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LEVEL I STUDY
FOR
TOWN OF KIRBY
WATER SUPPLY PROJECT
FINAL REPORT

PREPARED FOR:

WYOMING WATER DEVELOPMENT COMMISSION
# TOWN OF KIRBY - LEVEL I STUDY
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CHAPTER 1
INTRODUCTION

A. SCOPE OF STUDY

Engineering Associates has been retained by the Wyoming Water Development Commission to conduct the Level I Study to evaluate possible improvements to the water system serving the Town of Kirby. Specific items to be completed under this study are to improve system operations, to identify long term improvements needed to the water system, and to improve record keeping practices by performing the following:

- Survey the location of each water line, service connection, curb box, sewer line, gas line, telephone line, and any other utility identified that may impact the cost of construction or repair of water system components, water tanks, vaults, valves, raw water wells, and municipal buildings.
- Perform a leak detection survey if determined appropriate based upon water delivery to the system versus actual amounts billed to customers.
- Utilize the Record of Survey map dated June 1982 and other information on easements, annexations, and other survey related data provided by Rick Hudson, PLS to prepare an AutoCAD map of the Town.
- Incorporate survey data relating water system components into an AutoCAD drawing.
- Generate demands for water use and prepare a water system model in Watercad to evaluate fire flow and system flows. Verify pipe sizes with Ernie Slagle, the Town’s Water System Operator.
- Further evaluate operation and maintenance needs and implement appropriate changes.
- Assimilate AutoCAD surveying and mapping, water model, operational parameters, historical data, photographs, aerial photos, raw water well data, zoning data, land use data, easement data, and water rights data into an ArcView GIS file to provide a single source inventory of infrastructure for record keeping, planning, and analysis for the Town of Kirby.
- Work with Town personnel to identify priorities for system modifications, replacement and construction of transmission and distribution piping, and funding options.

B. BACKGROUND INFORMATION

The Town of Kirby is located in Hot Springs County within the Big Horn Basin approximately 12 miles north of Thermopolis. Kirby was originally surveyed and platted in June of 1915 and incorporated in August of 1915. The Town currently has 14 blocks plus a few small additions within the corporate limits.

Kirby has approximately sixty residents with many of those individuals working in either Thermopolis or Worland. Historically, the Town has had a population as high as 174
people which likely correlated to a time when the Gebo Mine was in operation. In 2001, the per capita income in Hot Springs County was just over $25,000. It is likely that many in Kirby have lower incomes than the Hot Springs County average based on discussions with local residents. Identifying viable funding and the ability of Town residents to pay for any system modifications or improvements is an important component of this project.

Water for the water system is supplied by the Town of Thermopolis via the Lucerne Water and Sewer District pipeline. Water is sold to Lucerne by Thermopolis. Kirby purchases their water from Lucerne at a rate of $3.61 per 1000 gallons. Residents of Kirby generally only use water from the potable water system for domestic needs. The Town has a series of groundwater wells located around Town that are used for irrigation purposes. The use of these wells significantly reduces potable water usage for irrigation in the Town.

In 2000, the Town completed various upgrades to their water system. Modifications included construction of a new 53,000-gallon bolted steel water storage tank, a supply line to and from the tank, and a liquid chlorine disinfection system. As modifications to the water system were completed, it became apparent to the operator and others in the Town that the system was probably not going to operate in a manner that was acceptable to the public or that met public health requirements. Specifically, no disinfection residual was found in the return line from the tank to the distribution system and there were taste issues associated with the water.

As a result, Engineering Associates (EA) was retained to review the design and construction of the system. EA recommended several other improvements to the system and EA was appointed as the Town Engineer in 2001. These changes resulted in the Town meeting EPA regulations, but left some of the water quality issues unresolved because of the cost of hit and miss changes to the water system.

There is little data available on the Town of Kirby water system. Several water system maps and data collected during site surveys were combined to create an electronic Town map. This project was completed to address operational issues discussed previously, provide mapping and modeling of the water system, and identify other modifications and/or operational changes needed by the system.

C. ABBREVIATIONS, DEFINITIONS, AND TERMINOLOGY

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Acre</td>
</tr>
<tr>
<td>ADD</td>
<td>Average Daily Demand</td>
</tr>
<tr>
<td>DEQ</td>
<td>Department of Environmental Quality</td>
</tr>
<tr>
<td>EA</td>
<td>Engineering Associates</td>
</tr>
<tr>
<td>ENR CCI</td>
<td>Engineering News Record Construction Cost Index</td>
</tr>
<tr>
<td>FPS</td>
<td>Feet per second</td>
</tr>
<tr>
<td>GPCD</td>
<td>Gallons per capita per day</td>
</tr>
<tr>
<td>GPD</td>
<td>Gallons per day</td>
</tr>
<tr>
<td>GPM</td>
<td>Gallons per minute</td>
</tr>
</tbody>
</table>
D. PROJECT NOTEBOOK

All data required to recreate the information shown in this report is included in the Project Notebook. This information includes backup data for basic modeling, pipeline parameters (diameter, length), demands, printouts of data for various alternatives, population information, zoning and land use information, and other backup data used to determine alternatives and recommendations. Billing and usage data provided by the Town is included in the Project Notebook, as well.
CHAPTER TWO
SERVICE AREA IDENTIFICATION

A. STUDY AREA

The study area includes developed areas within the incorporated Town of Kirby. Projected demands are discussed in Chapter 3. There are no anticipated developments in the Town of Kirby at this time. The study area is the Town of Kirby and adjacent properties east of U.S. Highway 20.

B. EXISTING ZONING

The Record of Survey prepared by R.L. Hudson dated October 25th, 1982 was used to determine the current total acreage within the Town limits. A copy of this Record of Survey map is included in the Project Notebook. A copy of the corporate boundary map created based upon the record of survey is included as Sheet 1 of 4 in Appendix A. The entire Town of Kirby has been designated as a Managed Growth (MG) Zoning District. Basic descriptions of the land use and occupancies within the MG district are described below.

Town of Kirby Land Use and Occupancy Categories

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MG-R</td>
<td>Managed Growth – Residential</td>
</tr>
<tr>
<td>MG-RM</td>
<td>Managed Growth – Residential Mobile</td>
</tr>
<tr>
<td>MG-C</td>
<td>Managed Growth - Commercial</td>
</tr>
</tbody>
</table>

The limits of these areas are described in the current master plan for the Town of Kirby, dated March 8th, 1999. Figure 2.1 shows the zoning areas graphically.

C. CURRENT LAND USE

About thirty-nine percent of the land within Kirby is essentially developed or undevelopable. Un-developable land includes streets and the railroad. The total area within the Town is approximately fifty-three acres. Approximately thirty-three acres within the Town remain undeveloped. Of these thirty-three acres, thirteen are located on the west side of the railroad tracks and twenty are located on the east side of the railroad tracks. This remaining undeveloped area is owned by the Town. If growth occurs, it is assumed that it will occur on these thirty-three acres. For our current study, this area has been assumed to grow at a rate of 0.68% per year, as discussed in the following section. Land uses in rural areas such as Kirby are generally agricultural and residential. No attempt has been made to categorize these separately since no changes are anticipated through the 2036 design year.
D. FUTURE LAND USE

Land use projections for the year 2036 were calculated using the following information:

- The development of land in and around the Town will occur in proportion to the projected population growth (0.68% per year).
- The majority of growth within Kirby will occur on lands owned within the Town. Growth will be distributed in proportion to current land use patterns within the Town.

Information on the existing and projected developed areas of the Town is summarized in the following table.

**TABLE 2.1**
ACREAGE DATA BY LAND USE AREA

<table>
<thead>
<tr>
<th>Land Use</th>
<th>2005 - Total Developed Acres</th>
<th>2036 - Additional Developed Acres</th>
<th>2036 - Total Developed Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>8.64</td>
<td>12.84</td>
<td>21.48</td>
</tr>
<tr>
<td>Residential - Mobile</td>
<td>3.81</td>
<td>5.66</td>
<td>9.47</td>
</tr>
<tr>
<td>Commercial</td>
<td>1.04</td>
<td>0.84</td>
<td>1.88</td>
</tr>
<tr>
<td>Totals</td>
<td>13.49</td>
<td>19.34</td>
<td>32.83</td>
</tr>
</tbody>
</table>

E. RECOMMENDED LAND USE AND ZONING CHANGES

During the initial scoping meeting for this project there was significant discussion about the need to insure that zoning regulations adequately protect the Town against potential indiscriminate placement of mobile homes and unregulated mixing of home businesses with residential dwellings. We reviewed the current master plan for the Town of Kirby with relation to these issues and in a general manner. Based upon our review, we recommend the following major changes be made:

- Modifying requirements relating to mobile homes to assure a reasonable trailer density (providing space between trailers)
- Defining the various land use classifications within the Town
- Adding a Multiple Use Residential (MUR) land use classification

The suggested changes to the zoning regulations and land use classifications are included in Appendix B. The Town would use the MUR zone as a transition area between the Business and Residential Zones and to establish areas suitable for home occupation businesses. Suggested rezoned areas are included as Figure 2.2.
F. CORPORATE LIMITS COMPARISON

All lands within the existing corporate limits were considered when generating demands for modeling the water system. In addition, the potential for growth and possible annexations or adjacent developed lands were considered to ensure the proposed system is capable of expanding to fit future needs. The proposed future limit of the Town’s service area is included as sheet 1 of 1 in Appendix B.
CHAPTER THREE
WATER DEMANDS

A. HISTORICAL DATA

Historic water usage data for treated water in the Town of Kirby for the last two years has been used to generate average daily demands and maximum daily demands. The projected average rate based on the metering records available is 97 gpd per capita, and the maximum daily demand is 243 gpd per capita. The metering records do not necessarily indicate usage on a daily basis since they are monthly records. There may have been periods where watering did not occur or the meters were not read.

B. PROJECTED DEMANDS

In order to evaluate future demands for the Town of Kirby water system, it was necessary to project population. Several sources of data were analyzed, including the United States Census Bureau and the Wyoming Department of Administration and Information. The following population estimates were calculated using a growth factor of 0.68% per year for the Town:

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual or Projected Town Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>75</td>
</tr>
<tr>
<td>1980</td>
<td>129</td>
</tr>
<tr>
<td>1990</td>
<td>59</td>
</tr>
<tr>
<td>2000</td>
<td>57</td>
</tr>
<tr>
<td>2001</td>
<td>56</td>
</tr>
<tr>
<td>2002</td>
<td>55</td>
</tr>
<tr>
<td>2003</td>
<td>54</td>
</tr>
<tr>
<td>2005</td>
<td>59</td>
</tr>
<tr>
<td>2010</td>
<td>61</td>
</tr>
<tr>
<td>2015</td>
<td>63</td>
</tr>
<tr>
<td>2025</td>
<td>68</td>
</tr>
<tr>
<td>2036</td>
<td>73</td>
</tr>
</tbody>
</table>

The population of Kirby has varied between 129 and 54 during the last 30 years. It is unlikely that the projected population will result in any significant increase in land area or water usage. The maximum daily water demand in the year 2036 per capita per user is projected to be approximately 612 gpd.
Recently, properties west of Town were connected to the Town water system. These properties have used an average of 5,000 gpd for the last three months. The following Table projects domestic water usage for the Town of Kirby over the next 30 years based on historical demands excluding the additional usage over the last three months.

**TABLE 3.2**

<table>
<thead>
<tr>
<th>Description</th>
<th>2005 ADD (GPM)</th>
<th>2005 PEAK (GPM)</th>
<th>2036 ADD (GPM)</th>
<th>2036 PEAK (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Projected Water Demand</td>
<td>3</td>
<td>8</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

Population Projections for 2036 suggest that the population will be 73 people. However, Kirby could see a population increase to 129 people by year 2036. This would change ADD in 2036 to 6 gpm and maximum demand to 15 gpm. Assuming a population of 73 people or 129 people will not dramatically impact the water system since it is designed to provide fire flows in excess of 1,000 gpm.

**C. WATER DEMAND VARIATIONS**

An average daily demand of 0.004 MGD (3 GPM) was calculated for the entire Town using the total monthly water consumption records for the past 31 months (this does not include the new users west of Town). Since the Town of Kirby does not have records for peak hour or peak day demands, peaking factors were estimated from available
demand information and factors found in engineering literature. The actual calculations and assumptions are included in the Project Notebook. The design peaking factors selected are as follows:

TABLE 3.3
PEAKING FACTORS

<table>
<thead>
<tr>
<th>Maximum Day Demand</th>
<th>Average Day Demand</th>
<th>2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Hour Demand</td>
<td>Average Day Demand</td>
<td>4</td>
</tr>
<tr>
<td>Peak Hour Demand</td>
<td>Maximum Day Demand</td>
<td>1.6</td>
</tr>
</tbody>
</table>

The following community water use data for small Big Horn Basin communities was transcribed from the State of Wyoming 2000 Water System Survey Report.

TABLE 3.4
DEMAND AND PEAKING FACTOR COMPARISON

<table>
<thead>
<tr>
<th>Community</th>
<th>Population</th>
<th>ADD (GPCD)</th>
<th>MDD (GPCD)</th>
<th>MDD Peaking Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burlington</td>
<td>209</td>
<td>200</td>
<td>370</td>
<td>1.85</td>
</tr>
<tr>
<td>Byron</td>
<td>600</td>
<td>100</td>
<td>316</td>
<td>3.16</td>
</tr>
<tr>
<td>Cowley</td>
<td>500</td>
<td>100</td>
<td>190</td>
<td>1.9</td>
</tr>
<tr>
<td>Deaver</td>
<td>260</td>
<td>145</td>
<td>409</td>
<td>2.82</td>
</tr>
<tr>
<td>Frannie</td>
<td>173</td>
<td>75</td>
<td>144</td>
<td>1.92</td>
</tr>
<tr>
<td>Average</td>
<td>348</td>
<td>124</td>
<td>286</td>
<td>2.33</td>
</tr>
</tbody>
</table>

A comparison of Kirby’s MDD peaking factor with those of communities in the preceding table indicates that the peaking factor for the maximum day demand for Kirby is a little higher than average.

D. FIRE FLOW REQUIREMENTS

In order to provide adequate fire protection, the recommended fire flow must be delivered to the area in need while concurrently supplying the maximum daily demand to the remainder of the system. Fire flows are limited by DEQ requirements which state that 20 psi residual pressure be maintained in the distribution system when fire flows are drawn from the system. Two or more hydrants may be needed to obtain the
necessary flow in some areas of the Town and for some types of development. Minimum fire flows were established based on consideration of the type and distribution of construction within the Town (Type V-B with an area under 3,600 square feet).

**TABLE 3.5**
**REQUIRED FIRE FLOWS BY LAND USE CATEGORY**

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Fire Flow (GPM)</th>
<th>Duration (Hours)</th>
<th>Minimum No. of Hydrants</th>
<th>Hydrant Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1,000</td>
<td>2</td>
<td>1</td>
<td>500'</td>
</tr>
<tr>
<td>Commercial</td>
<td>1,500</td>
<td>2</td>
<td>1</td>
<td>500'</td>
</tr>
</tbody>
</table>

The table shown above uses the Town’s existing Managed Growth zone districts. If the Town changes their land use classifications to include Multiple Use Residential (MUR), it will fall under the residential land use for fire flow requirements. Additional discussion and data on fire flows are included in Chapter 5 of this report.
CHAPTER FOUR
EXISTING WATER SYSTEM INFORMATION

A. EXISTING SYSTEM DESCRIPTION

Figure 4.1 shows the current configuration of the water treatment and storage system. The Town of Thermopolis supplies water to Kirby through a 6” transmission line operated by Lucerne Water District. Water then enters Kirby and passes through a manhole containing a strainer and a chlorine injection port. The water then flows to a second manhole containing a 2” SeaMetrics MR-200 pulse flow meter. The water then flows from the meter location in the second manhole through a 2” HDPE supply line to an altitude valve placed before a tee located in a third manhole near the 53,000 gallon steel tank.

From this manhole, the water can flow into the tank or toward the Town via an 8” PVC transmission line. This 8” PVC line runs back to the second manhole where another chlorine injection port is located. Chlorine is injected at this location by a manually operating pump. The water then continues on to a fourth manhole containing a continuously monitoring analyzer/controller system which is inoperable. From this location, the water flows into the Town’s distribution system.

The Hays Flow Meter in the first manhole is intended to control the amount of chlorine injected upstream of the metering location in the aforementioned manhole. However, due to poor operation of the pulse function and difficulties with the chlorine injection meter, the pump was replaced with a manually operating chlorine injection pump that continuously injects chlorine into the system.

Figure 5.1, on Page 33, shows the existing water system components that are included in the GIS map prepared for the Town.
The continuously monitoring analyzer/controller system is an ALLDOS Conex system intended to control the amount of chlorine injected by an ALLDOS Primus M205 injection pump located upstream of the metering location in the second manhole. If the
unit were operational, the amount of chlorine injected would be based on the residual chlorine detected by the ALLDOS Conex analyzer/controller system in the fourth manhole.

B. WATER SYSTEM EQUIPMENT AND FIXTURES

The Town currently has about 10,300 total feet of buried water transmission line with the majority being PVC, and the remainder being DIP. The Town also has 12 fire hydrants, 5 manholes, and 26 valves.

1. Piping

Polyvinyl Chloride (PVC) has an impressive record of long-term durability. This pipe is invulnerable to underground external corrosion as well as internal pipe corrosion. It is able to bend or flex without breaking, making them better suited to handle ground movements. PVC pipe delivers water as clean and pure as it receives and it imparts no taste or odor to the water it transports. PVC piping in the Town is the newest piping and was installed in the early 1980’s.

Ductile Iron Pipe (DIP) is long lasting, and typically will have a life of 100+ years. This type of pipe has been recognized as the industry standard for modern water and wastewater systems. DIP’s high degree of dependability is primarily due to its high strength, durability, and resistance to corrosion. It is designed to resist damage during shipping and handling, water hammer, frozen ground, deep trenches, areas of high water table, and heavy traffic. DIP was originally installed in the Town, but most of it was removed when the new PVC was installed. Any lengths of DIP remaining in the Town are remnants of the original installation. There are also segments of steel and asbestos cement pipe of unknown condition. Most pipe constructed of these materials are over 30 years old.

2. Fire Hydrants

Twelve fire hydrants are currently installed in the Town. These hydrants were installed in the early to middle 1970’s while the Town’s water supply was sourced from ground water wells. Six hydrants installed in the Town were manufactured by Mueller, four by America Darling, and two by Kennedy. New hydrants should be Mueller Super Centurion 250 fire hydrants with seven foot burial depth.

3. Manholes

Four manholes in Town are near the Town Shop and contain a flow-metering device, a strainer and chlorine injector, a connection to an existing drain field, and a pressure reducing valve, respectively. Another manhole near the water storage tank contains an altitude valve that regulates the water level in the tank.
4. Altitude Valve

The Altitude Valve provides automatic filling of the elevated tank. When the altitude control senses a drop in the water level below the predetermined set point, the valve opens to fill the tank. When the level again reaches the set point, the valve will close. Discharge of the tank is by a separate line.

5. Raw Water Wells

The Town has several raw water wells that are used by property owners for irrigating their lawns. Well locations are shown on the water system map included as Figure 5.1. These wells act as a supplemental supply that helps to minimize treated water usage. The annual fee for raw water will be increased to $180 per year, billed at $15 per month, in 2006.

Yearly startup procedures consist mainly of inspection and any necessary repair of the spigots to ensure correct operation for users. Fall shutdown procedures consist of draining all lines and opening a drain on the well casings to lower the water level several feet in the wells.

C. SUPPLEMENTAL DATA ON EXISTING SYSTEM EQUIPMENT

1. Chlorination System Equipment

Water supplied to the Town of Kirby is chlorinated at two locations in the distribution system. The first chlorination pump is located in the southern-most manhole and injects chlorine as water passes through it. This pump was originally controlled by a flow meter. The original pump has been replaced with one in manual operation. The new pump injects a small amount of chlorine into the system continuously.

A second chlorine injection pump is located in a manhole immediately downstream of the storage tank. This pump was originally operated by an ALLDOS Conex 350 Chlorine analyzer/controller, located in the Town Shop. This controller was designed to monitor chlorine residual, water temperature, and pH level information received from sensors in the manhole across the street.

Based on the chlorine residual, the controller was supposed to signal the pump located downstream of the storage tank to inject additional chlorine into the system as needed. The signal between the controller and the pump was a 4-20 milliamp signal.

Efforts were made to calibrate the monitoring system. However, the equipment operated intermittently and then stopped sending a signal. It appears that the control wire or monitoring equipment is corroded. The second chlorine injection pump has since been replaced with one that is in manual mode and injects chlorine continuously into the system.
2. Flow Meters

The Kirby Water System has two master flow meters that monitor flow into the system. One is located at the connection to Lucerne and is an older meter. Lucerne has suggested that the Town consider replacing that meter in the near future. Our comparison of flows recorded by the meter versus usage by customers does not indicate the need for replacement at this time.

The second meter is a SeaMetrics MR-200 2” diameter bronze pulse flow meter with a reed switch on the HDPE line to the storage tank. This meter is designed for 150 psi maximum pressure, 105°F maximum temperature, and has an accuracy of 1.5%. The range of acceptable flow rates for this meter is from 1 gpm to 130 gpm. Pulse readings from this meter have been determined to be intermittent and unreliable for pacing chlorine pumps.

MR Meter Sensors respond to a magnet which is turning on the face of the meter under the lens. The sensors give one output "pulse" (on/off) each time a magnet pole passes. The magnets have one, two or four poles. The white dots on the magnet indicate the number of poles. The sensors are designed for electronic control loads. They should not be used to switch power loads such as motors or lights, and they should not be connected to 110 VAC. The flow meter inlet strainer needs to be cleaned at least yearly.

3. Tank

The Town of Kirby uses an AO Smith Aquastore tank, which has a capacity of 53,000 gallons. The tank is steel with bonded fiberglass surfaces on both the interior and exterior of the tank, and has a diameter of 14 feet and a height of approximately 46 feet. This tank was constructed in 2000. The tank is fed with water from the Town of Thermopolis via Lucerne.

D. EXISTING SYSTEM EVALUATION

Industrial Systems performed an independent evaluation of equipment used in the Kirby water system. They specialize in supplying and setting up control and process equipment for water and wastewater systems. Their electronics technician found the following during the site visit:

- The flow meter for pacing Chlorine Pump Number One is not providing a usable signal but is recording flows.
- Chlorine Injection Pump Number One has been replaced with a new manually operating pump that does not take an outside signal. It is pumping continuously regardless of demand.
• The chlorine monitoring system probes are out-of-date and the monitoring system needs calibrated. The signal from the monitor to the controller is operating intermittently. There is likely a problem with the control cable or connections in one of the units. This could be due to corrosion as a result of methane gas and condensation in the manhole.

• Chlorine Injection Pump Number Two has been replaced with a new manually operating pump that does not take an outside signal. It is pumping continuously regardless of demand.

E. WATER QUALITY ISSUES

The Kirby Water System has several water quality issues that have been identified by Town citizens and other issues that were identified through testing within the system. Issues identified include taste and odors, chlorine concentration, Total Trihalomethanes, and system pressure.

1. Probable Causes of Water Quality Issues

There have been ongoing problems with water quality in the Kirby Water System. A review of system operations and supply offers some insights into why these issues exist. Following are likely causes for these issues:

• Design and Operation of Lucerne Water and Sewer District
• Installation of the New Storage Tank in Kirby
• Design of the New Tank
• Chlorination Equipment Operating Mode

2. Design and Operation of Lucerne Water and Sewer District

The average retention time (the amount of time water spends in water pipes and tanks) in the water system has a significant affect on water quality. Following is a discussion on estimated water retention time impacting the Kirby system. Figure 4.2 shows this information graphically.

The Lucerne Transmission Line is approximately 13 miles long and contains approximately 100,000 gallons of water. Average daily usage is approximately 28,000 gallons per day with average usage as low as 20,000 gallons per day in the winter. Due to the distribution of the population served by the Lucerne Water District, average retention time in the first 8.5 miles to Sunnyside Lane is approximately 2.5 to 3 days. Average retention time in the 1.8 miles of pipe between Sunnyside Lane and Black Mountain Road is approximately 1 day. Retention time between Black Mountain Road and the Lucerne Tank is another 2.5 days on an average day. The average retention time in the Lucerne Transmission line between Thermopolis and the Lucerne Tank is approximately 6 days.
Retention time in the Kirby Pipeline from the Lucerne Tank to Kirby is approximately 3 days. Thus, the total retention time in transmission lines between Thermopolis and the beginning of the Kirby System is approximately 9 days. Water systems typically need to utilize water within 5 to 10 days in systems utilizing free chlorine to insure adequate chlorine residuals are maintained. The potential exists within the distribution system that chlorine residuals could be maintained with a good flushing program.

