This is a digital document from the collections of the Wyoming Water Resources Data System (WRDS) Library.

For additional information about this document and the document conversion process, please contact WRDS at wrds@uwyo.edu and include the phrase “Digital Documents” in your subject heading.

To view other documents please visit the WRDS Library online at: http://library.wrds.uwyo.edu

Mailing Address:
Water Resources Data System
University of Wyoming, Dept 3943
1000 E University Avenue
Laramie, WY 82071

Physical Address:
Wyoming Hall, Room 249
University of Wyoming
Laramie, WY 82071

Phone: (307) 766-6651
Fax: (307) 766-3785

Funding for WRDS and the creation of this electronic document was provided by the Wyoming Water Development Commission (http://wwdc.state.wy.us)
TOWN OF DIXON WATER SUPPLY PROJECT
LEVEL I STUDY
FINAL REPORT

EXECUTIVE SUMMARY

PREPARED FOR:

Wyoming Water Development Commission
Herschler Building
122 West 25th Street
Cheyenne, WY 82002

PREPARED BY:

Lidstone & Anderson, Inc.
736 Whalers Way, Suite F-200
Fort Collins, CO 80525

November 1, 1991
EXECUTIVE SUMMARY

Authorization and Purpose

In the Fall of 1990, the Town of Dixon submitted an application to the Wyoming Water Development Commission (WWDC) to fund a reconnaissance study of water supply alternatives. On June 5, 1991 Lidstone & Anderson, Inc. (LA) entered into a contract with the WWDC to provide professional services related to the Level I-Dixon Water Supply Project. The purpose of the project is to (1) investigate the quality and quantity problems associated with their current source of water, (2) develop and evaluate alternatives to rehabilitate the current source and (3) identify and evaluate viable groundwater sources as an alternative water supply. This report documents the results associated with the Level I investigation.

Project Location and Summary of Existing Problems

The existing water supply system for the Town of Dixon was originally constructed in the late 1950's and presently provides water to meet the domestic and fire flow requirements for both the permanent and seasonal residents. The source of water for the supply system is the Little Snake River via diversion through an infiltration gallery. Figure 1 presents the general location map for the Town of Dixon and the project area.

The existing system consists of several components including an infiltration gallery, wet well and pump house with chlorination treatment system, chlorine contact chamber and pump house, storage tank, and water distribution pipelines. The present system is neither filtered or metered. Historically, maintenance has been limited to: (1) replacement of the original cast iron pipelines with the more conventional PVC pipe, and (2) periodic maintenance and replacement of the existing pumps and electric motors.

The existing problems with the water supply system involve both water quantity and water quality. In general, the water supply system provides sufficient water to meet the domestic needs for the residents. During periods of peak demand, however, the current water source and supply system are unable to meet the domestic water requirements. As this occurs, restrictions are placed upon the water users.
Figure 1. General Location Map
A more severe problem facing the Town of Dixon pertains to water quality. As previously mentioned, the current water source is the Little Snake River via diversion through an infiltration gallery. Other than chlorination, the water supply system contains no additional facilities for treatment or filtering. Water quality samples collected by the operator for the Town of Dixon are submitted regularly and consistently meet the current primary drinking water standards imposed by the EPA. Although the water meets the drinking water standards, the EPA classifies the infiltration gallery as an unfiltered surface water source subject to the requirements of the recently promulgated Surface Water Treatment Rule (SWTR). With the enactment of the SWTR, the present water supply source may require treatment to be in compliance. Consequently, it is likely that the Town of Dixon must either provide adequate treatment or face enforcement action from the EPA.

Overview of Level I Investigation

The Level I investigation focused upon an evaluation of the existing water supply system and the development of alternatives to mitigate the existing water quality and quantity problems. An extensive field investigation was conducted to inventory and evaluate the existing system as well as evaluate alternative ground water sources in the vicinity of Dixon. Additional work involved the identification and appraisal of alternative treatment facilities to mitigate the potential water quality restrictions imposed by the EPA. A detailed investigation into the implications of the Surface Water Treatment Rule was completed. Existing and future water demands were also quantified to assist in the evaluation of alternative supply sources. Finally, a recommended alternative was selected and preliminary designs and cost estimates prepared.

Summary of Alternative Analysis

During this Level I study the following alternatives were investigated:

- Partial rehabilitation of the existing infiltration gallery
- Extensive rehabilitation of the existing infiltration gallery
- Partial rehabilitation of the existing infiltration gallery with treatment provided by a slow sand filter system
- Extensive rehabilitation of the existing infiltration gallery with treatment provided by a slow sand filter system
- Implementation of water conservation measures
- Development of a ground water source in the Browns Park Formation
- Development of a ground water source in the alluvium
- Purchase and transmission of treated water from Baggs

The results of the alternative evaluation indicated that additional investigation of ground water as a supply for the Town of Dixon appears warranted. It is recommended that two test wells be drilled, completed, and developed; one in the Browns Park Formation and one alluvial well. The major expense would be associated with the Browns Park well with an estimated completion depth of 500 feet. Once a drilling rig is mobilized, however, the cost of installing an alluvial well with an estimated depth of 27 feet will be comparatively inexpensive. After the wells are completed and developed, an aquifer test of the Browns Park well should be conducted to determine the maximum safe yield and collect water samples for analysis. Should problems with water quality or quantity arise, it is recommended that an aquifer test be conducted on the alluvial well to determine the maximum safe yield and the need for additional alluvial wells.

