willing to provide the well and its water to the Town.

   b. Technical and Legal Considerations
      
      i. Deep wells
         Based upon research of the oil well companies (Merit Energy) by Aqua Engineering, none of the nearby wells are currently producing water that could be used for this project.
ii. Shallow wells
While there are some limited source groundwater aquifers in this area, reports indicate that the potential yields are limited (max capacity = 100 gpm) and some have also reported poor water quality.

c. Action Items - None

d. Fatal Flaws – This alternative is not recommended for further evaluation due to the presumed limited quantity of groundwater available for this project.

A Combination of Options
In many cases, a combination of water sources can be effectively brought together for the purposes of combining the volumes associated with differing water sources, mixing waters to obtain a suitable water quality, or minimizing the impact of water flow or flows changing over a day or a longer period.

In a highly simplified way, the graphic below exemplifies this approach.

It is recommended, given the variables that have been discovered with the various water source alternatives, that a pond be constructed for the purpose of combining and storing water. A pump station would then be used to pump water at a suitable rate and discharge pressure.

This combination option is identified herein as **Option 11**.
OPINION OF PROBABLE COSTS

The probable costs of developing one or more of these water sources is of critical importance to the Town of Frannie. This is especially true because funds available from the Wyoming Water Development Commission are highly competitive.

Additionally, if a new pond and pumping system were to be developed, there is cost associated with that infrastructure.

Pond and pumping system costs have been estimated as follows:

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNITS</th>
<th>UNIT COST</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pond Excavation</td>
<td>30,000</td>
<td>CY</td>
<td>3</td>
<td>$90,000</td>
</tr>
<tr>
<td>Bentonite Liner</td>
<td>150</td>
<td>TON</td>
<td>60</td>
<td>$9,000</td>
</tr>
<tr>
<td>Liner Tilling and Compaction</td>
<td>10,000</td>
<td>SY</td>
<td>3</td>
<td>$30,000</td>
</tr>
<tr>
<td>PUMP SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump, motor, filtration</td>
<td>1</td>
<td>LS</td>
<td>50,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>Intake Structure and Screen</td>
<td>1</td>
<td>LS</td>
<td>9,500</td>
<td>$9,500</td>
</tr>
<tr>
<td>Pump System Wet Wall</td>
<td>1</td>
<td>LS</td>
<td>3,500</td>
<td>$3,500</td>
</tr>
<tr>
<td>Pump Station Enclosure</td>
<td>1</td>
<td>LS</td>
<td>16,000</td>
<td>$16,000</td>
</tr>
<tr>
<td>Miscellaneous PVC Piping</td>
<td>1,000</td>
<td>LF</td>
<td>10</td>
<td>$10,000</td>
</tr>
<tr>
<td>Contingencies and Engineering (15%)</td>
<td>1</td>
<td>LS</td>
<td>32,550</td>
<td>$32,550</td>
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<tr>
<td><strong>Total Construction Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$249,550</strong></td>
</tr>
</tbody>
</table>

This preliminary cost estimate, totaling $250,000, assumes that the pond would be constructed to store water suitable to 10 days of peak season water usage. If contributing water sources can be brought in on a continuous basis and more or less 24-hour basis, then costs can be reduced by decreasing the pond storage capacity.

This cost estimate has been presented to the Town and the costs have been deemed too high without cost sharing dollars coming from sources other than the Town.
RECOMMENDATIONS

Options 2, 3, 6, 8, and 9 are discounted as having fatal flaws and/or high costs.

Potential Options (Near Term)

Option 1. Frannie surface water right for 6.1 acres.

Option 5. Kirk #1 Well leakage - Direct Use.

Option 7. Purchase of water from Buffalo Bill Reservoir.

Option 11. Capture Kirk #1 Well and leakage flow and Frannie’s water right flow in storage.

Potential Options (Long Term)

Option 4. Transfer of Shoshone Project irrigation water rights.

Option 10. Acquisition of water-producing wells from nearby oil fields.

Other recommendations are made as follows:

- Automated irrigation systems to operate at night and balance night-time irrigation against daytime hose end (manual) irrigation in order to reduce the flow rate from 604 GPM to a lesser flow rate with a corresponding smaller pumping system.

- Obtain actual water quality data from canal water and Sage Creek.

- Prepare a drought response plan – details of what the reaction will be to varying drought conditions in the future.