Figure 4.2
Kirby and Lucerne Chlorine Retention Time
The Lucerne Tank has a storage capacity of 200,000 gallons. If the system were designed to fully utilize the tank, it would take about 7 days to change water in the tank. American Water Works Association (AWWA) recommends that water in storage tanks should be exchanged every 3 to 4 days to maintain chlorine residuals and good water quality. Unfortunately, the Lucerne System is not designed to fully utilize water from the storage tank. The Lucerne Tank is designed to float on the Thermopolis Water System and under normal operations very little water is used out of the tank. Depending upon usage patterns, water in the Lucerne Tank may only be turned over every 15 to 30 days. It is probable from chlorine testing that stagnant, un-chlorinated water may remain in the Lucerne Tank for many months at a time. Installation of a control valve at the connection to the Thermopolis System, based on water elevations in the Lucerne Tank, would help eliminate this problem.

Unsubstantiated reports indicate that Lucerne may not flush lines in their system or drain the storage tank on a regular basis as recommended by AWWA. That, coupled with the long retention time in the system, suggests that the water being delivered to Kirby may not be of the highest quality.

3. Installation of the New Tank in Kirby

Water entering the Kirby System is already of marginal quality. Installation of the 53,000 gallon water storage tank has exacerbated the water quality problem. The tank has a retention time of approximately 10 days during low usage periods. The average retention time for water in the distribution system in some areas of Kirby with dead end lines may be an additional 5 days. A total of 15 days of detention time is estimated for some portions of the Kirby water system before the water is used.

Based on pressure recorder data from the Town, it appears that only the top seven feet of the storage tank is being utilized due to low pressures in the distribution system when the water level in the tank drops below that level. As discussed previously, the tank was originally designed to have separate feed and discharge lines. Unfortunately, this design was changed during construction and there is only one line feeding into the tank from the bottom that facilitates minimal mixing. These factors result in further degradation of water quality in Kirby.

The new tank was installed without separate inlet and outlet pipes. Instead, the inlet pipe was teed into the outlet pipe. This installation resulted in some significant issues with controlling water quality in the system. Specifically, there was a new flow meter controlled chlorine injection pump installed to inject chlorine into the inlet line to the pump. With this layout, there is the potential for water that has lost its chlorine residual to be drawn from the tank into the distribution system. Resolving issues with this installation is difficult due to the need to tear down the tank to install separate inlet and outlet pipes or fabricating a special fitting to facilitate water flowing into the pipe to enter near the top of the tank and water drawn from the pipe to be drawn from the bottom of the tank.
4. Chlorination Equipment Operating Mode

Due to the inoperability of control equipment installed on the system (the pulse meter and continuously monitoring chlorine analyzer), the chlorine injector pumps were set to operate in “manual” mode where they inject the same amount of chlorine regardless of water demand. As the chlorine injector pumps needed repaired and/or replaced, they were replaced with manually operating pumps that cannot take an outside control signal.

The result of this mode of operation is that there will either be periods when inadequate levels of chlorine are injected into the system or there are excessive levels of chlorine injected into the system. In the case of the Kirby system, there were no instances where inadequate levels of chlorine were detected. However, there were times when levels of over 0.8 mg/l were detected and there were reports of times when the water smelled of chlorine which would correlate to chlorine levels in excess of 1 mg/l.

Water tests were taken to isolate disinfection byproducts of Total Trihalomethanes (TTHM) and Haloacetic Acids (HAA5) that were potentially present considering current system operation. Water testing results summarized in Table 4.1 indicate that TTHM formation is a problem in the Kirby system that needs to be addressed. TTHM’s are likely forming as a result of the high chlorine concentration coupled with other operating methods utilized with this system. In general, disinfection byproducts form when chemical disinfectants combine with organic or inorganic material found in water.

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Trihalomethane Concentration Mg/l</th>
<th>TTHM EPA Maximum Contaminant Level Limit Mg/l</th>
<th>Total Regulated Haloacetic Acids Mg/l</th>
<th>HAA5 EPA Maximum Contaminant Level Limit Mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>109 East Main</td>
<td>0.072</td>
<td>0.080</td>
<td>0.013</td>
<td>0.060</td>
</tr>
<tr>
<td>Main &amp; Nelson</td>
<td>0.093</td>
<td>0.080</td>
<td>0.024</td>
<td>0.060</td>
</tr>
<tr>
<td>Town Shop</td>
<td>0.067</td>
<td>0.080</td>
<td>0.064</td>
<td>0.060</td>
</tr>
<tr>
<td>Average</td>
<td>0.0773</td>
<td>0.080</td>
<td>0.0145</td>
<td>0.060</td>
</tr>
</tbody>
</table>

The EPA has set the maximum contaminant level (MCL) at 0.080 mg/l and 0.060 mg/l for TTHM and HAA5 due to health effects when people are exposed to levels above the MCL. Exposures to levels of TTHM over the MCL for many years may cause people to experience problems with their liver, kidney, or central nervous system. Excessive exposure to HAA5 increases the risk of cancer in some people.
F. POTENTIAL SOURCE OF SUPPLY – BIG HORN REGIONAL SYSTEM

The Big Horn Regional Joint Powers Board (BHRJPB) was formed in 2001 with representatives from Thermopolis, Worland, Greybull, Basin, Lucerne Water and Sewer District, Washakie Rural Improvement and Service District, and the South Big Horn Joint Powers Board. This Board has been involved with numerous studies by a variety of engineers analyzing various sources of supply as well as other water storage, treatment, and transmission improvements throughout the Big Horn Basin. Currently, the “Northern Supply Pipeline” is under design which will provide primary, supplemental, and emergency water supply from the Worland Wells to Greybull, South Big Horn Joint Powers Board, Basin, Worland, and Washakie Rural Improvement and Service District. Expansion to Burlington and Otto is also being considered.

In conjunction with design efforts for Washakie Rural, Engineering Associates has designed the Phase 4 Washakie Rural System so that 100 gpm in static conditions is available that could be used for supply to Kirby and Lucerne in the Winchester area near the Washakie/Hot Springs County line. The design of a pipeline to connect the Washakie Rural pipes to Kirby/Lucerne is not within our scope of that project.

Various information regarding the Big Horn Regional System was developed in the Hot Springs Rural – Worland Pipeline Regional Water Supply Project – Level II Study by BRS, Inc., Forsgren Associates, Inc., and Lidstone and Associates, Inc., dated November 2004. One option investigated was to replace the Thermopolis Water Treatment Plant. An estimated cost to construct a 5 million gallon per day plant was $8 million. Estimated costs per EDU (or tap) for this option is $9.28/EDU/month.

There were also two test wells drilled during the preparation of the BRS study. Below is a general summary of those findings:

Wildhorse Butte Well – 13 miles southeast of Thermopolis
- Madison Aquifer – 900 feet deep
- Yield 65 gpm
- Total dissolved solids – 441 mg/l
- Well rendered unsuitable due to depth and inadequate yield

Buffalo Creek Well - 6.5 miles southeast of Thermopolis
- Madison Aquifer – 200 feet deep
- Yield in excess of 750 gpm
- Total dissolved solids – 449 mg/l
- Hardness - 346

The high level of total dissolved solids and hardness make use of the Buffalo Creek well water without some form of softening somewhat questionable since most residents are accustomed to water from the Thermopolis Treatment Plant that has a hardness of 100 to 120. Many residents and businesses will likely install domestic water softeners to minimize the drying affect on their skin and impact on dishwashers and laundry facilities.
Other information contained in this report outlines two possible sources for Kirby off of the Big Horn Regional System. Water could be provided from the end of the Washakie Rural System with a new pipeline from the Winchester end to Kirby. The BRS study proposed an 8" diameter line and pump station between the Lucerne Tank and the Winchester end. This option is proposed only as a supplemental or emergency supply. Several other options propose to continue feeding on a daily basis from Thermopolis and Lucerne. These options vary based on location of the final well source and other piping scenarios. Depending upon the sources of water and other parameters, costs for the improvements range from $0.37 to $44.09 per EDU per month.

Currently, Weston Engineering is preparing another Level II Study of the Southern Big Horn Regional System. Their project work includes testing and redevelopment of the Buffalo Creek Well, as well as siting and possibly drilling several other test wells. They will also be providing data and updating costs for a possible pipeline to connect Kirby/Lucerne with the Washakie Rural System and/or any other piping improvements that might be related to a new water source for Thermopolis and its surrounding communities. This project is in the early stages, and information should be available sometime late next year. When this report is available, the Town should review it to determine the impacts various water source options will have on future costs to consumers.
CHAPTER FIVE
TREATED WATER SUPPLY MODELING AND MAPPING

A. DESIGN CRITERIA

In order to properly analyze the existing water system, establish current capacities, and evaluate future capacities and uses, design criteria needed to be established. The following design criteria are deemed appropriate for the United States according to engineering literature. These requirements were used in developing the base model for the existing system within the WaterCAD program.

Projected Water Requirements for the Year 2036

- Average Daily Demand: 0.006 MGD (4 GPM)
- Maximum Daily Demand: 0.014 MGD (10 GPM)
- Peak Hour Demand: 0.023 MGD (16 GPM)

Source of Supply Volumes
Capacity equal to or greater than maximum day demand and redundancy as required by DEQ.

Storage Capacity
Total of equalizing, fire, emergency, and bottom storage requirements.

Pressure Regulator Stations
Capacity necessary to meet peak hour demand, or maximum day plus fire flow demands through the station.

Distribution Mains
Sized to carry the peak hour demand at 5 fps, or maximum day plus fire flow at a maximum velocity of 10 fps and with a maximum head loss of 20 ft. per 1,000 ft.

Transmission Mains
Capacity necessary to transfer maximum day demand from sources of supply to storage.

Current System Pressures (within the Town of Kirby)
- Maximum: 92 psi
- Minimum-Without Fire Flow: 51 psi
- Minimum-With Fire Flow: 20 psi

The numbering of pipes and junctions was performed according to location. Table 5.1 shows the location, and numbering system used in the model.
### TABLE 5.1
PIPE AND JUNCTION NUMBERING

<table>
<thead>
<tr>
<th>Location</th>
<th>Pipe Numbers</th>
<th>Node Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission line from Thermopolis to Lucerne</td>
<td>1 - 50</td>
<td>1 – 99</td>
</tr>
<tr>
<td>Transmission line from Lucerne to Kirby</td>
<td>51 - 61</td>
<td>100 – 111</td>
</tr>
<tr>
<td>Stark Subdivision/ Sunnyside Lane</td>
<td>1000 - 1009</td>
<td>1000 – 1019</td>
</tr>
<tr>
<td>Town of Kirby Existing Piping</td>
<td>3000 - 3091</td>
<td>3000 – 3089</td>
</tr>
<tr>
<td>Town of Kirby New Piping</td>
<td>4000 - 4023</td>
<td>4000 – 4021</td>
</tr>
</tbody>
</table>

Demands within the Town were distributed according to the zoning of the area surrounding each junction with an adjustment for high water usage of known origin. Information on the existing water system is included in Appendix A as Sheet 2 of 4 and Sheet 3 of 4.

**B. HYDRAULIC MODEL - WATERCAD**

The base model for this study was developed from records provided by the Town and information provided from Ernest Slagle, Water System Operator. Various data is required in order to properly iterate the model. This data includes pipe diameter, length, elevation, roughness coefficient, and demands, along with storage tank elevations. Roughness coefficients were based on the Hazen-Williams "C" Value which is assigned according to a pipe’s material and estimated age. Piping in the Town of Kirby’s distribution system is mostly PVC, but there is also some Asbestos Concrete (ACP), HDPE, and welded steel, some of which is believed to have been installed as early as the 1930's.

Table 5.2 shows the roughness coefficients which were used.
TABLE 5.2
HAZEN-WILLIAMS ROUGHNESS COEFFICIENTS

<table>
<thead>
<tr>
<th>Type of Pipe</th>
<th>Pipe Age</th>
<th>&quot;C&quot; Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC</td>
<td>0 - 10 Years</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>11 – 20 Years</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>21-30 Years</td>
<td>120</td>
</tr>
<tr>
<td>ACP</td>
<td>0 - 20 Years</td>
<td>140-150</td>
</tr>
<tr>
<td></td>
<td>Over 20 Years</td>
<td>140</td>
</tr>
<tr>
<td>STEEL</td>
<td>11 – 20 Years</td>
<td>90</td>
</tr>
<tr>
<td>HDPE</td>
<td>11 – 20 Years</td>
<td>130</td>
</tr>
</tbody>
</table>

We have a portable recorder that allows us to record system pressures at selected locations over a 24-hour period. Collecting pressure readings on various parts of the system provides us with a good understanding of the actual performance of the existing system. This is paramount to the calibration of the model to ensure that the model is representative of operation of the actual system.

The model was calibrated using the following procedure:

1. A flow meter was connected to the 4.5" diameter pumper nozzle on a fire hydrant (flowing hydrant). The static pressure was recorded at this hydrant.

2. The static pressure was recorded at 3 other hydrants in the system (residual hydrants).

3. The flowing hydrant was fully opened and the rate of flow was recorded as well as the pressure.

4. The pressures at the three residual hydrants with the flowing hydrant open were recorded.

After the model was calibrated, other conditions were analyzed by making changes to the parameters – i.e., fire flows. Demands were added using water user records obtained from the Town Clerk for residences and businesses.

Fire flow and tank sizing requirements were based on the 2003 Edition of the International Fire Code which was recently adopted by Wyoming State Statute 35-9-106, as well as NFPA, ISO, AWWA, and other recognized literature establishing criteria for fire prevention.
Demands within the Town were distributed according to the zoning of the area surrounding each node. If a known high water user is within an area, an increase adjustment was added to the node. Spreadsheets showing the distribution of demands within the system are included in the project notebook.

The calibration of the model was completed using the pressure recorder results. Pressures within the Town of Kirby were measured at four different locations using a continuous pressure recorder. The model was run at the average daily demand to compare the model with the field data. The pressures from the model were very similar to the field data, with an average pressure in Town of 51 to 92 psi. Table 5.3 shows the results of the pressure tests.

<table>
<thead>
<tr>
<th>Pressure Recorder Location</th>
<th>Junction</th>
<th>Field Data</th>
<th>Model Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town Hall - SW corner of 4th and Bryan Ave.</td>
<td>J-3021</td>
<td>60 psi</td>
<td>61.2 psi</td>
</tr>
<tr>
<td>6th St. between Bryan Ave. and SW Railroad Ave.</td>
<td>J-3031</td>
<td>59 psi</td>
<td>59.3 psi</td>
</tr>
<tr>
<td>SW corner of Main St. and Nelson St.</td>
<td>J-3043</td>
<td>68 psi</td>
<td>67.3 psi</td>
</tr>
<tr>
<td>220 W. 5th St. - NE corner of 5th and S. Dickie</td>
<td>J-3071</td>
<td>50 psi</td>
<td>53.0 psi</td>
</tr>
</tbody>
</table>

Current literature recommends that the difference between the static and the flowing pressure readings at the residual hydrants be at least 5 psi. The differences obtained during the test on the Kirby System ranged between 4 and 8 psi. The flow test was conducted in the early morning hours when other demands on the system would be at a minimum. A minor adjustment in the C Value for some of the pipes resulted in a difference of 0 - 3 psi between the observed value and the pressure predicted by the model at the residual hydrants. These results indicate that the model is well calibrated for the purposes of this study.

The existing distribution system is shown on Sheet 2 of 4 in Appendix A. Sheet 3 of 4 in this appendix shows pressure contours for the system under average day demand and location of system pressure nodes.

Proposed system improvements are shown on Sheet 4 of 4 in Appendix A. This drawing shows proposed improvements including new transmission mains and storage tanks, fire flow improvements, and pipe replacements recommended by this study.

C. FIRE FLOW CAPACITIES

Municipalities are required to provide adequate fire flow to their community per the State Fire Marshall and 2003 International Fire Code (IFC). The requirements state that a certain flow and time duration is required with a minimum delivery pressure of 20 psi,
while not allowing pressures at other locations to go below 20 psi. This is also required by Wyoming DEQ.

Based on this criterion, we analyzed fire flow capacities in selected business and residential areas. In general, the Town system pressure is lowest in the southwest corner of Town and greatest in the northeast corner of Town. The fire flow demand for residential areas is 1,000 gpm for 2 hours and 1,500 gpm for 2 hours for businesses.

D. STORAGE CONSIDERATIONS

1. Types of Storage

There are four general types of storage considered when calculating storage requirements. Those include: supply, fire, reserve, and bottom. Supply storage, also known as equalization storage, is the difference between the supply rate and the MDD. Fire storage capacity refers to the water required to meet fire flow requirements for the designated duration. Reserve storage capacity refers to the volume of water to be held in the reservoir for emergencies. Bottom storage is the volume of water lost due to the silt traps used in tank bottoms to keep the tank from being drained completely and sucking silt back into the system.

2. Supply Storage

The demand for water in a distribution system varies during the day. Minimal usage is experienced from 9 pm until 6 am, while a constant, higher rate is anticipated between 6 am and 9 pm. Supply or equalizing storage, provides water to the system during those periods when the demand rate exceeds the supply rate. Maximum day demand is used to calculate the storage volume needed to augment the supply available during this worst-case scenario. This volume needed is found by plotting the demand curve against the supply curve, over time. From this mass diagram, the sum of the vertical distances between the two curves yields the amount of supply storage necessary to meet the demands of the system for maximum day.

A normal distribution of percentage of MDD expected for each hour of the day is used to develop the demand curve. The supply curve represents the expected flow that is delivered to the Town by Lucerne and the storage tanks. Although the demand curve for out-of-Town use may create some anomalies in the supply rate to the Town, that factor is considered insignificant for this analysis because the rural users do not rely on tank storage. Therefore, a constant supply curve is used for this evaluation. Since the supply from Lucerne is over 300 gpm and MDD is 10 gpm, there is no difference between the two curves and the Town needs no supply storage.
3. Fire Storage

The maximum required fire flow within Town in 2036 is estimated at 1500 GPM or 180,000 gallons over two hours. Lucerne can provide approximately 300 gpm or 36,000 gallons over two hours to supplement the Town’s fire flows. Thus, the Town should provide 144,000 gallons of fire storage to comply with 2003 International Fire Code (IFC) recommendations. The Town currently has 53,000 gallons of storage which is not adequate fire storage to comply with IFC. Due to the water quality issues that the Town currently experiences, we do not recommend constructing additional storage at this time. If a commercial development or building requiring Fire Marshall approval is proposed in the Town of Kirby, discussions should be held with the local fire chief about reducing duration of fire storage due to the low density of development in the Town.

4. Reserve Storage

Reserve storage is provided to enable the system to meet minimal demands on the system in the event of a facility outage. For this report, we have used an estimate of 40 gpcd for 2 days as the basis for meeting emergency needs. This assumes that the Town will conserve water resulting in a 60% reduction from the normal usage rate of 97 gpcd for the period required for repair of the facility. Reserve storage is calculated at approximately 4,500 gallons.

5. Bottom Storage

Aside from all other storage requirements, there should always be at least 0.75 foot of storage in the bottom of the storage tanks. Bottom storage is calculated at 1,000 gallons.

E. SYSTEM ANALYSIS

Some questions posed by the Town concerning their water system are listed below:

Can adequate fire flows be provided for existing developed areas within Town?
Can adequate flows be provided to serve any proposed future service areas?

In order to answer these questions, several conditions were modeled. The Project Notebook contains a detailed printout with the results of each case. The model results indicate that portions of the existing system are not capable of producing recommended fire flows of 1500 gpm. The existing water system can generate fire flows of 750 gpm on the west side of Town and 1,200 gpm on the east side of Town. While this does not meet the recommended flow rate of 1,000 gpm, these flow rates should provide adequate fire protection for the Town in the near future due to the sparse nature of development within Town. The Town should start installing upgrades to transmission lines identified over the next decade to insure adequate flows are available for growth. Table 5.4 is a summary of conditions modeled.
### TABLE 5.4
**SUMMARY OF CONDITIONS MODELED**

<table>
<thead>
<tr>
<th>NODE AND FIRE FLOW</th>
<th>Existing System (Tank in use; PRV closed)</th>
<th>Proposed System (Tank in use; PRV Closed)</th>
<th>Proposed System (Tank in use; PRV Open)</th>
<th>Proposed System (No Tank; PRV Open)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Available Fire Flow</td>
<td>Available Fire Flow</td>
<td>Available Fire Flow</td>
<td>Available Fire Flow</td>
</tr>
<tr>
<td></td>
<td>Pressure</td>
<td>Pressure</td>
<td>Pressure</td>
<td>Pressure</td>
</tr>
<tr>
<td>Junction Node</td>
<td>Required Fire Flow</td>
<td>Required Fire Flow</td>
<td>Required Fire Flow</td>
<td>Required Fire Flow</td>
</tr>
<tr>
<td>J-3021</td>
<td>1000 gpm</td>
<td>1235 gpm</td>
<td>1505 gpm</td>
<td>302 gpm</td>
</tr>
<tr>
<td></td>
<td>989 gpm</td>
<td>27.3 psi</td>
<td>26.6 psi</td>
<td>29.4 psi</td>
</tr>
<tr>
<td>J-3031</td>
<td>1000 gpm</td>
<td>1330 gpm</td>
<td>1651 gpm</td>
<td>304 gpm</td>
</tr>
<tr>
<td></td>
<td>1147 gpm</td>
<td>21.7 psi</td>
<td>20.0 psi</td>
<td>28.2 psi</td>
</tr>
<tr>
<td>J-3043</td>
<td>1000 gpm</td>
<td>1240 gpm</td>
<td>1512 gpm</td>
<td>303 gpm</td>
</tr>
<tr>
<td></td>
<td>996 gpm</td>
<td>30.9 psi</td>
<td>29.2 psi</td>
<td>36.2 psi</td>
</tr>
<tr>
<td>J-3071</td>
<td>1000 gpm</td>
<td>1249 gpm</td>
<td>1511 gpm</td>
<td>301 gpm</td>
</tr>
<tr>
<td></td>
<td>681 gpm</td>
<td>20.0 psi</td>
<td>20.0 psi</td>
<td>22.1 psi</td>
</tr>
</tbody>
</table>
F. GEOGRAPHIC INFORMATION SYSTEM MAPPING

A Geographical Information System (GIS) was created and includes a geodatabase with many different feature classes that can be represented by different layers in the GIS. The 2002 Kirby orthophoto and USGS topographic map serves as a base layer over which all other layers can be overlaid.

The 1982 Record of Survey map, showing corporate boundary, block, lot and street information along with easements, annexations and other survey data provided by Rick Hudson, PLS are incorporated into the GIS. The geodatabase feature class for easements and rights-of-way include the easement type, recording date, county, book & page number, and recorded document number. This information can be used to find the recorded document. A zoning feature class is included in the geodatabase based upon Kirby’s existing zoning regulations.

The parcel ownership information for Hot Springs County is included in the GIS. Unfortunately, the parcel ownership layer has some spatial alignment problems which the County is aware of but has been unable to resolve. The alignment is still close enough to be useable so it is included in the GIS to provide ownership information.

Geodatabase feature classes for treated water lines, valves, fire hydrants and raw water wells were created. Additional geodatabase fields for the treated water lines store the pipe size, material, pressure rating and size type. Similar information on valves and fire hydrants can be added in the future as the information becomes available. The permit number and well head number for the raw water wells is included in the geodatabase.

The GIS was used to determine the developed, undeveloped, and street areas (undevelopable areas) in each type of zoning. This information was used in projecting future demands on the water system.

The State Plane Coordinate System, Wyoming West Central Zone, using the North American Datum of 1927 was used for this GIS. This coordinate system was chosen because most of the existing survey data was referenced to this coordinate system. Engineering Associates used the surveying control network used by Rick Hudson so our survey data would align with his survey data in the GIS. The GIS was created using ArcView 9.1. Much of the spatial information in the geodatabase was created by importing AutoCAD data which was created based upon survey data created by Rick Hudson, PLS and Engineering Associates. A topographic contour with two foot intervals was generated with the survey data obtained throughout the Town. This can be overlaid on the USGS topographic map, which has only twenty-foot intervals.