In addition to the above recommendation concerning the long-term water supply for Dixon, the following is recommended to address the more immediate water quantity issues. Partial rehabilitation of the existing source should be accomplished; these improvements will enhance the capability of the existing system to meet the water demand with minimal cost. Should the existing infiltration gallery be removed from compliance with the SWTR (either through testing or an EPA ruling), it is also recommended that the improvements to the existing source include replacement of the infiltration pipe and wet well facility. Finally, in conjunction with all other recommendations, implementation of water conservation measures (water meters and/or ordinances) are strongly recommended to alleviate the shortage problems experienced during the peak consumption months; these improvements should be seriously considered.
Preliminary Design and Cost Estimates

Based on the alternative recommendations, preliminary design details and cost estimates were generated for the completion of a municipal supply source in both the Browns Park Formation and the alluvium. The cost estimate for the municipal supply in the Browns Park Formation is based on the completion of one well while the municipal supply in the alluvium is based on a well field consisting of two wells.

Construction costs were calculated according to the guidelines established by the WWDC. Preparation of the preliminary cost estimates included construction costs, debt service, and operation, maintenance and replacement costs. WWDC funding for the project improvements is assumed in the form of a 50% grant and 50% loan. The term of the loan is anticipated to be 30 years with an interest rate of 4%. With this information, the annual cost to the Town of Dixon is calculated as indicated in Table 1. Also included in Table 1 is the cost/tap/month based on 72 taps.

<table>
<thead>
<tr>
<th>Item</th>
<th>Two Alluvial Wells</th>
<th>One Browns Park Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Cost</td>
<td>$ 54,960</td>
<td>$ 98,650</td>
</tr>
<tr>
<td>50% Loan</td>
<td>$ 27,480</td>
<td>$ 49,325</td>
</tr>
<tr>
<td>Repayment Factor (30 yrs @ 4%)</td>
<td>0.05783</td>
<td>0.05783</td>
</tr>
<tr>
<td>Annual Payment</td>
<td>$ 1,589</td>
<td>$ 2,852</td>
</tr>
<tr>
<td>Annual O&amp;M Costs</td>
<td>$ 1,200</td>
<td>$ 1,500</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$ 2,789</strong></td>
<td><strong>$ 4,352</strong></td>
</tr>
<tr>
<td>Less Annual O&amp;M Costs for Infiltration Gallery</td>
<td>$ 930</td>
<td>$ 930</td>
</tr>
<tr>
<td><strong>TOTAL ANNUAL COST</strong></td>
<td><strong>$ 1,859</strong></td>
<td><strong>$ 3,422</strong></td>
</tr>
<tr>
<td>Cost/Tap/Month (72 Taps)</td>
<td>$ 2.15</td>
<td>$ 3.96</td>
</tr>
</tbody>
</table>
Conclusions and Recommendations

The conclusions and recommendations generated during this Level I study are provided on the basis of priority within each category given below.

Conclusions and Recommendations for the Level II Investigation

- Drill, complete, develop and test two wells for potential as a municipal supply during a Level II study; one well should be drilled in the Browns Park Formation and one well drilled in the alluvium.

- Assuming that the Level II drilling program provides a suitable ground water source, proceeding immediately to Level III is not recommended. Given the present uncertainty associated with the SWTR, establishment of a water quality sampling program for the current supply source is warranted. Should the EPA rule that treatment is ultimately required regardless of the results obtained from the sampling, the ground water source could then proceed to Level III design and construction.

- A water sampling program should be established immediately to provide a data base for removing the infiltration gallery from the requirements of the SWTR. Quarterly particulate sampling of the water obtained through the infiltration gallery (prior to chlorination) should be conducted. Sampling should include two spring runoff samples and one sample collected following an extended period of little or no rainfall. Simultaneous to the daily turbidity testing presently conducted by the Town of Dixon, turbidity and temperature measurements of the streamflow (raw water) should also be collected and documented.

- The WWDC should initiate formal meetings with the EPA to discuss the direction and implications of the SWTR with respect to the small municipal water supply systems. This is especially important with respect to municipal sources such as springs and infiltration galleries that presently meet the EPA primary drinking water standards. Following these meetings, a policy should be formulated that will provide guidelines for small communities likely to be impacted by the SWTR.

- Full rehabilitation of the existing source is recommended if water sampling results or an EPA ruling indicate compliance with the SWTR. The full rehabilitation is estimated to cost $40,000 and will significantly improve water quantity and remove the quality problem associated with pipe deterioration.
Conclusions and Recommendations to Immediately Improve the Existing System

• Improving the diversion structure on the Little Snake River and raising the structure downstream of the infiltration gallery will improve the water supply capability of the existing collection pipe. These improvements should be considered and implemented.

• The Town of Dixon should install a master meter on the discharge line of the booster pumps to accurately document the consumptive use for the community.

• Installation of water meters and implementation of ordinances should be considered to encourage water conservation.

• The fire protection associated with the present system is estimated to be 346 gpm for 2 hours. This level of protection is apparently adequate for the Town of Dixon and implies that the residents incur increased hazard insurance premiums to compensate for any reduction in the optimum fire protection (1000 gpm for 2 hours). As water demand increases with an increase in population, the fire protection provided by the present system will reduce without an increase in storage; consequently, additional storage should be considered should the community experience a population growth. An additional storage capacity of 50,000 gallons would provide both a buffer for increased fire protection and increased equalization storage needed to offset peak summer demands.