- Buy a used pump as may be available in the region (600 GPM, $8,000).

- Move forward with an Alternative 11 to provide the greatest amount of flexibility and adaptability.

- Measure & update unknown flow rates.

- Initiate communications with the District (e.g. Deaver Irrigation District) in regard to the issue with water delivery.
APPENDICES
In December 2007, the following letter was received from the Town indicating that they did not wish to continue with Phase 2 of the project scope of work.
December 17, 2007

Doug Tzou  
Aqua Engineering  
4803 Innovation Drive  
Fort Collins, CO  80525

Dear Mr. Tzou,

The Frannie town council voted at a recent council meeting not to enter into Phase II of the project. Thank you for your time and effort on this project. The town has chosen to go a different way for now.

Sincerely,

[Signature]
Brook Loyning
The following Power Point presentation was used in the fall of 2007 in the public meeting held in Frannie.
**Task 1 - Scoping Meeting Highlights**

- Residents have concerns over the canal and Sage Creek water quality.
- Town of Frannie owns some water rights.
- Potential water-producing oil wells west of Town. Preferred to avoid water right change issues if possible.
- Prefer to improve upon the Kirk #1 Well for their lawn watering without substantial effort and / or costs.

**Task 2 - Identification of Service Area, Demand Projection**

- Typical residential landscape with hose bib.
- Typical park landscape.
Task 2 - Identification of Service Area, Demand Projection

Estimated potential irrigated area is about 26 acres including parks and ball field.
2000 census population is 180 and population forecast for 2020 is 196 (8.9 percent increase) (Wyoming Department of AB: Economic Analysis Division December 2006)

Projected future irrigated acreage will be about approximately 30 acres.

### PEAK SEASON DESIGN AND ANNUAL WATER REQUIREMENTS

<table>
<thead>
<tr>
<th>Key Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area, Acres</strong></td>
</tr>
<tr>
<td><strong>Flow Season Design</strong></td>
</tr>
<tr>
<td><strong>Irrigation Requirement, inches/day</strong></td>
</tr>
<tr>
<td><strong>Total Seasonal Irrigation Application, inches</strong></td>
</tr>
<tr>
<td><strong>Total Seasonal Irrigation Application, acre-ft</strong></td>
</tr>
<tr>
<td><strong>Total Seasonal Irrigation Requirement, gallons</strong></td>
</tr>
<tr>
<td><strong>Irrigation Flow Requirement with an Irrigation Window of 12 Hours, gpm</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site</th>
<th>Irrigated Area (Acres)</th>
<th>Design Flow (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Area</td>
<td>22.7</td>
<td>47</td>
</tr>
<tr>
<td>Old Elementary School</td>
<td>0.3</td>
<td>6</td>
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<tr>
<td>Town Hall Park</td>
<td>1.4</td>
<td>29</td>
</tr>
<tr>
<td>Fleming Park</td>
<td>0.37</td>
<td>7</td>
</tr>
<tr>
<td>Baseball Field</td>
<td>1.23</td>
<td>25</td>
</tr>
<tr>
<td>Additional Future Expansion Area</td>
<td>4</td>
<td>81</td>
</tr>
</tbody>
</table>

**Total:** 30 604
Task 3. Raw Water Source Alternatives

1. Surface Water Rights Owned by the Town of Frannie
6.1 acres with a water duty of 1 cfs/70 acres near Frannie Ball Field.
Equivalent of about 40 gpm.
Priority date: May 22, 1899.

2. Surface Water Rights Owned by Town Residents
Shoshone Municipal Pipeline System.
Irrigation use water rights changed to municipal purposes and changed in point of diversion to Shoshone Municipal Pipeline.
Expensive to be used for irrigation ($2.00/1000 gal, Mar – Oct).

3. Transfer of Sage Creek Irrigation Water Rights
Limited water rights permitted and adjudicated from Sage Creek.
Zeller No. 1 Ditch located many miles downstream from the Town near the mouth of Sage Creek.
Very difficult to change the location of this water right many miles upstream.

4. Transfer of Shoshone Project Irrigation Water Rights
Re-describe the place of use of existing water rights in the project.
Identify willing sellers.
Legally possible under State law, but will require approval of irrigation districts and United States Bureau of Reclamation.
The processes for approval may be more involved.