The GIS is very useful for creating maps that graphically display multiple pieces of information together, enabling the user to see how they are related. It is also useful as a database to store information about the Town’s assets and their location. Once the
GIS contains basic information, it can be useful in quickly answering questions regarding this information. For example, if several residents called with a water outage complaint, the GIS could be used to identify which waterline is the problem. The size of the line could be determined so the repair people could make sure they have the right size with them to repair the break. In addition, the location of the valves necessary to shut down the water to the broken line could also be determined. Finally, a map and table could be printed for the repair people with this information.

The water system maps, zoning map, and right-of-way and easement maps with orthophoto background included in other areas of this report were created from the GIS mapping of the Town. Information relating to the water system has been integrated into the database. Figure 5.1 shows the water system components while Figure 5.2 shows existing easements and right-of-ways for motor infrastructure in and around Town.
Figure 5.1: Treated Water Lines

- 1" HDPE
- 2" HDPE
- 4" PVC
- 6" PVC
- 6" AC
- 6" STEEL
- 8" PVC

Key:
- Fire_Hydrants
- Treated_Water_Valves
- Manholes
- Wells

TOWN of KIRBY - LEVEL 1 STUDY
Water System

Engineering Associates - Cody, Wyoming
Consulting Engineers and Surveyors
Gravel
Corporate Limit
Lots
Street & Alley ROWs
Access & Utility Easements
Railroad ROW

Pavement

TOWN of KIRBY - LEVEL 1 STUDY
Right-of-Ways & Easements

Engineering Associates - Cody, Wyoming
Consulting Engineers and Surveyors

Figure 5.2
CHAPTER SIX
ALTERNATE DESIGNS AND COST ESTIMATES

A. ALTERNATIVES CONSIDERED

Extensive consideration was given to options that would help the Town improve water quality and the water system without significantly increasing user costs, compromising public safety, or substantially increasing the complexity of the system. After looking at the various options, the following were selected for further consideration:

- Installing a chloramine generation and mixing system
- Eliminating the Kirby storage tank
- Installing a mixing system in the Kirby tank
- Modifying chlorine control and injection systems
- Implementing an aggressive system flushing program
- Installation of new transmission lines
- Installing other upgrades to improve water quality and fire flows

B. OPTION 1 - CHLORAMINE GENERATION

Chloramine is a disinfectant that is formed when ammonia and free chlorine combine at a five to one ratio in water. The disinfection properties of chloramines are not as strong as the free chlorine the Town uses now. Chloramines also have an impact on water quality when changing from one type of chlorine system to another.

Discussions were held with the Town of Thermopolis water plant operators about the potential of changing from free chlorine disinfection to chloramines. Due to the extensive impacts on consecutive systems during a potential changeover and the capital cost of the new equipment, there was little support for this option at this time at the Thermopolis Water Plant. This option may be viable in the future when the existing chlorine injection system needs replaced.

There are chloramine generation systems and mixing systems that could be installed at the Kirby tank to mix chloramines in the storage tank water. Unfortunately, mixing and chloramines with water containing varying amounts of free chlorine would result in the need for relatively complicated monitoring and control equipment. The cost of a system to mix water in the storage tank and inject chloramines would likely be over $100,000 installed and would have significantly higher operation and maintenance costs than the existing chlorine injection equipment utilized by the Town.
C. OPTION 2 - ELIMINATING THE EXISTING STORAGE TANK

Efforts were made to find a way to eliminate the Kirby Storage Tank since it is a major contributing factor in the water quality problems being experienced by the Town. As indicated previously, water supply modeling was performed to determine if the tank could be eliminated without causing a significant impact on fire flows. However, system modeling (see Chapter Five of this report) indicates that there would be almost a 75 percent decrease in fire flows. Decreasing fire flows to this extent with a resulting increase in insurance rates due to inadequate flow is likely to be unacceptable when other alternatives exist that address water quality concerns, and this solution may not fully resolve water quality issues.

D. OPTION 3 - INSTALLING A MIXING SYSTEM IN THE KIRBY TANK

This alternative initially looked very promising and could likely be accomplished at a reasonable cost. However, providing continuous mixing of the tank will result in freezing all or most of the water in the storage tank. Under current operating conditions, water freezes on the tank walls and the top of the water column creating an insulated layer between the outside air and the water. Mixing will result in a more rapid cooling of water in the tank. This option could cause significant operation and maintenance issues in the system.

E. OPTION 4 - MODIFYING THE CHLORINE CONTROL AND INJECTION SYSTEMS

As indicated previously, the chlorine control and injection system is not operating in an optimal manner. Several simple modifications can be made to these systems to facilitate good control of the chlorine injected into the system without any significant change to operator efforts. These changes would include replacing the existing flow meter on the 2” supply line to the tank with a new meter, with a 4 to 20 milliamp signal, and installing an automated chlorine injection pump paced by the signal from the meter. A second meter would be installed in the manhole where the chlorine analyzer is currently installed. This would be an insert-type meter producing a 4 to 20 milliamp signal and controlling a second chlorine injection pump. Total cost of this change would be in the range of $5,000 to $7,000. Chlorine could then be added in proportion to the flow with a residual of 0.25 mg/l injected by the first meter and 0.25 mg/l injected by the second meter. Regardless of the flow patterns, the maximum chlorine concentration should be about 0.50 mg/l entering the Town’s Distribution System once the system is calibrated.
F. OPTION 5 - IMPLEMENT A SYSTEM FLUSHING PROGRAM

Implementing a system flushing program will help reduce odor, color, and taste problems in the distribution system especially on dead end mains and in areas of low water consumption. Flushing is the process of opening hydrants and allowing large volumes of water to flow out of the water system under pressure. There has been a reluctance to utilize flushing at a level that would be needed to keep good water quality in the distribution system because of the high cost of purchasing water. Calculations indicate that flushing, as needed, could cost the Town as much as an additional $2,000 per year for water and labor. However, the long-term impact of not flushing the system could result in occasionally failing tests that are reported to EPA. The EPA will require sampling and retesting of the system to show required limits are being met.

Ultimately, the system flushing program should improve consumer confidence, reduce the potential for failing required tests, and reduce operational costs over other alternatives for improving water quality.

G. OPTION 6 – INSTALLATION OF NEW WATERLINES

Installation of new transmission lines around the perimeter of the Town will facilitate providing fire flows in the future and meeting needs of the Town as it grows. Installation of these lines will maximize the benefit of the installation. Several additional water distribution lines need to be installed to loop existing waterlines and improve water quality.

H. OPTION 7 – OTHER WATER SYSTEM UPGRADES

Two additional upgrades to the system are recommended to improve system operation and improve water quality. These include installation of two new fire hydrants and replacement of the existing pressure reducing valve.

To fully implement the flushing program and facilitate improving water quality, new hydrants will need to be installed at the end of existing water lines in alley two and alley three. Installation of these new hydrants will require submission of an application for a Permit-To-Construct to the DEQ with design information and modeling information from this report.

The existing pressure reducing valve has been manually closed and is currently inoperable. That valve should be replaced with a new unit designed to work with the reconfigured water system. This will facilitate the PRV valve opening during a fire where high flows are needed.
I. RECOMMENDED IMPROVEMENTS

Considering all factors impacting the Kirby Water System, the four options that we recommend implementing are: Option 4 - Modifying the Chlorine Control and Injection Systems; Option 5 - Implementing a System Flushing Program; Option 6 – Installation of New Water Lines; and Option 7 – Other Water System Upgrades. Out of these four options, Option 4, Option 5, and Option 7 should be completed within the next few years. These three options will provide the greatest improvement in water quality and water system in the near future. Unfortunately, all capital improvements included in these options, except replacement of the PRV (which will cost about $1,500), are considered water treatment and do not qualify for WWDC funding. Option 6 should be implemented if the Town starts to realize any significant growth. Much of the work under this option qualifies for WWDC funding. Other options may become viable as the Town grows.

J. POTENTIAL FUNDING SOURCES

There are numerous available funding sources for water related improvements, both at the State and Federal levels. Different funding sources have different program requirements, as well as various types of funding. Most typical are grant funds, which usually require some percentage of matching funds. Loans are also available at various terms and interest rates.

Typically, State funded projects are “approved” prior to the legislative session, but are only formally funded once the legislature approves the related budget. These funds are usually unavailable until June of each year, even though funding applications are often due up to 9 months prior to that date. Below is a summary of some of the programs available.

1. Wyoming Water Development Commission (WWDC)

This program provides loans and grants for construction projects that maximize the beneficial use of ground water and surface water within the State of Wyoming. Construction Phase funding from the WWDC is known as “Level III” funding. Projects identified for Level III funding are funded from several different accounts. One is for New Development, and another account funds Rehabilitation projects. The Rehabilitation program provides funds for water systems that have been in use for at least 15 years. Currently, grants are awarded at 67% of the project costs, with a 33% match or loan coming from other sources. Both New Development and Rehabilitation project loan funding is 4% for municipalities, with the term to be set by WWDC ranging from 20 to 50 years.

Level I and Level II Studies have previously been prepared using WWDC funds to determine the condition of the water system and its required improvements. Other
sources can include other funding agencies to assist in providing the 33% match. Typically, only supply, storage, and transmission lines are funded, but both treated water and raw water systems qualify for funding.

2. DEQ State Revolving Fund Loan Program (SRF)

The SRF Loan Program funds projects for all types of water system issues, including supply, storage, distribution, transmission, and treatment. There are two sections to this loan program, the “Clean Water State Revolving Fund (CWSRF)” and the “Drinking Water State Revolving Fund (DWSRF)”. The CWSRF generally targets storm water and wastewater treatment projects. The DWSRF provides loans for water systems requiring improvements. The ranking criteria for the DWSRF includes Public Health Issues (200 pts), Compliance Issues (240 pts), System Deficiencies that may affect public health or compliance (85 pts), and Affordability (30 pts). The DWSRF 2005 fiscal year fund balance started at almost $41 million, and as of December 2005, over $11 million was still available. It is likely that any needed loans from this funding source would be available. Examples of this are two projects funded last year with only 2 points scored and ranking of 129 and 130 out of 137 statewide. On the 2005 list, the Town of Kirby is ranked 11 out of 137 for corrections to their water system estimated at $100,000. This information is typically a “guesstimate” made by DEQ knowing that a municipality is undergoing a WWDC Study, or has expressed a need for funding. Formal application for any loan funds would be required; however, it is very likely that any project Kirby plans to improve its water system would qualify for these funds.

Project Affordability –

Relative Income Index = 49.6% (15 pts – highest rating)
Kirby Annual Median Household Income (AMHI) = $18,750
Wyoming Annual Median Household Income (AMHI) = $37,769

Relative Water Rate Index = 2.5%* or 3.5%** (15 pts – highest rating)
Expected Average Annual Residential User Charge * = $468.00
Expected Average Annual Residential User Charge ** = $648.00
Local AMHI = $18,750

* The figure above represents the estimated residential use at the current rate schedule assuming a use of 4,000 gallons per month. Any rate increases as a result of the Town of Thermopolis’, Lucerne Water and Sewer District or the Town of Kirby’s project requesting funding can be included in this charge.

** This figure includes raw water well costs of $15 per month. It does not include the power costs to operate the pumps for the wells.
SRF loans have up to a 20-year term and an interest rate that is currently 2.5%. The first payment on a loan made through this agency is due one-year after project completion. These loans can be used as matching funds for WWDC, OSLIB, and AML grants. An environmental review is required before a loan will be provided by this agency. Minority-and-women-owned business enterprises must be given an opportunity to bid on materials and labor not provided by the owner.

3. Office of State Lands and Investment Board (OSLIB)

OSLIB provides grants and loans from the Mineral Royalty Account during two meetings each year. This funding is available for water, sewer, storm drainage, road, solid waste, emergency vehicles, and public buildings and health care facilities. Since almost every type of public project can be funded by these monies, there is often a lot of competition for funding. Funds available every year are variable, but total funding available is approximately $11 million per semi-annual meeting. Amounts vary annually based on distributions from the legislature. Typically, grants are available at the 50% level if at least 7 mils have been levied by the municipality. Over 50% can be granted if the municipality has levied at least 11 mils during the previous tax year.

In addition, up to 75% matching grants are available for public infrastructure projects in Towns with populations under 1,300 people or in Counties where the 3 year average of local government sales and use taxes is under 70% of the statewide average. Kirby and Hot Springs County meet these requirements. On an annual basis, 12.5% of the total money available is earmarked for these communities.

At the upcoming meeting in January, approximately $581,000 will be awarded at a 75% grant level and $10.4 million at a 50% grant level. This upcoming semi-annual meeting has almost $32 million in grant requests under consideration. Mitigation of health and safety issues qualifies a grant request in the highest priority category, as well as projects that have already received some type of funding (ongoing projects). Currently, loans are also available at 6% interest for a term of 30 years.

4. Community Development Block Grants (CDBG)

The CDBG Program for economic and community development projects. The Wyoming Community Development Authority manages the portion of funding designated by the Wyoming Business Council for housing in Wyoming.

The CDBG Program is a federal funded pass-through grant program from the U.S. Department of Housing and Urban Development (HUD). Wyoming has
received an annual allocation from a low of $2.2 million, to a high of $3.7 million. For the 2005 program, the state has received close to $3.6 million. Of this amount, there is close to $550,000 for this program year available for infrastructure. In order to qualify for funding, the project must meet one of three HUD imposed national objectives. The three objectives are:

- Benefit to low and moderate income families;
- Elimination of slums and blight;
- Projects which meet an urgent community development need that pose a serious and immediate threat to the health or welfare of the community.

Moderate income is defined as eighty percent of the median income and adjusted by family size. In addition, if permanent jobs are not created as a direct result of the project, there are other various income criteria that must be met. Because of the limited amount of funding available, this may not be a program that is well-suited for water project funding.

5. Wyoming Business Ready Community Program (BRC)

The Wyoming Business Council was created in 2003 to promote economic development at local levels. Grant and loan funding is available under three different categories.

- Community Readiness – Infrastructure construction for future businesses or new business development (i.e. industrial park). Must demonstrate potential for new job creation.
- Business Committed – Must be backed by a specific business(es) that require infrastructure improvements. Requires proof of the potential to create jobs.
- Community Enhancements – Aesthetic improvements (N/A for this study). This relatively new funding source is a great source for businesses in the community to utilize for new infrastructure construction in locations at the edges of municipalities where infrastructure may not currently exist. Municipalities hoping to create economic development via a business park can now provide infrastructure for those needs with this grant funding.

Grants are available up to $1,500,000, and a match of either 5% or 10% are dependant upon the amount of the grant. No or low interest loans up to $1,500,000 are also available at the Board’s determination. This loan money cannot be used to refinance or pay off existing loans.
6. Rural Utility Services (RUS) Funding from USDA

This USDA program provides funding for mainly water and sewer related projects in rural communities. RUS and the WWDC work closely on water projects to try to provide the most affordable options for Wyoming communities. Historically, WWDC has provided a grant for 50% of eligible costs, which is matched by a grant and loan from RUS. RUS has also established a minimum water bill for Wyoming communities to be approximately $30 to $40 per month in order to qualify for funding. We have estimated the Town’s average residential water bills at close to $39 per month, or $54 per month including raw water costs.

RUS considers several factors to determine grant eligibility and loan interest rate. Statewide and local MHI’s are derived from census data collected by the Census Bureau (currently using 2000 census data). A comparison of the Median Household Income (MHI) to the State MHI is used to determine eligibility and ranking. If the MHI in the project area falls between 80% and 100%, it is considered to be “Intermediate Level”. Typically, debt service for the water system at this level must exceed 1% of the MHI. If the MHI in the project area falls below 80%, it is considered to be “Poverty Level”. In this level, debt service should exceed 0.5% of the MHI.

The Town currently has no debt load. There are 61 EDU counting the two large taps in Town. The MHI for Kirby is $18,750, while the State MHI is $37,769. The Town’s ratio of MHI is 49.6%. This ratio qualifies Kirby for USDA poverty level funding. The program provides grant funding once debt service exceeds 0.5% of MHI per EDU ($93.75 per EDU).

Discussions with RUS indicate that based on 2006 funding available, the best case scenario for projects is 80% loan and 20% grant. Kirby is eligible for the “poverty interest rate”, which is currently 4.5%, which is higher than the SRF loans available.

Grants are usually higher for Poverty Level projects. However, in discussions with KayLyn Nerby at RUS, they are anticipating a much larger portion of loan funds than grant funds in the next fiscal year. Interest rates for USDA loans are currently 4.625% for intermediate income level areas. The loan rate for poverty level income areas is currently at 4.5%. The term on USDA loans is generally 30-years in Wyoming. The USDA currently requires that their grants be matched with USDA loan funds.

7. Other Funding Sources

There are also several entities that provide technical assistance, especially targeted at small water systems. At a national level, any town with a population
under 10,000 is considered a small water system. Unfortunately, almost every community in Wyoming qualifies as such so project funding based on population is not very effective. These agencies include:

- Wyoming Rural Water Association (WRWA) – training and on-site assistance;
- Rural Community Assistance Program (RCAP) – Wyoming is part of “MAP”, or the Midwest Assistance Program – training and technical assistance;
- National Environmental Services Center (NESC) – training;
- EPA Safe Drinking Water Hotline – 1-800-426-4791 – information hotline.

Another funding source is the Optional 1-Percent Sales Tax-Special Purpose County Tax (Capital Facilities Tax). Hot Springs County has been utilizing the 1% General Purpose Tax since 1977. This additional tax is used exclusively for a specific project or activity. Once the funds needed to fund that project or activity are collected, the tax is discontinued. The General Purpose and Special Purpose taxes can be imposed separately or together. The taxes also do not have to be 1%, but could be 0.25% or a higher portion of a percent. This tax must be approved County-wide by a vote. Table 6.1 is a summary of various funding options available and associated requirements.
<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Type of Projects</th>
<th>Grant</th>
<th>Required Match for Grant</th>
<th>Loan</th>
<th>Environmental Review Required?</th>
<th>Application Due Date</th>
<th>Other Information Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC</td>
<td>Storage, treatment, transmission, raw water</td>
<td>67% typical</td>
<td>33%</td>
<td>33% of project costs 20-50 years 4% interest</td>
<td>Yes</td>
<td>Aug. 15 for new; Aug. 15 for ongoing</td>
<td></td>
</tr>
<tr>
<td>DWSRF</td>
<td>All water projects</td>
<td>None</td>
<td>N/A</td>
<td>100% of project costs Up to 20 years 2.5% interest</td>
<td>Yes</td>
<td>Loans only – every other month at SLIB meetings</td>
<td></td>
</tr>
<tr>
<td>SLIB</td>
<td>Public projects</td>
<td>50% to 75%</td>
<td>25% to 50%</td>
<td>25-50% of project costs 30 years 6.0% interest</td>
<td>No</td>
<td>3rd Thursday in February for June meeting; 3rd Thursday in September for January meeting</td>
<td></td>
</tr>
<tr>
<td>CDBG</td>
<td>Community and economic development</td>
<td>Up to $300,000</td>
<td>Varies</td>
<td>N/A</td>
<td>Yes</td>
<td>1st of August, October, February, or May</td>
<td></td>
</tr>
<tr>
<td>BRC – Business Committed</td>
<td>Specific business must require infrastructure improvements</td>
<td>Up to $250,000</td>
<td>5% match</td>
<td>$1,500,000 max.</td>
<td>No</td>
<td>Sept 16, 2005</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$250,000 to $1,500,000</td>
<td>10% match</td>
<td>No or low interest as determined by Board.</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRC – Community Readiness</td>
<td>Proposed business or industrial park infrastructure needs</td>
<td>Up to $250,000</td>
<td>5% match</td>
<td>$1,500,000 max.</td>
<td>No</td>
<td>Oct 3 for Jan 2006 or March 3, 2006 for June 2006</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$250,000 to $1,500,000</td>
<td>10% match</td>
<td>No or low interest as determined by Board.</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RUS</td>
<td>Water and sewer</td>
<td>20%</td>
<td>80% from other sources</td>
<td>80% 30 years 4.5% interest</td>
<td>Yes</td>
<td>Typically pursued in conjunction with other funding</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Environmental Assessment</td>
<td></td>
<td>Preliminary Engineering Report (PER) Required.</td>
<td></td>
</tr>
</tbody>
</table>
K. AFFORDABLE USER FEES

Affordability is a function of the household ability-to-pay. According to the Environmental Protection Agency (EPA) guidance document “Information for States on Developing Affordability Criteria for Drinking Water,” household ability-to-pay is based on several factors. Factors include median household income (MHI), unemployment rates, rate structures, cost of living, and taxes. Areas with low MHI, high unemployment, high cost of living, and high taxes have populations with a low household ability-to-pay. Conversely, areas with high MHI, low unemployment, low cost of living, and low taxes have a population with a high ability-to-pay.

Several of the factors influencing ability-to-pay are codependent and can be considered aggregately. Cost of living, taxes, and unemployment within a state generally vary less than nationally. Thus comparison of the statewide MHI with the project area MHI is one way to begin establishing user ability-to-pay. This is the method established by RUS to determine eligibility for their grant program. It is also used during the scoring process for SRF loans. Kirby currently qualifies for RUS funding at the “Poverty” level.

Additional information contained in the EPA document indicates that when annual cost of a customer’s water rates exceeds 1.5% of the local MHI, the affordability of water becomes questionable. The maximum affordability limit for a customer’s annual water rate is 2.0% of MHI. Using the current estimated annual water bill of $468 to $648, the Town’s water rates currently exceed 2.5% of the MHI. This indicates that the Town’s cost for water to its residents does create financial hardship.

To project what level of affordability could be incurred if rates increase, the following information is determined.

EPA Questionable Affordability Limit (1.5% MHI) = $18,750 * 1.5% = $281.25/year = $ 23.44/month

EPA Maximum Affordability Limit (2% MHI) = $18,750 * 2% = $375.00/year = $31.25/month

If you include just the base rate for Kirby at $25.00 per month and the $15.00 per month raw water cost, the Town’s residents are already paying over the maximum affordability limit for water.

Three other factors that need to be considered when evaluating ability-to-pay are the rate structures, demographics of the project area, and the economies of scale. Typically, user rates are established to increase costs as usage increases to promote water conservation. In addition, commercial and industrial customers are charged more for their base rate (or charges vary based upon the size of the tap). From a practical standpoint, the easiest way to address this issue is by setting rates based on EDU’s.
However, in the Town of Kirby, essentially all users, possibly with the exception of Butch’s Place, are residential users and all have the same EDU size.

A rate schedule that is fair to all users should be established. If high water usage is to be discouraged, then rates should increase as water consumption goes up. On the contrary, high water usage in Kirby may be something the Town wishes to encourage. In that case, after covering costs via a rate schedule that assumes minimal water usage, additional use rates could be lower than the rates for the first 5,000 gallons for instance. Water revenue should cover these main items:
  - Operation and Maintenance Costs
  - Water Source/Supply Costs
  - Debt Retirement (to pay off Capital Construction Costs and interest)
  - Depreciation (or a Reserve Account)

Currently, the Town of Kirby’s treated water rate schedule is:
  - $25.00 base rate, including 2,000 gallons
  - $0.70 per additional 100 gallons

Cost to Lucerne Water and Sewer District for water:
  - $3.25 for every 1,000 gallons (same cost from Town of Thermopolis)
  - $0.36 for every 1,000 gallons transport
  - $3.61 per 1,000 gallons total

It should also be noted that for a true analysis, the costs for landscape irrigation should be considered. In 2006, Town residents paid $15.00 per month ($180/year) for the wells. The electrical costs are approximately $1700 per year. In addition, it should be at least noted that the Town is currently not contributing to the EDU charge imposed by the Big Horn Regional JPB (Thermopolis is paying at $0.66/EDU/month).

Currently, all users are charged the same rates, and the only variation is for the amount of water used. In addition, from looking at the last 3 fiscal years of actual and budgeted revenue and expenditures for water, it is apparent that the water department is not covering actual costs of operation.

L. SYSTEM COSTS

1. Capital Construction Costs

Capital construction cost estimates have been prepared for the various alternatives based on previous bids for similar facilities and quotes from suppliers. This information is included in the cost summaries included in Appendix C.
2. Operation and Maintenance Costs

Costs have been developed for operation and maintenance of the proposed facilities based on costs information available from the Town and other records.

3. Funding Agency Participation

Anticipated participation by potential funding sources was assumed in the cost estimates to provide an estimate of the capital construction costs to be paid by citizens.

4. Depreciation

Depreciation cost estimates, or estimated fees that need to be charged to pay for the depreciation, are included in the operation and maintenance costs. Depreciation costs are based on an estimated 50-year average life for the facilities. They include costs for a complete replacement of all facilities constructed under the project.

5. Projected System Costs

The following table summarizes the preliminary costs for the five options. It includes operation and maintenance, capital construction, and depreciation. The total projected costs per customer or equivalent dwelling unit are shown in Table 6.2 for Option 4, 5, 6, 7, and a combined cost estimate for Option 4, 5, and 7. Estimates for Option 1, 2, and 3 are not included since they are not technically feasible considering other factors impacting the system. These costs were developed to allow a direct comparison of the alternatives. Input from the Town and WWDC refined cost estimates for the various options selected are not needed at this time.
TABLE 6.2
ANNUAL COST SUMMARY

<table>
<thead>
<tr>
<th>Description of Cost</th>
<th>Option 4</th>
<th>Option 5</th>
<th>Option 6</th>
<th>Option 7</th>
<th>Option 4, 5, &amp; 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Construction Costs</td>
<td>$154</td>
<td>$0</td>
<td>$11,672</td>
<td>$545</td>
<td>$699</td>
</tr>
<tr>
<td>Operation &amp; Maintenance Cost Increase</td>
<td>$300</td>
<td>$1,250</td>
<td>$1,250</td>
<td>$200</td>
<td>$1,750</td>
</tr>
<tr>
<td>Facility Depreciation</td>
<td>$500</td>
<td>$0</td>
<td>$0</td>
<td>$1,000</td>
<td>$1,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$954</strong></td>
<td><strong>$1,250</strong></td>
<td><strong>$12,922</strong></td>
<td><strong>$1,745</strong></td>
<td><strong>$3,949</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description of Cost</th>
<th>Option 4</th>
<th>Option 5</th>
<th>Option 6</th>
<th>Option 7</th>
<th>Option 4, 5, &amp; 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Construction Cost</td>
<td>$0.20</td>
<td>$0.00</td>
<td>$15.18</td>
<td>$0.71</td>
<td>$0.91</td>
</tr>
<tr>
<td>Operation &amp; Maintenance Cost Increase</td>
<td>$0.39</td>
<td>$1.63</td>
<td>$1.63</td>
<td>$0.26</td>
<td>$2.28</td>
</tr>
<tr>
<td>Facility Depreciation</td>
<td>$0.65</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$1.30</td>
<td>$1.95</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1.24</strong></td>
<td><strong>$1.63</strong></td>
<td><strong>$16.81</strong></td>
<td><strong>$2.27</strong></td>
<td><strong>$5.13</strong></td>
</tr>
</tbody>
</table>

A combined Option 4, 5, and 7 will most likely be the best option for the Town to select to address their water quality issues. This option would add new hydrants to allow flushing the entire system, provide new flow meters to pace chlorine pumps so that all the water in the system is chlorinated based upon flows, and start a flushing program to clean out the system and improve long-term water quality.

M. RATE SCHEDULES

The Town’s current rate schedule does not adequately fund the water system and raw water well operation and maintenance. Based on the current rate schedule and recent increase in raw water rates to $15 per month, the Town will bill a total of approximately $22,500 annually for water and raw water. The annual cost of operating these facilities based on records from the past two years has been approximately $29,500. Table 6.3 shows the existing rate schedule excluding the $15 monthly raw water fee.
## TABLE 6.3
EXISTING WATER RATE SCHEDULE AND TREATED WATER INCOME

<table>
<thead>
<tr>
<th>Tap Size</th>
<th>EDU</th>
<th>Total Taps</th>
<th>Base Rate Per Month**</th>
<th>Cost per Usage Over 2,000 Gallons (per 100 Gallons)</th>
<th>Average Water Usage Over 2,000 Gallons</th>
<th>Average Monthly Bill</th>
<th>Total of Monthly Bills</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; Inactive</td>
<td>1</td>
<td>15</td>
<td>$0.00</td>
<td>$0.70</td>
<td>0</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>1</td>
<td>38</td>
<td>$25.00</td>
<td>$0.70</td>
<td>800</td>
<td>$30.60</td>
<td>$1,162.80</td>
</tr>
<tr>
<td>1 1/2&quot; *</td>
<td>4</td>
<td>1</td>
<td>$25.00</td>
<td>$0.70</td>
<td>6000</td>
<td>$74.00</td>
<td>$74.00</td>
</tr>
<tr>
<td>2&quot;</td>
<td>7.11</td>
<td>1</td>
<td>$25.00</td>
<td>$0.70</td>
<td>1000</td>
<td>$32.00</td>
<td>$32.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total $1,268.80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 1 1/2" tap serves 3 homes

** Based on EDUs and includes 2,000 gallons

Table 6.4 includes a rate schedule formulated to allow the Town to cover treated water costs without any upgrades.

## TABLE 6.4
PROPOSED TREATED WATER RATE SCHEDULE AND INCOME

<table>
<thead>
<tr>
<th>Tap Size</th>
<th>EDU</th>
<th>Total Taps</th>
<th>Base Rate Per Month**</th>
<th>Cost per Usage Over 3,000 Gallons (per 100 Gallons)</th>
<th>Average Water Usage Over 3,000 Gallons</th>
<th>Average Monthly Bill</th>
<th>Total of Monthly Bills</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; Inactive</td>
<td>1</td>
<td>15</td>
<td>$5.00</td>
<td>$0.75</td>
<td>0</td>
<td>$5.00</td>
<td>$75.00</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>1</td>
<td>38</td>
<td>$37.50</td>
<td>$0.75</td>
<td>0</td>
<td>$37.50</td>
<td>$1,425.00</td>
</tr>
<tr>
<td>1 1/2&quot; *</td>
<td>4</td>
<td>1</td>
<td>$150.00</td>
<td>$0.75</td>
<td>6</td>
<td>$195.00</td>
<td>$195.00</td>
</tr>
<tr>
<td>2&quot;</td>
<td>7.11</td>
<td>1</td>
<td>$266.63</td>
<td>$0.75</td>
<td>0</td>
<td>$266.63</td>
<td>$266.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total $1,961.63</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 1 1/2" tap serves 3 homes

** Based on EDUs and includes 3,000 gallons

Table 6.5 contains the total proposed rate plus the $15 per month raw water user fee.
TABLE 6.5
PROPOSED TREATED AND RAW WATER RATE SCHEDULE AND INCOME

<table>
<thead>
<tr>
<th>Tap Size</th>
<th>EDU</th>
<th>Total Taps</th>
<th>Base Rate Per Month**</th>
<th>Cost per Usage Over 3,000 Gallons (per 100 Gallons)</th>
<th>Average Water Usage Over 3,000 Gallons</th>
<th>Average Monthly Bill</th>
<th>Total of Monthly Bills</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; Inactive</td>
<td>1</td>
<td>15</td>
<td>$5.00</td>
<td>$0.75</td>
<td>0</td>
<td>$5.00</td>
<td>$75.00</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>1</td>
<td>38</td>
<td>$52.50</td>
<td>$0.75</td>
<td>0</td>
<td>$52.50</td>
<td>$1,995.00</td>
</tr>
<tr>
<td>1 1/2&quot; *</td>
<td>4</td>
<td>1</td>
<td>$165.00</td>
<td>$0.75</td>
<td>6000</td>
<td>$210.00</td>
<td>$210.00</td>
</tr>
<tr>
<td>2&quot;</td>
<td>7.11</td>
<td>1</td>
<td>$281.63</td>
<td>$0.75</td>
<td>0</td>
<td>$281.63</td>
<td>$281.63</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong> $2,561.63</td>
<td></td>
</tr>
</tbody>
</table>

* 1 1/2" tap serves 3 homes
** Based on EDUs and includes 3,000 gallons
CHAPTER SEVEN
ROLES AND REGULATORY REQUIREMENTS

A. ROLE OF THE OPERATOR

1. Qualifications

The water system operator is responsible for insuring the safety of water delivered to customers supplied by their water system. They must have experience and knowledge in the following areas:
- Maintenance and repair of pumping equipment;
- Chlorination practices;
- Chlorine safety procedures;
- Operational characteristics of mechanical equipment used in the maintenance of cross connection and backflow prevention devices;
- Safe and efficient work practices and methods;
- Mathematic principles pertinent to water treatment calculations;
- Drinking Water Regulations as required by the State of Wyoming.

2. Operation and Maintenance

The water system operator is responsible for maintenance of existing water distribution facilities to ensure correct and safe operation. This includes flushing the system at regular intervals, replacing hydrants, maintaining and cleaning pumps, and maintaining and cleaning other system components. The system operator is required to perform periodic sampling to ensure that water quality is maintained throughout the system. A copy of the proposed operation and maintenance plan and schedule are included in Appendix D.

3. Certifications

Kirby’s water system operator must have a Level 1 certification as defined by Wyoming DEQ to operate the system. This certification requires the operator to have six months of experience, 35 contact hours (training, workshops, college courses, etc.), and successful completion of the Level 1 operator’s examination. There is a significant shortage of individuals with these qualifications in Wyoming at this time.

4. Legal Responsibilities

The operator is prohibited by state law from constructing, installing, or modifying a water distribution system unless the correct permit has been obtained as described in Chapter 3 of the Water Quality Rules & Regulations as set forth by the Wyoming DEQ. Water system operator is directly and legally responsible for any modifications.
to the system and can be fined $10,000 for an infraction of the aforementioned rule. Ultimately, the operator is responsible for the safety of water provided to individuals served by their water system and needs to be able to act reasonably autonomously of policy makers and financial controllers to assure safe operation of the system. As part of DEQ Chapter 12 regulations, the Town must implement a backflow prevention policy. A sample policy is included in Appendix E for the Town’s use.

B. ROLE OF COUNCIL AND ADMINISTRATION

1. Decision Making Level

The council and administration need to insure that accurate and up-to-date records are maintained to successfully manage the water system and keep it financially strong. This entails keeping mapping, operation, and maintenance data up-to-date. The Council needs to work closely with the water system operator on critical issues. Since the operator is responsible for insuring safe operation of the system, he should be consulted with prior to any non-standard agreement being made with users or potential users.

2. Funding Requirements

Revenue for a water system can be generated through increased efficiency, minimization of losses, or by increasing user fees. It seems that consideration of increased user fees will be required to fund any upgrade to Kirby’s system. The Council and administration will need to perform an annual review of water rates and compare expenses against income. The public should be kept informed of the results of this comparison, even when rates don’t need to be raised. Rates should be raised 5% per year until income exceeds expenses. Consideration should be given to taking out a State Revolving Fund Loan for any improvements needed to the system that cannot be paid for from cash reserve since construction costs have increased at over 20% per year for the last four years in Wyoming. Inflation has increased at about 3.4% per year during that same time frame and thus the ability for users to pay for upgrades directly is diminishing.

The Kirby Town Council may, for the purpose of paying the expenses of conducting and managing the Town’s water system, assess and collect a water fee of sufficient amount and in such manner as they deem most equitable from all premises supplied with water. The water rates along with tapping fees, water meter charges, capacity fees, etc., are not included with the Regulations because they are subject to change periodically. Further discussion on this is included later in this report.
3. Assuring Public Safety

The safety of the public must be maintained at all times by the concerted efforts of
the council/administration. This can be best accomplished by setting rates at
adequate levels to complete operation, maintenance, and upgrades, ensuring that
the water system operator is spending adequate time monitoring the system, and by
paying for regular operator training.

C. REGULATORY REQUIREMENTS

1. DEQ Regulations

Under current Department of Environmental Quality regulation, constructing,
installing or modifying a water distribution system without a valid DEQ Permit-to-
Construct is prohibited. In order to obtain a permit-to-construct, copies of plans,
specifications, design data, or other pertinent data must be submitted to WDEQ.
Plans, specifications, and the application for a permit-to-construct must bear the
signature or seal of a registered professional engineer. The underlying objective of
this is to insure that pipe sizes are correct, are constructed of the specified materials,
are installed correctly, and that installation efforts are adequately documented. To
insure that this is done correctly, construction must be completed under the direct
supervision of a registered professional engineer.

2. EPA Regulations and Reporting

Drinking water suppliers must provide water quality reports (sometimes called
consumer confidence reports) that tell where drinking water comes from, and what
contaminants may be in it. Reports must be submitted to the EPA. The Town of
Kirby performs a monthly Bacteriological Tests, and testing for lead and copper is
performed every third year with the next scheduled test year being 2006.

3. Design, Bidding Projects, and Construction

Design drawings, plans, specifications and estimates for public works of the state, or
a political subdivision thereof, involving engineering or land surveying, shall be
prepared by or under the personal direction of, and the construction of the works
shall be executed under the direct supervision of a qualified professional engineer
within the category involved. Before advertising for a bid for any work on the
construction of any public improvements, detailed plans and specifications shall be
prepared, together with an estimate of the probable cost and a form of the proposed
contract. Under state statutes, any contract for public improvements with an
estimated cost over $20,000 (including design, construction, and materials) must be
let to public bid.
Any person, firm, contractor or corporation desiring new water service shall make application in person or by agent for such service at the Town Office. Each house or building shall have a separate and distinct curb stop located outside the premises directly abutting such premises and on public right-of-way. There shall be only one house or building on each meter.
CHAPTER EIGHT
ENVIRONMENTAL REVIEW

The Town of Kirby is not currently pursuing capital funding that will require this section. This section is included in this report, so that in the future if necessary, this information will be available.

A. AFFECTED ENVIRONMENT/ENVIRONMENTAL CONSEQUENCES

1. Land Use/Important Farmland/Formally Classified Lands
   a) Affected Environment
      Areas affected by this project potentially include incorporated areas of the Town of Kirby. Land use information relating to this project is included in Chapter 2. No information or comments were received that indicate that there is the potential to significantly impact these resources.
   b) Environmental Consequences
      The nature of this project is such that it will have minimum impact on farmland and formally classified lands. The pipelines will be buried in existing roadways and previously disturbed areas which will be reclaimed after project completion.
   c) Mitigation
      Normal restoration and reclamation activities associated with buried utility activities will mitigate the impacts on these areas.

2. Floodplains
   a) Affected Environment
      No facilities will be located in special flood hazard areas.
   b) Environmental Consequences
      None identified.
   c) Mitigation
      The proposed options were reviewed by the Office of Homeland Security (Federal Emergency Management Agency – FEMA). Flood Insurance Rate Map information delineates Special Flood Hazard Areas within Kirby.
3. Wetlands
   a) Affected Environment
      No wetlands are included in the area identified for proposed facilities.
   b) Environmental Consequences
      None identified.
   c) Mitigation
      Not applicable.

4. Cultural Resources
   a) Affected Environment
      Clearance from the State Historical Preservation Officer (SHPO) is required before ground-disturbing activities occur. In order to receive SHPO clearance, a cultural resources survey of pipeline routes which are located in relatively undisturbed rural areas must be made. No areas that fall in that classification are included in the project area.
   b) Environmental Consequences
      The response from SHPO indicates that most of the areas have not been surveyed for cultural resources and that a survey meeting the Secretary of Interior’s Standards for Archaeology and Historic Preservation should be conducted. A report detailing the results of the cultural resource survey will need to be prepared and submitted to SHPO.
   c) Mitigation
      If archaeological sites which are considered eligible for the National Register are located, two options are available:
      - The site can be mitigated by archaeological excavation, or;
      - The site can be avoided by re-routing the pipeline.

5. Biological Resources
   a) Affected Environment
      The project area is not located in an area that is anticipated to impact wildlife and fisheries. Comments from the United States Fish and Wildlife Service (USFWS) and Wyoming Game and Fish Department indicate that there is the potential for the project to impact biological resources.
   b) Environmental Consequences
      Potential concerns identified by commenting agencies due to the proposed option include impacts on threatened and endangered species.
The USFWS identified bald eagles as a species that could be impacted by the project. Any impacts on migratory birds will also need to be mitigated.

c) Mitigation
A Threatened and Endangered Species Survey will need to be completed to fully identify species that may be impacted by the project.

6. Water Quality Issues

a) Affected Environment
There will be minimal potential for discharge of water to surface water during construction. The Water Quality Division of DEQ is responsible for reviewing project construction plans and specifications relating to water quality issues. DEQ approval and issuance of a Permit to Construct is required before construction can begin. The DEQ also requires an Engineer’s Design Report be prepared documenting design calculations and assumptions. The DEQ will review the plans and specifications to confirm that DEQ design standards and regulations have been met.

A General Storm Water Permit for construction activities issued by the Wyoming Department of Environmental Quality is normally required for construction activities that disturb more than a 1-acre area.

b) Environmental Consequences
Additionally, the water generated during dewatering activities, pipeline testing, and disinfection activities have the potential to adversely affect waters of the state.

c) Mitigation
A general storm water permit should be obtained by the Contractor which requires the Contractor to detail how runoff from the construction site will be handled so as not to degrade the water quality of natural waterways on or adjacent to the construction site. The Contractor will have to discharge water used for hydrostatic pipeline testing and pipeline disinfection. The DEQ typically handles this type of discharge through a letter of permission to allow discharge. The Contractor will be responsible to apply for and obtain a DEQ letter of permission.

Obtaining and complying with these permits and any other project-specific permits that may be required will ensure that there are minimal impacts from completing the proposed work.
7. Socio-Economic/Environmental Justice Issues

a) Affected Environment
No major issues associated with socio-economic or environmental justice issues were identified in conjunction with the proposed options. The ability-to-pay of users is questionable as discussed in previous chapters.

b) Environmental Consequences
None Identified.

c) Mitigation
The Town plans to investigate all alternatives for minimizing the costs passed on to customers.

8. Air Quality/Transportation/Noise Issues

a) Affected Environment
This project will have no long-term impacts on air quality, traffic flow, traffic volumes, or auditory senses. In the vicinity of the project, temporary impacts are anticipated relating to all issues as a result of construction activities.

b) Environmental Consequences
No long-term negative impacts are anticipated as a result of this work. Property owners in the vicinity of the project may be temporarily impacted by these issues.

c) Mitigation
Impacts on air quality will be limited by applying water to the project area during activities creating significant dust. Impacts of increased traffic flows and volumes will be limited by posting signs and using appropriate traffic control devices as identified in the Manual on Traffic Control Devices Work Zone Traffic Control Procedures Manual. Noise impacts will be limited by identifying the work hours that the contractor is allowed to work in the specifications for the project.

9. Additional Permitting and Access Issues

a) Mining Permit
The Land Quality Division of DEQ is responsible for administering the permit process for mining operations. The Contractor will require a material source for granular pipe bedding, riprap, and other aggregates. The Contractor will be assigned the responsibility to locate, secure, and obtain permits for borrow areas as required. The Contractor may elect to purchase these materials from a local supplier and avoid the need for this
permit.

b) Burning Permit
Permits will be required from the Air Quality Division of DEQ to burn selected construction debris and materials cleared from the right-of-way if the Contractor chooses to dispose of these materials by burning. The Contractor should obtain this permit.

c) Easements
Construction of some of the proposed pipelines will require permission to occupy existing easements or rights-of-way from the Burlington Northern and Santa Fe Railway. The mechanism for accomplishing this is purchasing a utility license and signing a utility permit prepared in conjunction with the railroad. This generally takes six months or longer to accomplish.

B. PERMITTING SUMMARY

As indicated previously, many permits, licenses, and rights-of-way will be required to construct the water improvements. Some of the permits are required to comply with environmental regulations as identified. Permitting will constitute a significant effort in time and money.

Most of these permits should be secured by the Town and Engineer prior to bidding the projects due to the complexity and long lead time necessary. Other permits which are specific to a Contractor’s operation and method of construction are obtained by the Contractor. The following table summarizes the permits which may be required to address the environmental issues as discussed previously. The table also indicates the party responsible for obtaining the permit.
TABLE 8.1
PERMIT SUMMARY

<table>
<thead>
<tr>
<th>Section No.</th>
<th>Permit</th>
<th>Obtained By Town and/or Engineer</th>
<th>Obtained By Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>Archaeology &amp; SHPO Clearance</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Permit To Construct</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>General Storm Water Permit</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>6.</td>
<td>Testing Water Discharge Permit</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>9.a)</td>
<td>Mining Permit</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>9.b)</td>
<td>Burning Permit</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

C. SUMMARY OF MITIGATION

Three significant issues will need to be mitigated in conjunction with this project during preliminary design and routing. These include completing the following:

- Threatened and Endangered Species Survey
- Cultural Resource Survey

The Threatened and Endangered Species Survey will need to be completed to fully identify species that may be impacted by the project. Facilities may need to be relocated to avoid significant impacts on critical species.

The Cultural Resource Survey will evaluate the potential that a project will impact culturally significant facilities. Any archaeological sites that are identified, which are considered eligible for the National Register, will require either:

- The site to be mitigated by archaeological excavation, or;
- The site to be avoided by re-routing the pipeline.
A. SUMMARY

The Town of Kirby Water System has issues with water quality as the result of water that is delivered to the system and operational characteristics of the system. Analysis of personal income levels of those living in the Town and evaluation of the cost of potential improvements suggests that it will be very difficult for the Town to implement a significant upgrade program from a financial standpoint. Efforts were made to evaluate innovative alternatives to improve operation of the water system and water quality. Four improvements were identified that should be implemented over the next decade. These include: modifying the chlorine control and injection systems, implementing a system flushing program, installing new waterlines, installing two new hydrants for flushing, and replacing the existing pressure reducing valve.

B. CONCLUSIONS

The small population, combined with the low average household income, limit the funding available to make improvements to the water system that will improve water quality or fire flow. There are a few distinct improvements that the Town can implement that will improve water quality in areas of the Town with the worst quality issues. Water quality in Kirby is being impacted by the operation and maintenance of the Lucerne Water System. There are limited changes that the Town of Kirby can make unilaterally to improve water quality. Changing the source of supply will likely also have minimum impact on water quality since the Lucerne Water System operates at a higher pressure and will likely continue to feed water to the Town of Kirby.

While the Town water system is not configured in a manner that facilitates providing fire flows established by the International Fire Code, the urban nature of the community and limited commercial development afford the Town some flexibility in timing on installing additional water transmission lines. Installing a few new waterlines at strategic locations could help improve water quality by facilitating additional flow in dead-end lines. The system was evaluated to determine if the existing storage tank could be eliminated. However, eliminating the tank would reduce fire flows in the Town to 300 gpm which would not be beneficial for long term growth in Kirby. Eliminating the tank will not afford any significant improvement in water quality considering retention time in the Lucerne Water System.

C. RECOMMENDATIONS

The Town should implement a flushing program to flush their entire water system at least twice per year. The Town should install two new hydrants on existing dead-end lines to facilitate flushing those lines that likely have not been completely flushed in over 20 years. New flow meters and chlorine injection pumps should be installed on the feed
to and from the storage tank. The Town should also change its rate structure to charge rates based upon EDU’s and at a level to cover costs of operation and maintenance of the system. The Town is planning to pursue options 4, 5 and 7 in the near future.

The Town will look at the need to pursue Option 6 in five to ten years as the Town evolves.
APPENDIX A

DRAWING SHEETS

TOWN OF KIRBY

WATER SUPPLY PROJECT
APPENDIX B

PROPOSED ZONING

TOWN OF KIRBY

WATER SUPPLY PROJECT
APPENDIX B
PROPOSED ZONING

(Zoning – GEBO to SE RR Ave – both sides of main designated as business)

AN ORDINANCE ADOPTED PURSUANT TO W.S. 15-1-701-709 PROVIDING FOR
ZONING IN THE TOWN OF KIRBY PURSUANT TO A COMPREHENSIVE OR
MASTER PLAN PURSUANT TO W.S. 15-1-601-612 (ORDINANCE: No. 39-1999)

BE IT ORDAINED by the Governing Body of the Town of Kirby.

Chapter I - Master Plan

That the Master Plan for the Town of Kirby is hereby adopted by reference and that said
Master Plan will serve as the comprehensive plan required as a basis for zoning and as
the Town’s principal guide in the regulation of development activity pursuant to this
Ordinance.

Chapter II - Zoning Districts

There is hereby created an

"MG" or Managed Growth Zoning District. This zoning district will apply to the entire
Town of Kirby and to any future additions thereto. A plan compliance permit shall be
required for all changes in land use or occupancy and for all construction within the MG
Zoning District.