Kirk #1 Well
Adjudicated flow rate is 500 GPM for municipal purpose.
Priority Date: October 8, 1955.
Historical well flow: 500 to 800 GPM.
Current estimated flow: < 100 GPM (WWDC estimate) due to deterioration.
Task 3. Raw Water Source Alternatives

5. Kirk #1 Well Leakage - Direct Use
   Capture leakage water and pump it or store it for pumping back to existing raw water supply system.
   Need storage facility (i.e., small pond) and pump station.
   Leakage rate is small, estimated to be about 20 to 30 gpm.
   Insufficient to meet entire project demand.

6. Kirk #1 Well Leakage - Exchange
   Return leakage water to the Creek and exchange for surface water from Sage Creek.
   Requires water measurement on leakage and diversion structure and pump station.
   Leakage rate is small, estimated to be about 20 to 30 gpm.
   Insufficient to meet entire project demand.
   Public has water quality concerns over using Sage Creek water for lawn irrigation due to pathogens.

7. Purchase of Water from Buffalo Bill Reservoir to Supplement Well.
   Price: $200/acre-foot on annual basis.
   Estimated 100 acre-feet of water is required assuming 50% canal conveyance efficiency.
   Annual WWDO water cost is $20,000 (100 x $200).
   Requires approval from USBR in regard to conveyance of this contract storage water (requires negotiation).

8. Waste water – Direct Use
   Estimated average effluent discharge: 14,400 gal/day (10 GPM) or 16 acre-feet/year.
   Amount insufficient to meet all project demand.
   Wyoming Department of Environmental Quality (DEQ) has no wastewater quality reuse standards for residential lawn irrigation.
   Town will have to develop its own standards in coordination with DEQ.
   Sewage treatment cost: $250,000 (including prepackaged treatment and pump system and storage facility).

   Discharge into Sage Creek in exchange of Sage Creek diversion of the same amount.
   Estimated average effluent discharge: 14,400 gal/day (10 GPM) or 16 acre-feet/year.
   Amount insufficient to meet all project demand.
   Requires waste water measurement.
   Requires treatment before waste water discharges from lagoons to Sage Creek.
   Public has water quality concerns over using Sage Creek water for lawn irrigation.
Task 3. Raw Water Source Alternatives

10. Acquire Water-Producing Wells from nearby Oil Fields (Merit Energy).
   - Shallow wells in the Tensleep geologic zone.
     - Flow yield less than 100 gpm.
     - Located about 8,000 feet away from the Town.
     - May be deepened into the high yield Madison zone at an estimated cost of $600,000.
   - Plugged deep wells in the Madison geologic zone.
   - Potential flow between 400 to 800 gpm.
   - Located about 4,000 feet away from Town.
   - May be re-entered and rehabilitated at an estimated cost of $350,000.
   - Many unknown factors and costly.

Task 3. Raw Water Source Alternatives

11. Construct Storage Facility for Kirk #1 Well and Town's Water Right or/and Other Potential Sources.
   - Collect Kirk #1 Well and Town's water right flow into a storage pond.
   - Reconfigure existing well piping layout.
   - Storage pond, pump station, and additional piping required.
   - Estimated cost for construction is about $250,000.
   - Annualized cost including power and O&M is about $22,000 assuming a project life of 20-years and 4% interest (equivalent of about $0.84/1000 gallons).

Task 3. Raw Water Source Alternatives

Summary and Recommendations:
Options 2, 4, 6, 8, and 9 are discounted as having total fees and/or high costs.

Potential Options

Near Term Options
1. Frannie surface water right for 6.1 acres.
2. Kirk #1 Well - Existing System.
3. Purchase of water from Buffalo Bill Reservoir.
4. Capture Kirk #1 Well and leaking water and Frannie's water right flow into storage.

Long Term Options
5. Transfer of Shoshone Project irrigation water rights.
6. Acquire of water-producing wells from nearby oil fields.

Discussions

Preferred raw water supply alternative(s),
Conclusions. Where do we go from here?
Ideas for Consideration:

- Automated irrigation systems to operate at night.
- Obtain actual water quality data from canal water and Sage Creek.
- Prepare a drought response plan – details of what the reaction will be to varying drought conditions in the future.
- Buy a 3-year-old used pump (600 GPM, $8,000).
- Move forward with an Alternative 11 to provide the greatest amount of flexibility and adaptability.
- Measure & update unknown flow rates.
- Initiate communications with districts (e.g. Deaver Irrigation District) in regard to issue with water delivery.