<table>
<thead>
<tr>
<th>Residential</th>
<th>Residential-Mobile</th>
<th>Multiple Use Residential</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1 (Lots 1-6;19-24)</td>
<td>Block 4</td>
<td>Block 1 (Lots 7-18)</td>
<td>Block 8 (Lots 13-24)</td>
</tr>
<tr>
<td>Block 2</td>
<td>Block 5 (Lots 13-24)</td>
<td>Block 6</td>
<td>Block 9 (Lots 1-12)</td>
</tr>
<tr>
<td>Block 3</td>
<td>Block 7</td>
<td>Block 13</td>
<td></td>
</tr>
<tr>
<td>Block 5 (Lots 1-12)</td>
<td>Block 8 (Lots 1-12)</td>
<td>Block 14</td>
<td></td>
</tr>
<tr>
<td>Block 11</td>
<td>Block 9 (Lots 13-24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 12</td>
<td>Block 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heeter Addition</td>
<td>Grimm Addition</td>
<td>Keasling Addition</td>
<td></td>
</tr>
</tbody>
</table>

The current Land Use Map for the Town of Kirby, Wyoming effective the 8th day of
March, 1999 follows immediately hereafter, and is made a part of Chapter II - Zoning
Districts.
Chapter III - Plan Compliance Permit

SECTION 1: Applicability. A plan compliance permit shall be necessary for any change in land use or occupancy or any construction within the MG Zoning District.

SECTION 2: Time of Application. Application for a plan compliance permit shall be made prior to the physical layout or construction of the proposed development. Applications must be filed with the Town Clerk at least 10 days before a regular meeting of the Council. Applications filed after this deadline shall not be considered until the following month’s regular meeting.

SECTION 3: Form for Application. Application for a plan compliance permit shall be made on the forms adopted in this Ordinance. A filing shall not be accepted until all information required is provided.

Chapter IV - Permit Approval Process

SECTION 1: Initial Review. An application for a plan compliance permit shall be reviewed at the Council meeting following its filing provided that the filing deadline is met.

SECTION 2: On-Site Inspections. The filing of an application for a plan compliance permit constitutes permission for the Town to conduct an on-site inspection of the proposed development.

SECTION 3: Applicant’s Presence Required. The applicant must be present for consideration of the application for a plan compliance permit to proceed.

SECTION 4: Initial Action. After its initial review of an application for a plan compliance permit the Council may:
   a. Approve the application with or without conditions (excepted as provided in IV.6). Any conditions imposed shall be transmitted to the applicant, in writing, within 5 working days of the approval.
   b. Request further information to be submitted prior to its next regular meeting and prior to the setting of a hearing date.
   c. Request further information and set a hearing date at its next regular meeting.

SECTION 5: Further Information Requests. Further information requests may cover any aspect of a proposed development which is dealt with in the performance standards contained in the Town Master Plan. Further information shall be submitted in accordance with a schedule agreed to by the applicant and the Council and forwarded in writing to the applicant within five working days after initial review of the application.

SECTION 6: Hearings. A public hearing shall be required in the case of all applications for new industrial, commercial, and multiple family dwelling developments, in the case of
all applications for mobile home courts, and in the case of all new subdivisions or additions.

SECTION 7: Hearing Notice. When a hearing is required, the applicant shall post public notice of the hearing in the Office of the Town Clerk at least 15 days prior to the hearing. The hearing notice shall contain the time, date, and place of the hearing and a description of the proposed development including its location.

SECTION 8: Action After Hearing and/or Submission of Additional Information. After a public hearing has been held and/or requested additional information submitted, the Council shall:

   a. Approve the application with or without conditions. Any conditions imposed shall be transmitted, in writing, to the applicant within 5 working days of the approval.

   b. Reject the application, filing its reasons for doing so in writing within five days after the decision is made, said reasons, also, being transmitted, in writing, to the applicant.

In no case shall a decision be delayed more than one month from the public hearing date or from the receipt of additional information.

SECTION 9: Plats of Subdivisions. The initial review of subdivisions shall be based on a preliminary plat. The preliminary plat need not be prepared by a professional engineer providing it is accurate as respects the parcel’s boundaries and is drawn to scale. The final plat and attachments may be submitted to the Town Clerk at least ten days prior to any regular Council meeting after the plan compliance permit has received initial approval. Any variance from the conditions of the initial approval shall be grounds for rejection of the final plat. The plan compliance permit shall not be considered complete until the final plat is approved. No subdivision lot may be sold or offered for sale prior to approval of the final plat.

SECTION 10: Plans of Mobile Home Courts. The initial review of mobile home courts shall be based on a preliminary plan. The preliminary plan need not be prepared by a Professional Engineer providing it is accurate as respects the parcel’s boundaries and is drawn to scale. The final plan and attachments may be submitted to the Town Clerk at least ten days prior to any regular Council meeting after the compliance permit receives initial approval. Any variance from conditions of the initial approval shall be grounds for rejection of the final plan. The plan compliance permit shall not be considered complete until the final plan is approved. No mobile home court may rent or offer to rent spaces until the final plan has been approved.

Chapter V - Nature of the Permit

SECTION 1: Permit Approval Includes Conditions. The approval of a plan compliance permit may include conditions provided these are transmitted in writing to the applicant by the Council with the signed permit. The Council may retain a Town Building Official
to insure compliance with conditions imposed.

SECTION 2: Permit is for Development as Represented. The plan compliance permit is approved for the proposed development as represented to the Council. Significant modification or deviation of the development from its represented and approved form shall void the plan compliance permit and subject the applicant to the penalties provided in VII.I.

SECTION 3: Duration. A plan compliance permit is valid for one year. A certificate of completion shall be submitted to the Town Clerk upon completion of the proposed development. If the certificate of completion is not received within one year the plan compliance permit will be held void until the applicant requests an extension.

SECTION 4: Fees.

Application fees shall be as follows:

a. For an industrial or commercial development $ 50.00
b. For a subdivision (per lot) $50.00
c. For a mobile home court (per unit) $50.00
d. For a multiple family dwelling (per unit) $50.00
e. For a single family dwelling $50.00

Inspection fees shall be as follows:

a. For an industrial or commercial development $150.00
b. For a subdivision (per lot) $75.00
c. For a mobile home court (per unit) $75.00
d. For a multiple family dwelling (per unit) $75.00
e. For a single family dwelling $75.00

SECTION 5: Permit Form. The approved Plan Compliance Permit Application form follows this section and may be duplicated as need.
Plan Compliance Permit Application

1. Applicant’s or representative’s name: ________________________________

2. Applicant’s or representative’s address: ________________________________

                                                                                     Telephone: ________________________________

3. This application is for:
   _____ Single Family Residence  _____ Multiple Family Residence  _____ Subdivision Plat
   _____ Mobile Home Park  _____ Commercial Enterprise  _____ Other

4. This application is accompanied by:
   a. A full legal description of the land involved.
   b. A complete sketch plan of the proposed development (for the definition of a sketch plan see the Definitions Chapter of this Ordinance).
   c. Completed applications for any other permits required by Wyoming Laws governing environmental quality or public health.

Section 2: Fees Schedule

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Signature: ____________________________________________ Date: ______________

Accepted for filing by Town: ____________________________ Date: ______________

Preliminary Approval:                                    Final Approval:

Mayor                                                Date

Mayor                                                Date

ATTEST:______________________________________________ ATTEST:__________________________

Town Clerk                                           Town Clerk
Chapter VI - Criteria for Rejection or Approval of Permits

Plan compliance permits in the MG Zoning District shall be approved or rejected on the basis of their compliance with the future land use map and the development performance standards contained in the Town Master Plan.

Chapter VII - Administrative Provisions

SECTION 1: Penalties. Any person who willfully violates any provision of this Ordinance shall be subject to a penalty of $100.00. Each day in which the violation continues shall be deemed a separate offense.

SECTION 2: Utilities Service. No development shall be provided with municipal utilities services until the provisions of this Ordinance have been complied with.

SECTION 3: Falsification of Information. Any person who intentionally falsifies or distorts information required by this Ordinance shall be subject to the penalties provided for in Chapter VII, Section 1 of this Ordinance.

SECTION 4: Burden of Proof. Burden of proof shall in all instances be assigned to the applicant in proceedings under this Ordinance.

SECTION 5: Relationship to other Ordinances or Regulations. Where other Town and/or State regulations apply concurrently with this Ordinance the more restrictive shall govern.

SECTION 6: Separability. If any provision of this Ordinance or the applicability thereof to any person or circumstance is held invalid, the remainder of the Ordinance and its application to other persons or circumstances shall not be affected.

SECTION 7: Construction. The provisions of this Ordinance shall be liberally construed in favor of the public interest.

Chapter VIII - Definitions

SECTION 1: Applicant. Refers to a person or entity making application for a plan compliance permit. Any person or entity named as an applicant may designate a representative to appear before the Council. Subdivider, developer, etc. are synonymous.

SECTION 2: Council. Refers to the duly elected Town Council of the Town of Kirby, Wyoming.

SECTION 3: Development. As used in this Ordinance, a comprehensive term including any and all building or construction and all changes in land use or occupancy.
SECTION 4: Managed Growth Residential - Residential. Dwellings, duplexes, and apartment complexes designed and constructed in accordance with the International Residential Code or International Building Code shall be allowed in the land use area. Occupations in this land use area shall be non-commercial in nature unless prior approval is received from the Town Council and the land use is changed to Managed Growth Multiple Use Residential.

SECTION 5: Managed Growth Residential – Mobile. Mobile homes and residential structures shall be allowed in areas identified under this land use classification. Recreational vehicle parks shall not be allowed in this land use area without approval of the Town Council and consent of abutting properties. Alternately, recreational vehicle parks can be integrated into mobile home parks provided that adjacent properties not owned by the park owner are buffered by mobile homes and as approved by Town Council.

SECTION 6: Managed Growth Multiple Use Residential. Residential dwellings, duplexes, and apartment complexes designed and constructed in accordance with the International Residential Code or International Building Code shall be allowed in the land use area. Examples of commercial endeavors consistent with a residential area are accounting offices, engineering offices, lawyer offices, beauty shops, barber shops, retail shops with a total area of 1,500 square feet, home occupancy businesses performed in a room or rooms of the house occupied by the business owner, churches, or other facilities approved in advance by the Town Council. Welding shops, auto repair shops, junk yards and other heavy commercial or industrial business are not generally consistent with this land use classification.

SECTION 7: Mobile Home Court. A mobile home court is an area occupied by 2 or more mobile homes or mobile home spaces. A mobile home court is distinguished from a subdivision, in which lots are sold for the placement of mobile homes, by its being in one ownership. Mobile home courts are distinguished from a recreational vehicle park as being developed for long term placement of mobile homes.

SECTION 8: An RV (recreational vehicle) Park. Is an area developed for use by travel trailer type vehicles. RV parks are intended for temporary occupation by the tenant (6 months or less) as opposed to mobile home courts which provide for long term placement of the mobile home.

SECTION 9: Mobile Home. A factory assembled moveable dwelling over 45 feet in length and more than 12 feet in width, designed and constructed to be towed on its own chassis, comprised of frame and wheels. The specifications by which mobile homes are built include provisions for its mobility on that chassis or by a vehicle. A travel trailer is defined as a factory assembled moveable dwelling built for recreational purposes less than 45 feet in length and 8 feet or less in width.

SECTION 10: Sketch Plan. (as required by the official application form) The sketch plan is the basis for discussions between the applicant, and the Town. It is intended that the
sketch plan be flexible and susceptible to modification in accord with the recommendations of the Council. The complexity of the sketch plan will vary with the size and complexity of the development. Applicants are encouraged to consult with the Hot Springs County Planning Staff during their preparation of a sketch plan. As a minimum the sketch plan should include:

a. A location map (drawn to scale).
b. A complete overhead view drawing of the proposed development showing all property lines, streets, alleys, and other public or private rights-of-way. Also, showing all setbacks and dimensions of all structures (including driveways, parking lots, patios, etc.) and all requisite utility services.
c. For mobile home courts and subdivisions all materials required by the Hot Springs County Subdivision Regulations for an initial subdivision plan shall be submitted.

SECTION 11: Subdivision. A subdivision is a division of a unit of land into three or more lots, plots, units, sites or other subdivisions of land for the immediate or future purpose of sale, building development or redevelopment, for residential, recreational, industrial, commercial or public uses. The word “subdivide” or any derivative thereof shall have reference to the term subdivision. This term includes the division of original Town lots.

KIRBY'S DEVELOPMENT PERFORMANCE STANDARDS

Kirby's planning policies will be implemented through a Town Development Code, adopted as an ordinance and incorporating elements of zoning, subdivision regulations, and mobile home court regulations. The successful use of the Development Code will depend on the performance standards which follow:

A word about performance standards... a performance standard is a guideline or a criterion for use in the evaluation of development proposals. Some performance standards are quite specific, others, dealing with more complex matters necessarily have some built-in flexibility. This flexibility is especially important in a small Town like Kirby where the potential for rapid growth exists. Flexible performance standards allow the current "rural, village" way of doing things to exist as long as it is appropriate but are, also, capable of dealing (at least at a basic level) with more rapid development.

Industrial and Commercial Developments. All industrial and commercial developments are expected to conform to the following performance standards:

1. No industrial or commercial development shall be allowed without thorough analysis of its impacts on the Town’s water supply and distribution system, solid waste collection and disposal program, fire protection facilities, law enforcement program, and streets.
2. No industrial or commercial development shall be allowed except when such development bears the full cost of any extension, expansion, or upgrading of Town facilities or services necessitated by its location in the Town.
3. Industrial or commercial developments that will produce dust, heavy smoke, odor, heavy traffic, and other adverse impacts on the Town should be required to
mitigate those impacts. Mitigation will be required in the Town's Development Code and the Town will work to see it accomplished in County, State, or Federal permitting procedures.

4. Industrial or commercial developments generating regular heavy truck traffic may necessitate the designation of truck routes. Where such routes are determined to be necessary the applicant will be required to provide funding for signing, traffic signals, and street improvements on the truck route.

5. Industrial or commercial developments may be required to take safety measure such as fencing of loose material stockpiles, trenches, etc.; shielding of glaring surfaces, arc lights or welding arcs, etc.; and noise reducing or muffling measures. An industrial development may be rejected on the basis of unreasonable noise, glare or light, or safety hazards.

6. The Council shall require reasonable buffer areas around industrial or commercial developments, such areas to be landscaped and, where necessary, fenced by the applicant. Reasonable set-backs from public streets and/or alleys shall, also, be required. Industrial or commercial development buffer zones should amount to approximately 40 percent of the space covered by structures, roadways, and material handling areas. No more than 60 percent of a buffer zone should be devoted to parking. The strict application of this performance standard may be varied, however, where the existing arrangement of structures or other conditions would make strict application an extreme hardship on the applicant.

7. Industrial and commercial developments shall provide off-street parking adequate for employees and customers, such parking having adequate drainage and lighting, and safe access to a public street. The strict application of this performance standard may be varied, however, for smaller developments where on-street parking will present no traffic congestion or safety hazard.

8. Advertising signs utilized by industrial or commercial developments shall not include moving, flashing, or blinking parts. Off-site signs or billboard are prohibited except for directional signs. No directional sign shall exceed 30 feet in height or 300 square feet in coverage nor shall it display any promotional material.

9. Industrial developments shall be located within those areas designated for industry in the Town's Master Plan.

10. Commercial developments shall be located within those areas designated for commerce in the Town's Master Plan.

11. Commercial and industrial developments shall also meet the sewage treatment performance standards. A commercial or industrial development may be rejected on the basis of inadequate sewage treatment.

**Subdivisions.** All subdivisions within or proposed as additions to the Town of Kirby shall conform to the following performance standards. All subdivisions within one mile of the corporate limits of the Town shall be reviewed for general compliance with these performance standards.

1. All subdivisions shall be evaluated for their impacts on the Town's water supply and distribution system, solid waste collection and disposal program, fire
protection facilities, law enforcement program, and streets. Subdivisions shall, also, be evaluated for their internal circulation and access patterns; lot size, arrangement, and layout; and for their relationship to natural conditions of soil type, including septic system suitability, drainage and hydrology, slopes, floodplains, and other natural resource considerations.

2. The location, size, shape, and orientation of lots shall be determine with regard to the following factors:
   a. Access for streets or roads and utilities and services.
   b. Off street parking.
   c. Relationship of structures to be erected.
   d. Provision of open space and maximization of scenic values.
   e. Minimum disruption of natural topography.
   f. Minimization of storm water run-off and soil erosion.
   g. Minimum disruption of irrigation and drainage systems serving other lands.
   h. Design elements intended to create identity and interest in the subdivision.

3. All lots shall have a minimum frontage of 7000 square feet. This performance standard, however, may be varied by the council where circumstances permit the effective use of smaller lots.

4. No subdivision shall be allowed except when the applicant bears the full cost of any extension or expansion of Town facilities or services necessitated by its location in the Town.

5. No subdivision shall be permitted which is not connected to the Town water supply system. The applicant shall install a central water distribution system serving all domestic and fire-fighting needs. The system shall be dedicated to the Town in the Certificate of Dedication required on the final subdivision plant. The applicant shall guarantee, by method agreeable to the Council, the system for one year from the date of acceptance. The system shall be fully compatible with the plan for utilities and conform to all standards adopted by the Town and the State. Approval by DEQ shall be submitted with the final plat.

6. Subdivisions shall meet the sewage treatment performance standards. A subdivision may be rejected on the basis of inadequate sewage treatment.

7. The applicant may be required to install water supply facilities of excess capacity where the Town's plan calls for an extension of the Town water supply system into areas beyond the subdivision. The cost of installing oversize water mains shall be shared by the applicant and the Town on a basis to be determined by the Council in each case.

8. A subdivision may be rejected on the basis of insufficient water capacity being available to serve it.

9. The applicant shall dedicate all water rights appurtenant to the property being subdivided as well as all shares in canals and ditches to the Town.

10. No Town utilities shall be provided on private rights-of-way.

11. All underground utilities shall be installed to the property line of each lot prior to street surfacing.

12. The applicant shall provide written assurances from all private utilities that proposed rights-of-way for those utilities will be adequate.
13. All lots shall be provided with useable access by dedicated public road or street. Principal access to a lot from an alley is prohibited.
14. Roads or streets shall follow natural terrain to the extent feasible and cuts and fills shall be minimized.
15. The layout, design, and construction of public roads, streets, and alleys shall be compatible with the Town's Master Plan. Street names shall be compatible with those existing and are subject to the approval by the Council.
16. Street construction standards shall be as follows:
   a. Cul-de-sacs and dead-end streets shall have a turning circle of at least 60 feet in diameter at their end and shall be no longer than 600 feet.
   b. Streets shall intersect at right angles, whenever possible.
   c. Culverts or bridges shall be provided by the applicant and shall extend across the entire street surface.
   d. Surface materials shall be crushed gravel or asphalt on a suitable base. The surfaced width shall be at least 24 feet. The Council may require a wider street surface where the traffic load will necessitate it.
   e. Adequate drainage of roads shall be provided for the subdivision's layout and design.
   f. A utility Right-of-Way of 7 feet in width shall be dedicated on both sides of each street or road.
   g. Alley rights-of-way shall be 20 feet in width where alleys are provided
17. All subdivisions shall be designed so as to minimize soil erosion and the consequent sedimentation of natural water courses. The construction of temporary or permanent storm drainage and/or other erosion control structures may be required. In general, all areas vulnerable to erosion or made vulnerable to erosion during the construction and use of a subdivision must be stabilized.
18. The final plat of any subdivision shall reflect all recommendations of the Council. It shall conform to the drawing standards of the Hot Springs County Subdivision Regulations. The Town Clerk shall be provided with one reproducible and two paper copies of the final plat. Additionally, the Town Clerk shall be provided with reproducible copies of as-built maps of all utility lines installed by the applicant.
19. The final plat shall be accompanied by:
   a. Copies of all covenants attaching to the subdivision.
   b. Evidence satisfactory to the Council that the applicant has adequate financial resources to develop and complete any facility proposed or represented to the responsibility of the applicant, including but not limited to water systems, sewage systems, streets and roadways. The applicant shall provide a performance bond, acceptable letter of credit or escrow funds from initial lot sales to assure that any facilities proposed or represented to be part of the subdivision shall in fact be completed as proposed.
   c. Approval of the subdivision sewage treatment and water distribution system from DEQ.
   d. A contract, ready for signature, approved by the Town Attorney, specifying the exact nature of public improvements to be completed by the applicant. The contract shall stipulate the kind and quality of materials to be used.
and providing for continuing inspection by a designated inspector as work progresses. The guarantee of adequacy of improvements shall be contained in the contract and shall be binding for one year after the completion date assigning liability to the applicant for failure due to poor workmanship or materials.

Where the Town and applicant share the costs of improvements the exact methods and amounts of cost sharing shall be specified in the contract. Where the costs are shared, liability for failures shall be shared in the same proportion as costs.

The contract may include provisions for phasing improvements subject to a plan approval by the Council.

**Mobile Home Courts.** All mobile home courts shall conform to the following performance standards:

1. All mobile home courts shall be evaluated for their impacts on the Town's water supply and distribution system, solid waste collection and disposal program, fire protection facilities, law enforcement program, and streets. Mobile home courts shall, also, be evaluated for their internal circulation and access patterns; unit size, arrangement, and layout; and their relationship to natural conditions of soil type, drainage and hydrology, slopes, floodplains, and other natural resource considerations. All mobile home courts shall meet the requirements of the Hot Springs County Land Use Plan.

2. Each mobile home unit shall contain 4200 or more square feet and shall be not less than twenty four (24) feet in width throughout. The strict application of this performance standard, however, may be varied by the Council where circumstances permit the safe and effective use of smaller units. The boundary of each individual unit shall be fenced with gates provided at the appropriate locations. Grass lawns shall be a requirement of each lot. The owner of the court shall be responsible for the planting and care of each lawn. The placement of each lot shall be arranged to avoid the repetitive, straight-line, sardine configurations common to mobile home courts.

3. No mobile home court shall be allowed except when the applicant bears the full cost of any extension or expansion of Town facilities or services necessitated by the court's location in the Town.

4. No mobile home court shall be permitted which is not connected to the Town water supply system. The Town will construct individual water lines from main to curb stop, and the applicant shall construct individual water lines from the curb stop to the point of consumption. A tap fee, in accordance with the current fee schedule, will be assessed for each mobile home to be serviced. Each line will be sized adequately to take care of all domestic and fire-fighting needs; conform to all standards adopted by the Town and the State; and approved by DEQ. The owner of the mobile home court shall bear the full cost of the maintenance of the water system lines within the court.

5. Mobile home court shall meet the sewage treatment performance standards. The applicant shall install a central sewage collection and treatment system serving
all proposed units and adequately sized. The system shall conform to all standards adopted by the Town and the State. Approval by DEQ shall be submitted with the final plan. A mobile home court may be rejected on the basis of inadequate sewage treatment.

6. All mobile homes shall be located at least twenty-five (25') feet from any court boundary line abutting upon a public street or highway and at least twenty (20') feet from other court property lines.

7. There shall be a minimum distance of fifteen (15') feet between any mobile home and the abutting court roadway.

8. Where spaces are located side by side, there shall be not less than twenty-four (24') feet between mobile homes.

9. Where spaces are located end to end there shall be not less than (20') feet between mobile homes.

10. There shall be minimum of fifteen (15') feet between any mobile home and any service building.

11. All roads within the court shall be minimum of twenty-four (24') feet in width. All roads shall be surfaced with gravel or asphalt on a suitable base. Adequate drainage of roads shall be provided for the mobile home court's layout and design.

12. All-weather walkways of three (3') feet minimum width shall be provided for each mobile home unit. These shall be of a permanent nature constructed of concrete, asphalt or some other material acceptable to the Council.

13. Adequate lighting of all internal roadways and public spaces shall be provided.

14. Mobile home courts shall provide adequate, all-weather, off-street parking at the rate of two spaces per unit. In addition, 1 guest parking space shall be provided for each two (2) units.

15. All mobile home courts shall meet the minimum standards for fire protection in mobile home courts set forth by the State Department of Fire Protection and Electrical Safety.

16. Mobile home courts shall be graded and adequately drained.

17. An adequately maintained solid waste container shall be provided for each unit or for groups of units where the containers are accessible by all weather walkways and adequately sized for the potential loading. All containers shall conform to Town standards. Weekly solid waste collection service shall be provided by the court operator with disposal being accomplished at an approved landfill. The vehicle or trailer used to haul solid waste shall be covered to avoid trash blowing and littering of public streets and private property.

18. Skirting of all mobile homes shall be required within sixty (60) days after occupancy in the mobile home court. Additions to mobile homes such as covered porches, additions, cabanas, etc. with the exception of open steps of less than 12 square feet per landing, shall be prohibited, unless they are provided for in the final plan of the mobile home court.

19. Applicants shall be encouraged to utilize the principles of cluster design in mobile home courts, to provide pedestrian movement systems separated from public streets and internal roadways. A common recreation area shall be designated and developed on 10% of the total area included in the mobile home court. 10%
of the total included area within the mobile home court shall be designated and developed as a common recreational area.

20. The final plan of any mobile home court shall reflect all recommendations of the Council. It shall conform to the drawing standards provided for subdivisions in the Hot Springs County Subdivision Regulations. The Town Clerk shall be provided with one reproducible and two paper copies of the final plan. Additionally, the Town Clerk shall be provided with reproducible copies of as-built maps of all utility lines installed by the applicant.

21. The final plan shall be accompanied by approval of the mobile home court sewage treatment and water distribution system from DEQ.

22. All mobile homes shall be securely attached to the ground by not less than six (6) "tie-downs". Each "tie-down" shall be connected to a ground anchor capable of withstanding a minimum uplift of 5,000 pounds, with one "tie-down" connected to each corner.

**Multiple Family Dwellings.** All multiple family dwellings are expected to conform to the following performance standards:

1. All multiple family dwellings shall be evaluated for their impacts on the Town's water supply and distribution system, sewage collection and treatment system, solid waste collection and disposal program, fire protection facilities, law enforcement program and streets.

2. No multiple family dwelling shall be allowed except when the applicant bears the full cost of any extension or expansion of Town facilities or services necessitated by its location in the Town.

3. A multiple family dwelling may be rejected on the basis of insufficient water capacity being available to serve it.

4. All multiple family dwellings shall provide adequate, all-weather off-street parking at a rate of 2.5 spaces per unit. Such parking shall be adequately lighted and drained and shall have safe access to public streets.

5. All multiple family dwellings shall provide adequate solid waste collection containers, accessible by all-weather walkways from the dwelling units, and conforming to all standards for such containers set by the Town. The owner/operator of multiple family dwellings shall provide weekly solid waste collection with disposal being accomplished at an approved landfill. The vehicle or trailer used to haul solid waste shall be covered to avoid trash blowing and littering of public streets and private property.

6. No multiple family dwelling structures shall be within 10 feet of any public alley or within 25 feet of any public street. The strict application of this performance standard, however, may be varied by the Council providing that the standard relating to overall open space on the parcel is met.

7. No multiple family dwelling structures should occupy more than 60 percent of the parcel on which it is located. No more than 60 percent of the open space so obtained should be devoted to parking. The strict application of this performance standard, however, may be varied where the existing arrangement of structures or other conditions would make strict application an extreme hardship on the
applicant.
8. Open space surrounding multiple family dwellings shall be properly landscaped and maintained by the applicant.
9. Multiple family dwellings are encouraged to maintain a high standard of appearance.
10. All multiple family dwellings shall meet the sewage treatment performance standards. A multiple family dwelling may be rejected on the basis of inadequate sewage treatment.
11. All multiple family dwellings shall meet the Town requirements for water supply lines, meters, etc.

**Single Family Dwellings.** All single family dwellings and appurtenant accessory buildings shall conform to the following performance standards:

1. Each dwelling shall have a separate service connection to Town water mains. Existing joint connections shall be replaced with separate connections whenever they are repaired or replaced.
2. Each dwelling shall meet the performance standards for sewage treatment. A single family dwelling may be rejected on basis of inadequate sewage treatment.
3. Dwellings shall be located in areas designated as residential on the future land use map contained in the Town Master Plan. Mobile homes on lots and mobile home courts shall be confined to those areas designated for their use.
4. No dwelling or accessory building "shall be within 10 feet of any alley, within 25 feet of any public street, or within 5 feet of any property line. The strict application of this performance standard, however, may be varied by the Council where the performance standard relating to lot coverage is met.
5. No dwelling and related accessory buildings should occupy more than 60 percent of the parcel on which it is located. The strict application of this performance standard, however, may be varied by the Council where an extreme hardship to the applicant would result from its strict application.
6. All homeowners are encouraged to maintain high standards of appearance.
7. All dwellings shall maintain a setback from public streets that is consistent with that of senior structures in their neighborhood. Accessory buildings shall be located in side or rear yards, not front yards.
   All mobile homes not in mobile home courts shall be placed on a permanent foundation consisting of one of the following:
   a. A continuous 4" deep concrete pad under the entire mobile home.
   b. A continuous 4" deep x 8" wide concrete runner, placed under each I beam.
   c. A perimeter footing and foundation built of masonry and/or concrete. 24" x 24" x 6" concrete pads placed under the I beams at intervals not greater than ten (10) feet.
8. All mobile homes shall be securely attached to the ground by not less than six (6) "tie-downs". Each "tie-down" shall be connected to a ground anchor capable of withstanding a minimum uplift of 5,000 pounds, with one "tie-down" connected to each corner.
9. All mobile homes shall be skirted within 60 days of placement and water pipes shall be wrapped with heat tapes or skirting shall be insulated to an "R" factor of nine (9). Minimum acceptable skirting shall consist of masonry, masonite, aluminum, or wood or other comparable material approved by the Town. 
10. There shall be no storage of any combustible material underneath any mobile home. 
11. Travel trailers, motor homes, or truck campers may not be used as permanent dwelling units on private lots within the Town of Kirby.

**Sewage Treatment.** Private on-site sewage disposal systems are currently used by all Kirby residences. These systems, even when properly constructed, can cause groundwater contamination, especially in a shallow, gravel aquifer like the one underlying Kirby. Proper construction of sewage disposal systems is essential and will be encouraged by requiring the new systems be installed pursuant to a permit issued by the Hot Springs County Deputy Health Officer. It is also recognized that alternative ways of dealing with sewage disposal will have to be considered as Kirby grows. The best available information indicates that the town site could accommodate 103-109 total private sewage disposal systems (this includes those existing today). As the population approaches this limit, the Town will consider the alternatives and take steps to provide for a cost-effective public sewage disposal system.
This Ordinance shall take effect on the 8th day of March, 1999.

Passed on First Reading: January 11, 1999.
Passed on Second Reading: February 1, 1999.
Passed on Third Reading: March 8, 1999.

ATTEST:

Melody N. Harvey, Clerk/Treasurer

TOWN OF KIRBY

Don Larson, Mayor
AN ORDINANCE ADOPTING A CODIFICATION OF THE ORDINANCES OF THE TOWN OF KIRBY, AND REPEALING EXISTING ORDINANCES.

BE IT ORDAINED BY THE MAYOR AND TOWN COUNCIL OF THE TOWN OF KIRBY:

SECTION 1: The ordinances of the Town of Kirby of a general and permanent nature, as codified by authority of the Town Council in that certain publication entitled "The Code of the Town of Kirby, Wyoming", consisting of Chapters 1 through 12, are hereby adopted by the Town of Kirby, Wyoming.

SECTION 2: The provisions of the above-described Code shall be in force and effect on and after March 8, 1999, and all ordinances of a general and permanent nature in force on March 8, 1999 and not contained therein are hereby repealed from and after March 8, 1999.

SECTION 3: The repeal provided for in the preceding section of this Ordinance shall not affect any offense or act committed or done or any penalty or forfeiture incurred or any contract or right established or accruing before March 8, 1999; nor shall such repeal affect any ordinance or resolution promising or guaranteeing the payment of money for the Town or authorizing the issue of any bonds of the Town, or any evidence of the Town's indebtedness, or any contract or obligation assumed by the Town; nor shall such repeal affect the administrative ordinances or resolutions of the Town Council not in conflict with the Code; nor shall it affect any right or franchise conferred by ordinance or resolution on any person or corporation; nor shall it affect any ordinance relating to the salaries of Town officers or employees; nor shall it affect any ordinance naming, opening, accepting or vacating streets or alleys in the Town; nor shall it affect any ordinance or resolution establishing or amending rates or fees charged for Town services, unless included in the Code.

SECTION 4: Copies of the Code adopted herein shall be filed in the office of the Town Clerk, who shall make them available for reference to any interested persons.

SECTION 5: This Ordinance and the Code adopted herein shall take effect on the 8th day of March, 1999, after having been published in the Thermopolis Independent Record as required by law.
ORDINANCE: No. 41-1999

Passed on First Reading: January 11, 1999.
Passed on Second Reading: February 1, 1999.
Passed on Third Reading: March 8, 1999.

TOWN OF KIRBY

Don Larson, Mayor

ATTEST:

Melody N. Harvey, Clerk/Treasurer
APPENDIX C

ALTERNATE PRELIMINARY DESIGN COST ESTIMATES

TOWN OF KIRBY

WATER SUPPLY PROJECT
## Unit Costs

### Projected ENRCCI June 2006

<table>
<thead>
<tr>
<th>Job</th>
<th>Description</th>
<th>Bid Date</th>
<th>Number of Bidders</th>
<th>ENRCCI</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Washakie Rural Water</td>
<td>2005 AUG</td>
<td>3</td>
<td>7500</td>
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<tr>
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<td>Amoretti Street Bore</td>
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<td>7630</td>
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<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Bid, Ave, or Est. Price</th>
<th>Low Bid</th>
<th>Adjusted Price</th>
<th>Use For</th>
<th>Estimated Quantity</th>
<th>Cost</th>
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<tbody>
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<td>1</td>
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<td>LS 5</td>
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<td>6</td>
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<td>7</td>
<td>Other Water System Upgrades - Option 7</td>
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<td>EA 1</td>
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Probable Costs.XLS
### Project Features and Costs

<table>
<thead>
<tr>
<th>Project Feature</th>
<th>Cost</th>
<th>Eligible for WWDC Funding</th>
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<tbody>
<tr>
<td>Chloramine System</td>
<td>$80,000</td>
<td>$0</td>
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<tr>
<td>Telemetry and Electrical Controls</td>
<td>$20,000</td>
<td>$0</td>
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</table>

### Construction Costs

| Construction Cost Subtotal No. 1     | $100,000 | $0                   |
| Construction Phase Eng               | 10.0%    | $10,000 | $0         |
| Construction Cost Subtotal No. 2     | $110,000 | $0                   |
| Contingency                          | 15.0%    | $16,500 | $0         |
| Construction Cost Total              | $126,500 | $0                   |
| Final Designs and Specifications     | 10%      | $12,650 | $0         |
| Permitting and Mitigation            | 3%       | $3,795  | $0         |
| Legal Fees                           | 2%       | $2,530  | $0         |
| Access and Rights-of-Way             | 3%       | $3,795  | $0         |

### Total Project Costs

- $149,270
- $0

### Project Sponsor Funding

- $1,493
- $0

### Additional Funding Required

- $147,777

### Funding Agency and Percentages

<table>
<thead>
<tr>
<th>Funding Agency</th>
<th>Percentage of Total Funding</th>
<th>Percentage of Eligible Funding</th>
<th>Grant/Loan Amounts</th>
<th>Capital Recovery Factors</th>
<th>Annual Debt Service</th>
<th>Annual Debt Service Per EDU</th>
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<tbody>
<tr>
<td>WWDC Grant</td>
<td>0.0%</td>
<td>67.0%</td>
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<td>$0</td>
<td>$0.00</td>
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<td>33.0%</td>
<td>$0.0735618</td>
<td>$0</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>IN-KIND</td>
<td>0.0%</td>
<td>0.0%</td>
<td>$0</td>
<td>$0</td>
<td>$0.00</td>
<td>$0.00</td>
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<tr>
<td>SRF Loan</td>
<td>2.500% 20 YEARS</td>
<td>25.0%</td>
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<td>0.0641471</td>
<td>$2,370</td>
<td>$36.97</td>
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<td>75.0%</td>
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<td>0.0%</td>
<td>$0</td>
<td>0.0871846</td>
<td>$0.00</td>
<td>$0.00</td>
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<tr>
<td>OSLIB Loan</td>
<td>6.000% 20 YEARS</td>
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<td>0.0871846</td>
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<tr>
<td>TOTAL</td>
<td>0.0%</td>
<td>0.0%</td>
<td>$0</td>
<td>0.0871846</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
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</table>

### Additional Operation and Maintenance

| Debt Service Required for RUS Grant Funds | $6,009.38 | $93.73 |

### Total Water System Cost

- $147,777
- $0

### Estimated Active Taps

- Total EDU: 64
- Estimated Total Active Taps: 38

### Estimated Monthly Costs

<table>
<thead>
<tr>
<th>TAP SIZE</th>
<th>PROPOSED BASE RATE</th>
<th>AVERAGE WATER USAGE</th>
<th>AVERAGE WATER BILL</th>
<th>DEBT SERVICE FOR THIS PROJECT</th>
<th>OPERATION &amp; MAINTENANCE FOR THIS PROJECT</th>
<th>PROBABLE DEPRECIATION CHARGE</th>
<th>NEW BASE RATE</th>
<th>NEW AVERAGE WATER BILL *</th>
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<tbody>
<tr>
<td>0.75</td>
<td>1.00</td>
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<tr>
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<td>$12.32</td>
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<tr>
<td>2</td>
<td>7.11</td>
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<td>$21.90</td>
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<td>$14.79</td>
<td>$414.59</td>
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</table>

* INCLUDES $15/MONTH RAW WATER FEE

### Estimations

- Existing Water Total Debt Service: $0.00
- Projected Debt Service: $2,369.87
- Debt Service Required for RUS Grant Funds: $6,009.38
- Additional Operation and Maintenance: $500.00
- Initial Depreciation Payment: $1,500.00
- Total Water System Cost: $4,469.87

### Notes

- *SEE EDU CALCULATION2.XLS*
## KIRBY WATER SUPPLY STUDY - LEVEL I
### ANNUAL COST ANALYSIS
#### OPTION 2 - ELIMINATE EXISTING TANK

<table>
<thead>
<tr>
<th>PROJECT FEATURE</th>
<th>COST</th>
<th>ELIGIBLE FOR WWDC FUNDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELIMINATE EXISTING TANK</td>
<td>$10,000</td>
<td>$0</td>
</tr>
</tbody>
</table>

| CONSTRUCTION COST SUBTOTAL NO. 1 | $10,000    | $0                        |
| CONSTRUCTION PHASE ENG           | 10.0%      | $1,000                    |
| CONSTRUCTION COST SUBTOTAL NO. 2 | $11,000    | $0                        |
| CONTINGENCY                      | 15.0%      | $1,650                    |
| CONSTRUCTION COST TOTAL          | $12,650    | $0                        |
| FINAL DESIGNS AND SPECIFICATIONS | 10%        | $1,265                    |
| PERMITTING AND MITIGATION        | 3%         | $382                      |
| LEGAL FEES                       | 2%         | $263                      |
| ACCESS AND RIGHTS-OF-WAY         | 3%         | $380                      |

**TOTAL PROJECT COST** $14,927 $0

**PROJECT SPONSOR FUNDING** $148

**ADDITIONAL FUNDING REQUIRED** $14,778

<table>
<thead>
<tr>
<th>FUNDING AGENCY</th>
<th>PERCENTAGE OF TOTAL FUNDING</th>
<th>PERCENTAGE OF ELIGIBLE FUNDING</th>
<th>GRANT LOAN AMOUNTS</th>
<th>CAPITAL RECOVERY FACTORS</th>
<th>ANNUAL DEBT SERVICE</th>
<th>ANNUAL DEBT SERVICE PER EDU</th>
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</thead>
<tbody>
<tr>
<td>WWDC GRANT</td>
<td>0.0%</td>
<td>87.0%</td>
<td>$0</td>
<td>0.0735818</td>
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<td>$0.00</td>
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<tr>
<td>WWDC LOAN 4.000%</td>
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<td>0.0%</td>
<td>$0</td>
<td>0.0</td>
<td>$0</td>
<td>$0.00</td>
</tr>
<tr>
<td>IN-KIND</td>
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<td>0.0%</td>
<td>$0</td>
<td>0.0</td>
<td>$0</td>
<td>$0.00</td>
</tr>
<tr>
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<td>25.0%</td>
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<td>OSLIB GRANT</td>
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<td>75.0%</td>
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<td>$0.00</td>
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<tr>
<td>OSLIB LOAN 6.000%</td>
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<td>0.0%</td>
<td>$0</td>
<td>0.0</td>
<td>$0</td>
<td>$0.00</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$14,927</strong></td>
<td><strong>$0</strong></td>
<td><strong>$0</strong></td>
<td><strong>$0.071846</strong></td>
<td><strong>$236.99</strong></td>
<td><strong>$3.70</strong></td>
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</tbody>
</table>

| EXISTING WATER TOTAL DEBT SERVICE | $0.00 | $0.00 |
| PROJECTED DEBT SERVICE            | $236.99 | $3.70 |
| DEBT SERVICE REQUIRED FOR RUS GRANT FUNDS | $6,009.38 | $93.75 |
| ADDITIONAL OPERATION AND MAINTENANCE | ($1,000.00) | ($15.60) |
| INITIAL DEPRECIATION PAYMENT      | ($1,000.00) | ($15.60) |
| TOTAL WATER SYSTEM COST           | ($1,763.01) | ($27.50) |

**TOTAL ESTIMATED ACTIVE TAPS** 38 | SEE EDU CALCULATION2.XLS | TOTAL EDU: 64

### ESTIMATED MONTHLY COSTS

**TAP SIZE** | **EDU** | **PROPOSED BASE RATE** | **AVERAGE WATER USAGE** | **AVERAGE WATER BILL** | **DEBT SERVICE FOR THIS PROJECT** | **DEBT SERVICE FOR THIS PROJECT** | **OPERATION & MAINTENANCE FOR THIS PROJECT** | **PROBABLE DEPRECIATION CHARGE** | **NEW BASE RATE** | **NEW AVERAGE WATER BILL** |
<table>
<thead>
<tr>
<th></th>
<th></th>
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* INCLUDES $15/MONTH RAW WATER FEE
## KIRBY WATER SUPPLY STUDY - LEVEL I
### ANNUAL COST ANALYSIS
#### OPTION 3 - INSTALL MIXING SYSTEM

<table>
<thead>
<tr>
<th>PROJECT FEATURE</th>
<th>COST</th>
<th>ELIGIBLE FOR WWDC FUNDING</th>
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<tr>
<td>ELLIMINATE EXISTING TANK</td>
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<tr>
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<tr>
<td>CONSTRUCTION PHASE ENG</td>
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<tr>
<td>CONSTRUCTION COST SUBTOTAL NO. 2</td>
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<td>CONTINGENCY</td>
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<th>PERCENTAGE OF ELIGIBLE FUNDING</th>
<th>GRANT/ LOAN AMOUNTS</th>
<th>CAPITAL RECOVERY FACTORS</th>
<th>ANNUAL DEBT SERVICE</th>
<th>ANNUAL DEBT SERVICE PER EDU</th>
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<tbody>
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<td>WWDC Grant</td>
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<td>0.0%</td>
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<td>$1,184.94</td>
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**EXISTING WATER TOTAL DEBT SERVICE** $0.00  **PROJECTED DEBT SERVICE** $1,184.94  **DEBT SERVICE REQUIRED FOR RUS GRANT FUNDS** $6,000.38  **DEBT SERVICE REQUIRED FOR RUS GRANT FUNDS** $9.75
**ADDITIONAL OPERATION AND MAINTENANCE** $300.00  **TOTAL WATER SYSTEM COST** $73889  **TOTAL WATER SYSTEM COST** $2,484.94  **TOTAL WATER SYSTEM COST** $38.77

TOTAL ESTIMATED ACTIVE TAPS: 38  **SEE EDU CALCULATION2.XLS**  TOTAL EDU: 64

### ESTIMATED MONTHLY COSTS

<table>
<thead>
<tr>
<th>TAP SIZE</th>
<th>EDU</th>
<th>PROPOSED BASE RATE*</th>
<th>AVERAGE WATER USAGE</th>
<th>AVERAGE WATER BILL</th>
<th>DEBT SERVICE FOR THIS PROJECT</th>
<th>OPERATION &amp; MAINTENANCE FOR THIS PROJECT</th>
<th>PROBABLE DEPRECIATION CHARGE</th>
<th>NEW BASE RATE</th>
<th>NEW AVERAGE WATER BILL *</th>
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<td>$2.24</td>
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* INCLUDES $15/MONTH RAW WATER FEE
## KIRBY WATER SUPPLY STUDY - LEVEL I

### ANNUAL COST ANALYSIS

#### OPTION 4

<table>
<thead>
<tr>
<th>PROJECT FEATURE</th>
<th>COST</th>
<th>ELIGIBLE FOR WIODC FUNDING</th>
</tr>
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<tbody>
<tr>
<td>NEW CHLORINE PUMPS AND FLOW METERS</td>
<td>$6,500</td>
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</table>

| CONSTRUCTION COST SUBTOTAL NO. 1 | $6,500     | ($)                          |
| CONSTRUCTION PHASE ENG | 10.0%      | $650                         |
| CONSTRUCTION COST TOTAL | $3,323     | ($)                          |
| FINAL DESIGNS AND SPECIFICATIONS | 10%        | $322                         |
| PERMITTING AND MITIGATION   | 2%         | $24                           |
| LEGAL FEES                  | 2%         | $164                          |
| ACCESS AND RIGHTS-OF-WAY    | 3%         | $247                          |

**TOTAL PROJECT COST**

- **PROJECT SPONSOR FUNDING:** $9,705
- **ADDITIONAL FUNDING REQUIRED:** $9,606

### FUNDING AGENCY

<table>
<thead>
<tr>
<th>FUNDING AGENCY</th>
<th>PERCENTAGE OF TOTAL FUNDING</th>
<th>PERCENTAGE OF ELIGIBLE FUNDING</th>
<th>GRANT/LOAN AMOUNTS</th>
<th>CAPITAL RECOVERY FACTORS</th>
<th>ANNUAL DEBT SERVICE</th>
<th>ANNUAL DEBT SERVICE PER EDU</th>
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</thead>
<tbody>
<tr>
<td>WWDC GRANT</td>
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<td>$0</td>
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**TOTAL:** $9,606

**EXISTING WATER TOTAL DEBT SERVICE:** $0.00

**PROJECTED DEBT SERVICE:** $154.05

**DEBT SERVICE REQUIRED FOR RUS GRANT FUNDS:** $6,009.38

**ADDITIONAL OPERATION AND MAINTENANCE:** $0.00

**INITIAL DEPRECIATION PAYMENT:** $300.00

**TOTAL WATER SYSTEM COST:** $454.05

### TOTAL ESTIMATED ACTIVE TAPS

- **TOTAL EDU:** 64
- **ESTIMATED ACTIVE TAPS:** 38

### ESTIMATED MONTHLY COSTS

<table>
<thead>
<tr>
<th>TAP SIZE</th>
<th>EDU</th>
<th>PROPOSED BASE RATE**</th>
<th>AVERAGE WATER USAGE</th>
<th>AVERAGE WATER BILL</th>
<th>DEBT SERVICE FOR THIS PROJECT</th>
<th>OPERATION &amp; MAINTENANCE FOR THIS PROJECT</th>
<th>PROBABLE DEPRECIATION CHARGE</th>
<th>NEW BASE RATE</th>
<th>NEW AVERAGE WATER BILL**</th>
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<td>$0</td>
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*INCLUDES $15/MONTH RAW WATER FEE
### Funding Option 5 - Implement System Flushing

#### ANNUAL COST ANALYSIS

<table>
<thead>
<tr>
<th>PROJECT FEATURE</th>
<th>COST</th>
<th>ELIGIBLE FOR WWDC FUNDING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

#### Construction Cost Subtotal No. 1
- **$0**

#### Construction Phase Eng.
- **10.0%**
- **$0**

#### Construction Cost Subtotal No. 2
- **$0**

#### Construction Cost Total
- **$0**

#### Final Designs and Specifications
- **10%**
- **$0**

#### Permitting and Mitigation
- **3%**
- **$0**

#### Legal Fees
- **2%**
- **$0**

#### Access and Rights-of-Way
- **3%**
- **$0**

#### Total Project Cost
- **$0**

**FUNDING AGENCY**

<table>
<thead>
<tr>
<th>FUNDING AGENCY</th>
<th>PERCENTAGE OF TOTAL FUNDING</th>
<th>PERCENTAGE OF ELIGIBLE FUNDING</th>
<th>GRANT/LOAN AMOUNTS</th>
<th>CAPITAL RECOVERY FACTORS</th>
<th>ANNUAL DEBT SERVICE</th>
<th>ANNUAL DEBT SERVICE PER EDU</th>
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</thead>
<tbody>
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<td>WWDC GRANT</td>
<td>0.0%</td>
<td>0.0%</td>
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<td>OSIL GRANT</td>
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<td>OSIL LOAN</td>
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**Total**
- **$0**
- **($0.00)**
- **($0.00)**

**EXISTING WATER TOTAL DEBT SERVICE**
- **$0.00**
- **$0.00**

**PROJECTED DEBT SERVICE**
- **($0.00)**
- **$0.00**

**DEBT SERVICE REQUIRED FOR RUS GRANT FUNDS**
- **$0.00**
- **$0.00**

**DEBT SERVICE**
- **$0.00**
- **$0.00**

**ADDITIONAL OPERATION AND MAINTENANCE**
- **$1,250.00**
- **$19.50**

**INITIAL DEPRECIATION PAYMENT**
- **$0.00**
- **$0.00**

**TOTAL WATER SYSTEM COST**
- **$1,250.00**
- **$19.50**

**TOTAL ESTIMATED ACTIVE TAPS**
- **38**

**SEE EDU CALCULATION2.XLS**

**ESTIMATED MONTHLY COSTS**

<table>
<thead>
<tr>
<th>TAP SIZE</th>
<th>EDU</th>
<th>PROPOSED BASE RATE IN TOWN</th>
<th>AVERAGE WATER USAGE</th>
<th>AVERAGE WATER BILL</th>
<th>DEBT SERVICE FOR THIS PROJECT</th>
<th>OPERATION &amp; MAINTENANCE FOR THIS PROJECT</th>
<th>PROBABLE DEPRECIATION CHARGE</th>
<th>NEW BASE RATE</th>
<th>NEW AVERAGE WATER BILL</th>
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<tbody>
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<td>$5.00</td>
<td>$0.00</td>
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<td>4.00</td>
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<td>$11.55</td>
<td>$0.00</td>
<td>$384.83</td>
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* INCLUDES $15/MONTH RAW WATER FEE
# Kirby Water Supply Study - Level I
## Annual Cost Analysis
### Option 6 - Installation of New Waterlines

<table>
<thead>
<tr>
<th>Project Feature</th>
<th>Cost</th>
<th>Eligible for WWDC Funding</th>
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</thead>
<tbody>
<tr>
<td>New Transmission Lines - 4,000 LF</td>
<td>$290,000</td>
<td>$260,000</td>
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<tr>
<td>New Distribution Lines - 1,500 LF</td>
<td>$97,500</td>
<td>$0</td>
</tr>
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</table>

| Construction Cost Subtotal No. 1       | $357,500 | $260,000                 |
| Construction Phase ENGR               | 10.0%    | 10.0%                     |
| Construction Cost Subtotal No. 2       | $393,250 | $286,000                 |
| Contingency                           | 15.0%    | 15.0%                     |
| Construction Cost Total               | $632,350 | $329,000                 |
| Final Designs and Specifications      | 10%      | 10%                       |
| Permitting and Mitigation             | 3%       | 3%                        |
| Legal Fees                            | 2%       | 2%                        |
| Access and Rights-of-Way              | 3%       | 3%                        |

**Total Project Cost:** $531,641
**Project Sponsor Funding:** $6,338
**Additional Funding Required:** $528,304

### Funding Agency

<table>
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<tr>
<th>Funding Agency</th>
<th>Percentage of Total Funding</th>
<th>Percentage of Eligible Funding</th>
<th>Grant/Loan Amounts</th>
<th>Capital Recovery Factors</th>
<th>Annual Debt Service</th>
<th>Annual Debt Service Per EDU</th>
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<td>DEBT Loan</td>
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<td>OSLIB Loan</td>
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<td>0.0</td>
<td>$0.00</td>
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<td><strong>Total</strong></td>
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<td>$283,642</td>
<td>0.0871</td>
<td>$20,318</td>
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</table>

**Existing Water Total Debt Service:** $0.00
**Projected Debt Service:** $11,672.28
**Debt Service Required for RUS Grant Funds:** $6,009.38
**Additional Operation and Maintenance:** $1,250.00
**Initial Depreciation Payment:** $0.00
**Total Water System Cost:** $12,922.28

**Total Estimated Active Taps:** 38

### Estimated Monthly Costs

<table>
<thead>
<tr>
<th>Tap Size</th>
<th>EDU</th>
<th>Proposed Base Rate*</th>
<th>Average Water Usage</th>
<th>Average Water Bill</th>
<th>Debt Service for this Project</th>
<th>Operation &amp; Maintenance for this Project</th>
<th>Probable Depreciation Charge</th>
<th>New Base Rate</th>
<th>New Average Water Bill*</th>
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* Includes $15/month Raw Water Fee

---

Annual Cost - Option 6 XLS
# KIRBY WATER SUPPLY STUDY - LEVEL I

## ANNUAL COST ANALYSIS

**OPTION 7 - OTHER WATER SYSTEM UPGRADES**

### PROJECT FEATURE
- **TWO NEW HYDRANTS FOR FLUSHING**: $20,000
- **NEW PRV VALVE FOR FIRE PROTECTION**: $3,000

### CONSTRUCTION COST SUBTOTAL NO. 1
- $23,000
- Other Water System Upgrades

### CONSTRUCTION COST SUBTOTAL NO. 2
- $25,500
- Final Designs and Specifications

### CONSTRUCTION COST TOTAL
- $29,995

### CONTINGENCY
- 10% $2,910
- Legal Fees 2% $582
- Access and Rights-of-Way 3% $873

### TOTAL PROJECT COST
- $34,332

### ADDITIONAL FUNDING REQUIRED
- $3,343

### FUNDING AGENCY

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<th>FUNDING AGENCY</th>
<th>PERCENTAGE OF TOTAL FUNDING</th>
<th>PERCENTAGE OF ELIGIBLE FUNDING</th>
<th>GRANT/LOAN AMOUNTS</th>
<th>CAPITAL RECOVERY FACTORS</th>
<th>ANNUAL DEBT SERVICE PER EDU</th>
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<td>$0</td>
<td>$0</td>
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### ESTIMATED MONTHLY COSTS

<table>
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<th>TAP SIZE</th>
<th>PROPOSED BASE RATE*</th>
<th>AVERAGE WATER BILL</th>
<th>DEBT SERVICE FOR THIS PROJECT</th>
<th>OPERATION &amp; MAINTENANCE FOR THIS PROJECT</th>
<th>PROBABLE DEPRECIATION CHARGE</th>
<th>NEW BASE RATE</th>
<th>NEW AVERAGE WATER BILL</th>
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* Includes $15/MONTH RAW WATER FEE

### TOTAL ESTIMATED ACTIVE TAPS
- 38 SEE EDU CALCULATION2.XLS

### TOTAL EDUCATION
- 64

---

* Excludes $15/MONTH RAW WATER FEE
### Kirby Water Supply Study - Level I
#### Annual Cost Analysis
##### Option 4, 5, & 7 - Combined

<table>
<thead>
<tr>
<th>Project Feature</th>
<th>Cost</th>
<th>Eligible for WWDC Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two New Hydrants for flushing</td>
<td>$20,000</td>
<td>$0</td>
</tr>
<tr>
<td>New PRV Valve for Fire Protection</td>
<td>$3,000</td>
<td>$0</td>
</tr>
<tr>
<td>New Chlorine Pumps and Flow Meters</td>
<td>$6,500</td>
<td>$0</td>
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</table>

### Construction Cost Subtotal No. 1
- $29,500

### Construction Phase
- Construction Phase EN5 10.0% $2,950 $0
- Construction Phase EN6 15.0% $4,469 $0

### Construction Cost Subtotal No. 2
- $32,460

### Construction Cost Total
- $37,318

### Final Designs and Specifications
- 10% $3,732 $0

### Permitting and Mitigation
- 3% $1,120 $0

### Legal Fees
- 2% $746 $0

### Access and Rights-of-Way
- 3% $1,120 $0

### Total Project Cost
- $44,035

### Project Sponsor Funding
- $440

### Additional Funding Required
- $43,595

<table>
<thead>
<tr>
<th>Funding Agency</th>
<th>Percentage of Total Funding</th>
<th>Percentage of Eligible Funding</th>
<th>Grant/Loan Amounts</th>
<th>Capital Recovery Factors</th>
<th>Annual Debt Service</th>
<th>Annual Debt Service per EDU</th>
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<tr>
<td>WWDC Grant</td>
<td>0.0%</td>
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<td>WWDC Loan</td>
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<tr>
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<td>OSLIB Grant</td>
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### Total
- $43,595

### Eligible for WWDC Cost Funding
- $20,000
- $3,000
- $6,500

### Percentage Grant Capital of Eligible Loan Recovery Funding Amounts
- 67.0% $0.0641471
- 25.0% $10,869
- 75.0% $32,696

### Existing Water Total Debt Service
- $0.00

### Debt Service Required for RUS Grant Funds
- $6,009.38

### Additional Operation and Maintenance
- $1,750.00

### Total Water System Cost
- $3,849.12

### Estimated Active Taps
- 38

### Estimated Monthly Costs

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<thead>
<tr>
<th>Tap Size</th>
<th>Tap No.</th>
<th>Proposed Base Rate</th>
<th>Average Water Usage</th>
<th>Average Water Bill</th>
<th>Debt Service for This Project</th>
<th>Operation &amp; Maintenance for This Project</th>
<th>Probable Depreciation Charge</th>
<th>New Base Rate</th>
<th>New Average Water Bill *</th>
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<td>$15.18</td>
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* Includes $15/month Raw Water Fee
APPENDIX D

WATER SYSTEM OPERATING PLAN

TOWN OF KIRBY
WATER SUPPLY PROJECT

OPERATOR RESPONSIBILITIES

1. All operators in direct responsible charge of a public water supply system, including the distribution system, must be certified by Wyoming DEQ to operate the system. A certified operator must be available at all times to make program control decisions that could affect the quality or quantity of water being distributed.

2. The water system operator for The Town of Kirby shall ensure that a free chlorine residual in all parts of the distribution system in the amount of not less than 0.2 mg/L is maintained. Public Water Systems using surface water shall continuously chlorinate and maintain a free chlorine residual of 0.2 mg/L in all parts of the distribution system.

3. All community water systems (CWS) must adopt an ordinance or policy and plan. After the adoption of the plan, each community water system must establish an ongoing program for the detection and elimination of hazards associated with cross-connections. Records of the cross-connection control program must be maintained by the water supplier and shall include such items as date of inspection, person contacted, recommendations, follow-up, and testing results.

4. Operator shall see that newly constructed or repaired distribution lines, finished water storage facilities and filters shall be flushed and disinfected before use in accordance with methods contained in American Water Works Association (AWWA) Standard C651-92, C652-92, and C653-97 or the latest revision. Bacteriological results indicating adequacy of disinfection procedure on tanks, mains and repairs must be maintained on file for five years.

5. No new construction shall be done nor shall any change be made to any public water system until the engineering plans prepared by a registered Professional Engineer for the new construction or change have been submitted and approved by the Wyoming DEQ. The plans must be approved prior to beginning work.

6. All vents on wells, springs, storage tanks, overflows and clear wells shall be properly screened. All overflows on springs and tanks shall be screened and protected.
7. All buildings and equipment used in and for the production and distribution of water (to include chemical and other storage buildings) must be well maintained and be reliable and fit for the purpose for which they are used.

8. All pipe, solder, or flux, which is used in the installation or repair of any public water system, shall be lead free. This shall not apply to lead joints necessary for the repair of cast iron pipes. The term “lead free” in this section is defined as follows:

   (a) When used with respect to solders and flux shall mean solder and flux containing not more than two-tenths of one percent (0.2%) lead and

   (b) When used with respect to pipes and pipe fittings shall mean pipes and pipe fittings containing not more than eight percent (8.0%) lead.

9. All public water systems using surface water shall provide disinfection to control the biological quality of the water. Due consideration shall be given to the contact time of the disinfectant in the water with relation to pH, ammonia, taste producing substances, temperature, presence and type of pathogens, and trihalomethane formation potential. The disinfectant will be applied in the manner needed to provide contact time to kill or inactivate any disease causing organisms present.

10. Operator shall endeavor to minimize leaks within the system by instituting a leak detection survey.

   (a) A leak detection survey begins with maps of the distribution system. These maps should show all information pertinent to the distribution system such as, but not limited to: water sources, treatments plants, mains, line sizes, valves, service lines, curb stops, and hydrants. Also, be sure to keep maps that show previously repaired leaks and locations of customer complaints. These may help in the location of future leaks.

   (b) Some parts of a water system leak more than others. At the beginning of any leak detection work, perform a preliminary survey. Look for signs of leaks and check the most common places for leaks to occur. Locations where leaks may be found by visual inspection:

   - storage tank overflows
   - stuck air relief valves
   - excessive leaks due to old or worn pump packing
   - new or recently repaired lines
   - cracked meter bottoms

   During inspection, also look for illegal taps or connections. For example, check fire hydrants on private property for illegal hose attachments.
(c) Leaks may also occur that cannot be found by visual inspection. One of the most common sources of leaks is fire hydrants. Valve seats can be damaged or improperly seated. Water can leak past these and out through drain holes inside the hydrant barrel. If the hydrant is a dry barrel type, it may be possible to listen for internal water leaks.

(d) If the aforementioned leak detection procedures fail to locate the source of the leak, the distribution system can be broken into zones to help isolate leaks. This will help determine how much water is being lost in each section of your system. Once water loss in each zone is determined, it will be easier to pinpoint leaks with leak detection equipment such as geophones, leak detectors, or leak correlators.

11. Operator is responsible for the periodic sampling of the water in the system for bacteria. When sampling water quality, the following things should be considered:

(a) When to Sample –

It is best to take samples at the same time each month. This will help in long-range planning and insure that enough time is allotted to perform the sampling properly. Select a time that is early in the month. This way, if a sample is somehow contaminated, the operator will be notified by the laboratory in time to get another sample sent. This means that a sampling error will not cause a system to appear to be in violation of the law for a given month. It is also advisable to select a sampling time that is early in the week. This will insure that a sample shipped to a laboratory will not arrive so late in the week that it is left until the following week for testing.

(b) Where to Sample –

Sampling locations should be chosen to systematically cover the entire distribution system. Trouble spots, such as dead ends should not be avoided. This can reveal localized contamination such as contamination from system breaks or cross-connections. The proper fixture to sample water from is an indoor faucet in a clean area. Make sure the faucet is not connected to a cistern, pressure tank, pump, softener, or hot water heater. Also, make sure that the plumbing and fixtures are not new or have not been recently repaired. Samples should not be taken from outdoor faucets due to the likelihood of contamination on the surface. Frost-free hydrants should be avoided as well. If a sample must be taken outdoors, use caution. Avoid dust, splashing rain, snow, and other possible sources of contamination. Taking samples from “mixing” faucets (where hot and cold water come through the same tap) should be avoided because water
coming through the “hot” side may not be representative of the water in the distribution system.

COUNCIL AND ADMINISTRATION RESPONSIBILITIES

1. Maintain accurate and up-to-date records to successfully manage the water system and keep it financially strong. Testing, treating, storing, pumping and delivering a constant supply of water is expensive. Ensuring that there are no record-keeping errors will help maintain income from the sale of water and service and will determine whether or not the system will prosper.

2. Consider alternate methods of increasing the water system income other than increasing system rates. Increasing income for a water system is possible without increasing rates. Possible methods are as follows:

   (a) Conduct a water audit –

      The water system may cut costs by conducting a water audit. This helps find water within the system that had been previously unaccounted for. Unaccounted water may be caused by inaccurate records or meters, unmetered connections, distribution leaks, or water theft. If water bill records are not accurate, the water system may provide more water than it is getting paid for. Unmetered connections make it impossible to estimate the operation efficiency of the system. Leakage in the system must be minimized. No system is leak-free, but some systems have more leaks than others. Water theft can be prevented by periodically checking the system for illegal taps, reversed water meters and other signs of theft.

   (b) Re-evaluate current system policies –

      If the price of service has increased steadily during the previous years, but the system’s rates and fees have remained the same, it may be time to revise system policies. Requiring all new customers to pay a deposit before starting service is one way to increase income without raising rates. Another way to increase income would be to establish a late payment charge or charge a service fee to connect or disconnect service.

   (c) Maximize system efficiency –

      Another option to increase cash flow is to operate more efficiently. Systems may be able to operate more efficiently by adopting a computer billing system and performing an energy audit to make sure pumps and motors are operating at top efficiency.
3. Increase rates only when the water system is in debt. The cost of water is usually dictated by the system’s financial status. Keeping your customers informed is highly recommended when the water system has to adjust rates.

**REGULATORY AND STATUTORY DATA**

**DEPARTMENT OF ENVIRONMENTAL QUALITY REQUIREMENTS -**

According to Wyoming Department of Environmental Quality (DEQ) rules, constructing, installing or modifying water distribution systems, water treatment plants, wastewater collection systems, wastewater pumping stations, or wastewater treatment plants without a valid DEQ permit-to-construct is prohibited. In order to obtain a permit-to-construct, copies of plans, specifications, design data, or other pertinent data must be submitted to DEQ. Plans, specifications, and the application for a permit-to-construct must bear the signature or seal of a registered professional engineer. Construction must be completed under the direct supervision of a registered engineer.

The Town is required to enforce a cross-connection control policy under Chapter 12 of DEQ regulations. Cross-connections are connections to water services or waterlines that can result in substances that are not sanitary or otherwise safe to drink being drawn back into that water system. One common example of this is the standard toilet design. If the tank on a toilet was not located above the flush bowl and a toilet were backed up when a suction was created on a waterline, sewage could be drawn into the waterline. A sample cross connection control policy is attached.

**STATE STATUTES -**

*Contracts for public improvements*

a) All contracts for any type of public improvement, excluding contracts for professional services or where the primary purpose is emergency work or maintenance, for any city or town or joint powers board wherein at least one (1) member is a municipality shall be advertised for bid if the estimated cost, including all related costs, exceeds a bid threshold of twenty thousand dollars ($20,000.00), except that a contract for the purchase or lease of a new automobile or truck shall be advertised regardless of cost and if there is an automobile or truck for trade-in, it shall be included as a part of the advertisement and bid. State statutory requirements do not apply to any city or town trading in an automobile or truck on the purchase of a new automobile or truck.

b) The advertisement shall be published on two (2) different occasions, at least seven (7) days apart, in a newspaper having general circulation in the city or town, or if a joint powers board in any city or town which is a member of the board. The published notice shall state the place, date and time when the bids will be received
and publicly opened and the place where interested persons may obtain complete specifications of work to be performed.

c) The contract shall be let to the lowest bidder who shall be determined qualified and responsible in the sole discretion of the governing body. The governing body may reject all bids submitted if it finds that none of them would serve the public interest. For contracts in excess of five hundred thousand dollars ($500,000.00), cities, towns and joint powers boards may prequalify contractors who wish to submit bids based on such criteria as the project type and experience, expertise, professional qualifications, past performance, staff proposed, schedule proposed, financial strength, qualification of supervisors proposed to be used, technical solutions proposed or references.

d) Every contract shall be executed by the mayor or in his absence or disability, by the president or other presiding officer of the governing body and by the clerk or designee of the governing body. The successful bidder shall furnish to the city, town or joint powers board a bond as specified in the advertisement, or if the contract price is one hundred thousand dollars ($100,000.00) or less, any other form of financial guarantee satisfactory to the city, town or joint powers board. The bond or other form of financial guarantee shall meet State of Wyoming statutory requirements.

e) Before advertising for a bid for any work on the construction of any public improvements, detailed plans and specifications shall be prepared, together with an estimate of the probable cost and a form of the proposed contract. Except as provided under State of Wyoming statutory requirements, no contract may provide for the monthly retention of more than ten percent (10%) of the contract price on the amount of work done during the month, as shown by the estimate of the city or town engineer or designated local official. No progress payment may be made until the city or town engineer or designated local official has furnished the estimate, together with a certificate that the amount of work estimated to have been done conforms in all material respects with the requirements of the contract. A joint powers board may designate an official of any member city or town to perform the functions required by this subsection.

f) In advertising for any bid, the forms of guarantee required under this section and approved by the city, town or joint powers board shall be specified. In addition, bidders shall be required to accompany each bid with a bid bond or if the bid is one hundred thousand dollars ($100,000.00) or less, any other form of bid guarantee approved by the city, town or joint powers board, equal to at least five percent (5%) of the total bid amount, with sufficient surety and payable to the city, town or joint powers board. The bid guarantee shall be forfeited as liquidated damages if the bidder, upon the letting of the contract to him, fails to enter into the contract within thirty (30) days after it is presented to him for that purpose or fails to proceed with the performance of the contract. The bid guarantee shall be retained by the city; town or joint powers board until proper bond or other form of
security satisfactory to the city, town or joint powers board to secure performance of the contract has been filed and approved. The right to reject any bid is reserved in all bid advertisements. All bids shall be numbered consecutively before they are opened and no further bids may be received after the advertised time of opening bids and any bid is publicly opened. The city, town or joint powers board shall give all persons who desire an opportunity to inspect all bids when they are opened. No bid may be considered unless accompanied by a bid guarantee in the required amount.

g) No contract for which a bond or other form of financial guarantee approved by the city, town or joint powers board is required may be assigned or transferred in any manner except by operation of law or consent of the governing body endorsed on the contract. Assignment by any other means renders the contract null and void as to any further performance by the contractor or the assignee, without any act on the part of the city, town or joint powers board. The city, town or joint powers board may at once proceed to re-let the contract or may at its discretion proceed to complete the contract as agent at the expense of the contractor and his sureties.

h) Before any contractor or his representative receives a final payment on any contract for which a bond or other financial guarantee is required, the city, town or joint powers board shall publish in a newspaper of general circulation in the city or town, or in the case of a joint powers board in any member city or town, at least ten (10) days prior to the final payment, a notice to the effect that persons having claims for labor and material furnished the contractor shall present them to the city, town or joint powers board prior to the date specified for payment.

i) Any officer or employee of the city, town or joint powers board who aids any bidder in securing a contract to furnish labor, material or supplies at a higher or lower price than that proposed by any other bidder, or who favors one bidder over another by giving or withholding information, or who willfully misleads any bidder in regard to the character of the material or supplies called for, or who knowingly certifies to a greater amount or different kind of material or supplies than has been actually received, is guilty of malfeasance, which renders his office vacant.

j) If an officer or employee is charged under subsection (i) of this section:

(i) The officer or employee:

A. Is entitled to a hearing before the governing body;

B. Shall be served a copy of the charge at least ten (10) working days before the hearing;

C. May present a defense in person or by counsel; and
D. May have the finding of the governing body appealed to the district court.

(ii) The governing body of the city, town or joint powers board shall hold a hearing on its own motion or when the charge is signed by at least ten (10) qualified electors of the city or town, or in the case of a joint powers board ten (10) qualified electors of any member city or town and:

A. May compel attendance and testimony of witnesses and production of papers;

B. Shall make findings of fact and conclusions of law; and

C. Shall render a conclusive decision upon a majority vote of the governing body.

k) Any officer or employee of the city, town or joint powers board found guilty of malfeasance with regard to a contract shall be punished by a fine of not more than one thousand dollars ($1,000.00).

l) If any person to whom a contract has been awarded has colluded with any person to prevent any other competing bids being made, or has entered into an agreement by which he has made a higher or lower bid than some other person for the purpose of dividing the contract or profits there between two (2) or more bidders, the contract is null and void, and the mayor or manager or joint powers board shall advertise for new bids or upon approval of the governing body provide for the work to be done under the mayor's, manager's or board's own supervision and control.

m) Any contract made in violation of the provisions of this section is void, and any money paid on account of the contract by the city, town or joint powers board may be recovered without restitution of the property or benefits received or retained.

n) Every contract of the kind specified in this section shall contain a provision expressly referring to this section and making it a part of the contract.

o) A public improvement shall not be divided into smaller units for the sole purpose of avoiding the advertising requirement of this section.

p) For purposes of this section "related costs" includes, but are not limited to, labor, labor burden, materials, transportation, storage, equipment, associated overhead and associated depreciation.
Public works

a) Drawings, plans, specifications and estimates for public works of the state or a political subdivision thereof involving engineering or land surveying, shall be prepared by or under the personal direction of, and the construction of the works shall be executed under the direct supervision of a qualified registrant within the category involved.

b) Surveys or maps required in connection with land surveying shall be made by or under the personal direction of a qualified registrant.

OPERATION AND MAINTENANCE RECOMMENDATIONS

CHLORINATION SYSTEM EQUIPMENT

Water supplied to the town of Kirby is chlorinated at two locations in the distribution system. The first chlorination pump injects in the first southern-most manhole the water passes through as it enters the Town. The original pump installed was intended to be controlled by the flow meter. That pump has been replaced with one in manual operation that pumps a small amount of chlorine into the system continuously.

A second chlorine injection point is located in a manhole immediately downstream of the storage tank. The system, as installed, was designed to monitor chlorine residual using an ALLDOS Conex 350 Chlorine analyzer/controller. This controller is located in the Town shop and is sent information from sensors in the manhole across the street. Information sent by the sensors includes chlorine residual, water temperature, and pH level. The controller is designed to send a signal that will then signal to a pump controlled by a 4-20 milliamp signal. Once again, that pump has been replaced with one that is in manual mode and injects chlorine continuously into the system. Efforts were made to calibrate the monitoring system. The equipment operated intermittently and then stopped sending a signal. It appears that the control wire or monitoring equipment is corroded.

The two chlorine injection pumps use a single chemical storage tank to store liquid chlorine (sodium hypochlorite – household bleach) mixed with water. This tank needs to be drained and cleaned biannually. Care needs to be taken to avoid damage to clothing and reactions on the operator’s skin.

Sodium hypochlorite is available in bulk containers at 12.5% chlorine concentration. However, due to the low chlorine usage rate in Kirby, the use of sodium hypochlorite sold in bulk will be expensive. Discussions have been held with the EPA about using household bleach (5.25% chlorine concentration) as a disinfectant in the water system and there are no issues with this approach as long as there are not additional additives to the bleach.
The chemical storage tank needs to be checked weekly and refilled once at least ½ the tank has been utilized. Based on the water usage rates of the Town, one gallon of household (unscented, etc.) bleach should be mixed with six gallons of water. The concentration of chlorine in solution decays with time, so the chlorine concentration should be checked at monthly intervals to assure minimum variability of the concentration in the tank.

Injection tubing and parts should be flushed with clean water and cleaned with vinegar biannually. Injection pump repair kits should be kept on-site for all pumps and pumps rebuilt as needed, but at least every five years.

**FLOW METER**

Flow into the storage tank is metered by a SeaMetrics MR-200 2” diameter bronze pulse flow meter with a reed switch. This meter is designed for 150 psig maximum pressure, 105°F maximum temperature, and has an accuracy of 1.5%. The range of acceptable flow rates for this meter is from 1 gpm to 130 gpm. Pulse readings from this meter have been determined to be intermittent and unreliable for pacing a chlorine pump.

MR meter sensors respond to a magnet which is turning on the face of the meter under the lens. The sensors give one output "pulse" (on/off) each time a magnet pole passes. The magnets have one, two or four poles. The white dots on the magnet indicate the number of poles. The sensors are designed for electronic control loads. They should not be used to switch power loads such as motors or lights, and they should not be connected to 110 VAC. The flow meter inlet strainer needs to be cleaned at least yearly.

**TANK**

The Town of Kirby uses an AO Smith Aquastore tank which has a capacity of 53,000 gallons. The tank is steel with bonded fiberglass surfaces on both the interior and exterior of the tank, and has a diameter of 14 feet and a height of approximately 46 feet. This tank was constructed in 2000. The tank is fed with water from the Town of Thermopolis via Lucerne.

Valves to this tank should be closed and the entire tank drained at least twice per year to improve water quality. If maintenance is performed inside the tank while it is empty, either persons performing the work need to be in sanitized clothing sprayed with bleach or the following procedures need to be followed to disinfect the tank.

**Sanitization:**

1. **FORMS OF CHLORINE**

   Various forms of chlorine are used for the purpose of sanitizing potable water tanks. Aquastore tanks are constructed using a joint sealant which can be substantially degraded during the curing process by a strong oxidizer such as
chlorine. Care must be taken to follow the recommended chlorination procedures to prevent deterioration of the tank joint sealant.

NOTE: Excessively high concentrations of chlorine will damage the tank joint sealant if granules or tablets are not dissolved prior to their being placed in the tank.

2. METHODS OF CHLORINATION (REFERENCE AWWA C-652)
The American Water Works Association (AWWA) Standard C-652 describes in detail several methods of tank chlorination. Some are more or less appropriate depending upon tank and coating system designs. The chlorination of a tank after construction and prior to being placed in service needs to be coordinated with your authorized independent Aquastore tank dealer. Specific criteria apply to the cure time requirements for structure sealants prior to the first filling and/or sanitization process.

a. The recommended method for chlorination of an Aquastore tank and the method preferred by many tank operators is to fill the tank with potable water to approximately 5% of its volume. Add sufficient available chlorine to this water to attain a 50 milligrams/liter (mg/l) available chlorine level. The chlorine can be added by: injecting gaseous chlorine by use of a gas-flow chlorinator; introducing sodium hypochlorite by chemical feed pump to the inflowing water; or pouring dissolved sodium hypochlorite into the tank from a side manway or roof hatch. Never exceed 50 mg/l concentration for the volume of water actually in the tank. This solution is to be retained for 6 hours. Then, fill the tank to the overflow level with potable water and retain at that level for a minimum of 24 hours. The free chlorine residual after 24 hours must be not less than 2 mg/l. The highly chlorinated water in the drain piping must then be purged. The remaining water should be tested and certified for acceptable quality according to local health department codes prior to delivery to the distribution system.

b. As an alternative method, the tank can be filled with potable water to the overflow level. Enough chlorine must be added so that the available chlorine concentration shall be 10 mg/l at the end of 6 hours, but at no time should the concentration exceed 50 mg/l. The chlorine can be added by injecting gaseous chlorine or introducing sodium hypochlorite by chemical feed pump to assure uniform mixing. After six hours, the chlorine residual should be reduced to not more than 2 mg/l by a combination of additional holding time and/or draining and refilling the tank with potable water having a lower chlorine residual. The water must then be tested for acceptable quality according to local health department code prior to delivery to the distribution system.
Care should be taken when handling any chemical. Only experienced personnel should attempt to chlorinate the tank contents. Use the utmost care and check local codes prior to disposal of chlorinated water.

Winter Operation:

1. MINIMIZE ICE FORMATION
   Ice formation in water tanks can cause extensive damage. Interior sealer or coating damage may result from the abrasive action and/or impact of an ice cap moving within the tank with changing water levels. In any tank, catastrophic structural failure can result from the tremendous forces of ice expansion or the loads created by the weight of ice. Internal accessories, level gauges, overflow weirs, etc., can be ripped from tank walls causing structural damage. To avoid this type of damage you must limit the formation of ice. There are various devices available to assist in this process, including the use of insulation to control heat loss. It is the owner’s responsibility to determine if the use of this tank requires such devices. The most widely used method to control ice in potable water tanks is to keep turning over the tank contents. It is recommended that pumping schedules be maintained so that water is kept moving during periods of lowest demand. On a daily basis, at least one third of the tank volume should be turned over. If necessary, water may have to be discharged to allow fresh, warmer water to be added. Take care to discharge water in an appropriate manner. Additionally, on tanks supplied with a roof, roof damage can occur when ice formations come in contact with the roof. To help minimize the chance of this type of damage, the high water level in the tank should be lowered during the winter months to keep ice formations from contacting the roof.

2. THAWING A FROZEN TANK
   A tank which has frozen has a high risk of structural damage. A tank which is no longer operational because of excessive ice buildup must be thawed immediately to limit further damage. The tank thawing process itself can create substantial risks. Experienced contractors should be employed to carry out the work, usually under the guidance of a consulting engineer. If the tank has experienced an extensive ice buildup requiring a thawing-out process, it should be drained and inspected for damage at the earliest opportunity. Your authorized independent Aquastore tank dealer can make this inspection and perform repairs at your direction.

CAUTION:
The formation of ice in a tank can result in damage to the tank, its roof (if applicable) and its accessories. The owner/operator must take appropriate steps to limit the formation of ice in the tank.
**Inspection and Maintenance:**

1. **TANK CLEANING**
   Potable water tanks should be drained and cleaned at least annually to prevent accumulation of silt and sediment which may affect water quality and damage water meters, valves, etc. Normally a water hose with line pressure water is sufficient. Hot water or cleaning additives are not recommended. Do not use high pressure water. A plan should be established for maintaining adequate water supply during the time the tank is out of service for routine inspection and cleaning. Cleaning schedules may also be appropriate for other types of Aquastore tanks.

2. **VISUAL INSPECTION**
   At the time of the regular tank cleaning, a visual inspection must be made to check the glass coated sheets for any evidence of physical damage. If structural damage is found, contact your authorized independent Aquastore tank dealer for recommended repair methods.

3. **LADDERS AND PLATFORMS**
   Ladder, ladder cage, and platform connection brackets must be visually inspected for corrosion or damage at each use. Replace damaged brackets if required. Ladder rungs should also be visually inspected to assure they are safe for use. If a safety climbing device was specified, follow the manufacturer’s instructions on proper care and use. The installation or use of fixed interior ladders is not recommended as they are susceptible to corrosion and ice damage.

4. **VENTILATION FOR ROOFED TANKS**
   The tank vent is provided to prevent damage to the tank from pressure and/or vacuum created by normal filling and emptying of the tank. It is designed to prevent most birds, insects and debris from entering the tank. The vent screen must be inspected at least annually. It must be cleared of leaves and debris which would prevent it from functioning properly. The screen can be cleaned by removing the four (4) bolts that secure the top cover. (Two 9/16” wrenches are required.) Lift off the cover and clean the screen thoroughly with a soft brush. Reinstall the cover by reversing the above procedure.

5. **OVERFLOW PIPE**
   Overflow pipes can become clogged with debris. To prevent entry of birds or small animals, the discharge ends should be screened, provided with a flap valve, or other method of closure. The overflow pipe should be kept clear and checked regularly to be certain it operates freely.

6. **GRAFFITI AND VANDALISM**
   Aquastore sheets can usually be wiped clean of painted-on graffiti without damaging the coating. A hydrocarbon solvent paint remover wiped on the graffiti with a cloth should be sufficient to thoroughly remove painted-on graffiti. If not, a
stiff brush can be used to remove paint. Follow label instructions for the paint remover being used, then wash the cleaned area with mild detergent and water. The coating typically does not suffer any damage from organic solvents. Avoid prolonged contact between the solvent and any sealant.

**PRV Valve**

Operation of the PRV valve should be checked biannually. The valve should be manually opened and closed to help keep it operational. The existing valve is closed and should be replaced with a new valve set to open at a pressure compatible with the remainder of the system.

**Strainer**

There is a strainer located in the manhole east of the Town Shop. The strainer should be inspected and cleaned biannually.

**Distribution System**

The entire distribution system should be flushed at least biannually. Hydrants at the following locations should be flushed on a monthly basis to help improve water quality:
5th Street and Dickie
4th Street and Bryan
Main Street and Nelson

**Flushing:**

Flushing the system will help reduce odor, color, and taste problems in the distribution system especially on dead end mains and in areas of low water consumption. Flushing is the process of opening hydrants and allowing large volumes of water to flow out of the water system under pressure. The following guidelines should be followed:

- All waterlines in the system should be flushed to change out the water in the waterlines at least three times.
- Flushing velocities should be maintained at over 2.5 feet per second. This equates to flows of over 220 gpm in a 6-inch main and 400 gpm in an 8-inch main.
- The entire water system should be flushed at least twice per year.
- Flushing of the system should begin at the Town Shop and proceed northeast.
- Dead end lines and those areas with low flow may need to be flushed monthly.
- The tank needs to be drained biannually.
- Hydrants used for flushing must be opened and closed slowly.

A map has been created identifying the flushing order and length of time each item will need to be flushed to replenish the water with fresh water.
Leak Detection:

A leak detection survey was completed in October of 2005. That survey indicted that there were no leaks in the Town of Kirby water system. That indicates that flows recorded at the main meter, where water enters town, should match the water use billed to customers closely, once water used for flushing is accounted for in the records.

Water Meters:

The Town has started a water meter replacement program and is planning to replace water meters this year. The Town will be installing Census brand meters during this replacement program.

Backflow Prevention and Cross-connection Control:

The Town is required to have a cross-connection control policy under DEQ regulations. Following are the basic requirements that must be met:

- Any new residential water connections made will be required to install backflow prevention devices.
- Existing unmodified service connections are “grand-fathered” and do not need to install back-flow prevention devices until replaced.
- Services that are connected to a water main that is being replaced or service lines that are replaced (by owner or the Town) will need to install backflow prevention or other appropriate devices.
- A meter assembly with dual check valve is sufficient on low-hazard services. A plumber or the homeowner will need to install an expansion tank and pressure-relief valve venting to atmosphere to protect the piping against damage.
- All high-hazard non-residential connections will need to install and maintain a backflow prevention device, if not already present. According to the DEQ, this rule has existed since 1985. Examples of facilities with probable high-hazard connections include: restaurants, laundries, dry cleaners, irrigation systems, facilities producing or utilizing hazardous substances, sewage treatment plants, mortuaries, refineries, car washes, etc.
- Water supplies shall establish and keep records showing how they are complying with the new regulations. The utility should know where high hazard connections are, make sure backflow prevention devices are in-place, and make sure that they are tested annually.
Treated Water Lines

- 1" HDPE
- 2" HDPE
- 4" PVC
- 6" PVC
- 6" AC
- 6" STEEL
- 8" PVC

- Fire Hydrants
- Fire_Hydrants_Proposed
- Treated Water Valves
- Manholes
- Raw Water Wells

Flushing Order | Flushing Minutes | Flushing Gallons
---|---|---
1 | 50 | 20000
2 | 100 | 60000
3 | 100 | 1000
4 | 400 | 2000
5 | 1500 | 3000
6 | 1500 | 3000
7 | 3000 | 500
8 | 3000 | 1000
9 | 2000 | 1500
10 | 1000 | 1500
11 | 2000 | 2000
12 | 500 | 1000
13 | 11000 | 1000
14 | 2000 | 2000

TOWN of KIRBY - LEVEL 1 STUDY
Water System Flushing Detail

Engineering Associates - Cody, Wyoming
Consulting Engineers and Surveyors
### Town of Kirby
### Water System Maintenance Schedule

#### YEAR: 2006

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APPENDIX E

TOWN OF KIRBY

POLICY FOR THE CONTROL OF BACKFLOW AND CROSS-CONNECTIONS

DECEMBER, 2005
A POLICY FOR THE CONTROL OF BACKFLOW AND CROSS-CONNECTIONS

ADOPTED PURSUANT TO THE REQUIREMENTS OF
THE WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY RULES AND REGULATIONS
CHAPTER 12, SECTION 14, SUBSECTION i, ENTITLED
“CROSS-CONNECTIONS”
WHICH MAY AFFECT POTABLE WATER LINES BELONGING TO
THE TOWN OF KIRBY, WYOMING

WHEREAS, the Town of Kirby operates a water supply system which serves
the Town of Kirby and certain surrounding areas;

WHEREAS, it is recognized that cross-connections allowing non-potable
water or other foreign substances to contaminate the municipal drinking water supply
present an imminent health hazard to both residential and non-residential users of
the public water system and the threat of significant economic loss due to disrupted
water service to all users including residential, commercial, industrial, and
institutional water users and the possibility of liabilities that may be incurred;

WHEREAS, the cost of restoring the public water supply after contamination
presents the possibility of substantial financial liability to the Town of Kirby;

WHEREAS, the penalty for knowingly violating the Wyoming Department of
Environmental Quality Rules and Regulations may be as high a $10,000 per day;

NOW THEREFORE, be it resolved that the Town of Kirby in their regular
meeting of ________________, 2005 adopted the following Policy for the control of
backflow and cross-connections; and directs that a program be developed and
implemented to carry out the provisions of this Policy.

SECTION 1  Purpose

The purpose of this Policy is to protect the public potable water supplied by
the Town of Kirby from the possibility of contamination or pollution by isolating within
the customer’s internal distribution system(s) or the customer’s private water
system(s) such contaminants or pollutants which could backflow into the public
potable water system.

The Policy promotes the elimination or control of existing cross-connections,
actual or potential, between the customer’s in-plant potable water system(s) and
non-potable water systems, plumbing fixtures and industrial piping systems.

The Policy also provides for the maintenance of a continuing program of
cross-connection control with a goal to systematically and effectively prevent the
contamination or pollution of all potable water systems, and provides for
discontinuance of service for violation of the Policy.
SECTION 2 Definitions

Approved – Accepted by the Water Commissioner as meeting an applicable specification stated or cited in this Policy, or as suitable for the proposed use.

Backflow – The undesirable reversal of flow of water or mixtures of water and other liquids, gases, or other substances into the distribution system of the public water supply from any other source or sources.

Back-Pressure – A form of backflow caused when the pressure of the water users’ system is greater than that of the water supply system. This could be caused by a pump, elevated tank, elevated piping, boiler, pressurized process, pressurized irrigation system, air pressure or any other cause of pressure.

Back-siphonage – A form of backflow caused by negative or reduced pressure in the water supply system. This situation can be caused by loss of pressure due to high water demands, a line break, excessive fire fighting flows, etc.

Backflow Preventer – A device or means designed to prevent backflow.

a) Air-Gap – The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of said vessel.

b) Reduced Pressure Principle Device – An assembly of two independently acting approved check valves together with a hydraulically operating, mechanically independent pressure relief valve located between the check valves and at the same time below the first check valve. The unit shall include properly located test cocks and tightly closing shut-off valves at each end of the assembly. The entire assembly shall meet the design and performance specifications as determined by a laboratory and a field evaluation program resulting in an approval by a recognized and approved testing agency for backflow prevention assemblies. The assembly shall operate to maintain the pressure in the zone between the two check valves at an acceptable level less than the pressure on the public water supply side of the device. At cessation of normal flow, the pressure between the two check valves shall be less than the pressure on the public water supply side of the device. In case of leakage of either of the check valves, the differential relief valve shall operate to maintain the reduced pressure in the zone between the check valves by discharging to the atmosphere. When the inlet pressure is two pounds per square inch or less, the relief valve shall open to the atmosphere. To be approved, these devices must be readily accessible for in-line testing and maintenance and be installed in a location where no part of the device will be submerged.

c) Double Check Valve Assembly – An assembly of two independently operating approved check valves with tightly closing shut-off valves on each end of the check valves, plus properly located test cocks for the testing of each check valve. The entire assembly shall meet the design and performance specifications as determined by a laboratory and field evaluation program resulting in an approval of a recognized and approved testing agency for backflow prevention assemblies. To be
approved these devices must be readily accessible for in-line testing and maintenance.

d) Dual check - A device conforming to ASSE Standard #1024 consisting of two independently acting check valves. Dual check valves are allowed only for residential water service connections that have a low hazard potential with back pressure or back-siphonage under continuous pressure.

Contamination – An impairment of the quality of the potable water by sewage, industrial fluids or waste liquids, compounds, or other materials to a degree which degrades the quality of the potable water or creates an actual or potential hazard to the public health through poisoning or through the spread of disease.

Cross-Connection – Any physical connection or arrangement of piping or fixtures between two otherwise separate piping systems; one of which contains potable water and the other non-potable water or industrial fluids of questionable safety, through which, or because of which, backflow may occur into the potable water system. This would include any temporary connections, such as swing connections, removable sections, four-way plug valves, spools, dummy sections of pipe, swivel or change-over devices or sliding multi-port tube.

Cross-Connections – Controlled – A connection between a potable water system and a non-potable water system with an approved backflow prevention device properly installed and maintained so that it will continuously afford the protection commensurate with the degree of hazard.

Cross-Connection Control by Containment – The installation of an approved backflow prevention device at the water service connection to any customer’s premises where it is physically and economically infeasible to find and permanently eliminate or control any or all actual or potential cross-connections within the customer’s water system; or the installation of an approved backflow prevention device on the service line leading to and supplying a portion of a customer’s water system where there are actual or potential cross-connections, within the customer’s premises which cannot be effectively eliminated or controlled at the point of the cross-connection.

Water Commissioner – The Water Commissioner is the Water System Operator for the Town of Kirby, and is invested with the authority and responsibility for the implementation of an effective cross-connection control program and for the enforcement of the provisions of this Policy and corresponding Wyoming Department of Environmental Quality Rules and Regulations.

DEQ – The Administrator of the Wyoming Department of Environmental Quality or a representative of the Administrator.

Hazard Classification Surveyor – Hazard classifications shall be conducted by hazard classification surveyors that are certified by the USC-Foundation for Cross-Connection Control and Hydraulic Research, the American Association of Sanitary Engineers (ASSE), or by another state certification program approved by the DEQ,
by a certified water distribution system operator employed by the Town, or by a professional engineer licensed in Wyoming.

**Hazard, Degree of** – An evaluation of the potential risk to public health and the adverse effect of the hazard upon the potable water system.

a) **Hazard – High** – A situation created when any substance which is or may be introduced into a public water supply poses a threat to public health through poisoning, the spread of disease or pathogenic organisms, or any other public health concern. Premises having (1) internal cross-connections that cannot be permanently corrected and controlled, or (2) intricate plumbing and piping arrangements or where entry to all portions of the premises is not readily accessible for inspection purposes, making it impracticable or impossible to ascertain whether or not dangerous cross-connections exist shall be considered a high hazard service connection.

b) **Hazard – Low** – a situation created when any substance which is or may be introduced into a public water supply does not pose a threat to public health but which does adversely affect the aesthetic quality of the potable water, but would not be dangerous to health. This includes all residential service connections where a hazard survey has not been completed and domestic non-residential service connections not identified as high hazard connections.

c) **Hazards – Extreme** - In the case of any water user’s system where, in the opinion of the Town or the DEQ, an undue health threat is posed because of the presence of extremely toxic substances or potential back pressures in excess of the design working pressure of the device, the Water Commissioner may require an air gap at the water service connection to protect the public water system.

**Town** – The Town of Kirby.

**Water – Potable** – Any water which, according to recognized standards, is safe for human consumption.

**Water – Non-Potable** – Water which is not safe for human consumption or which is of questionable safety.

**Water – Service Connection** – The terminal end of a service connection from the public potable water system; i.e., where the Town loses jurisdiction and sanitary control over the water at its point of delivery to the customer’s water system. If a meter is installed at the end of the service connection, then the service connection shall mean the downstream end of the meter. There should be no unprotected takeoffs from the service line ahead of any meter or backflow prevention device located at the point of delivery to the customer’s water system. Service connection shall also include water service connection from a fire hydrant and all other temporary or emergency water service connections from the public potable water system.
**Water** – Used – Any water supplied by the Town from the public potable water system to a consumer’s water system after it has passed through the point of delivery and is no longer under the sanitary control of the Town.

**Water System**

a) The water system shall be considered as made up of two parts: The Town’s Water System and the Customer’s System.

b) The Town’s Water System shall consist of the source facilities and the distribution system; and shall include all those facilities of the water system under the complete control of the Town, up to the point where the customer’s system begins.

c) The source facilities shall include all components of the facilities used in the production, treatment, storage, and delivery of water to the distribution system.

d) The distribution system shall include the network of conduits used for the delivery of water from the source to the customer’s system.

e) The customer’s system shall include those parts of the facilities beyond the termination of the Town’s distribution system which are used in conveying Town-delivered domestic water to points of use.

**SECTION 3 Responsibility**

The Water Commissioner shall be responsible for the protection of the public potable water distribution system from contamination or pollution due to the backflow of contaminants or pollutants through the public potable water service connection. If, in the judgment of said Water Commissioner, based on information provided by an authorized hazard classification surveyor, an approved backflow prevention device is required at the customer’s water service connection; or, within the customer’s private water system for the safety of the water system, the Water Commissioner or his designated agent shall give notice in writing to said customer to install such an approved backflow prevention device(s) at specific location(s) on his premises. The customer shall immediately install such approved device(s) at his own expense; and failure, refusal, or inability on the part of the customer to install, have tested, and maintain said device(s) shall constitute grounds for discontinuing water service to the premises until such requirements have been satisfactorily met.

The Water Commissioner shall maintain documentation of all non-residential connections to the Town water system indicating the hazard classification of each connection, name and address of the hazard classification surveyor, dates and results of testing and hazard classification survey, any modification or repair of backflow prevention devices, and any other pertinent information deemed appropriate by the Water Commissioner.
The Water Commissioner or a designated representative shall perform or cause to be performed a hazard classification survey to determine the level of hazard associated with each non-residential water service connection.

SECTION 4 Requirements

Pursuant to Section 3, the following requirements are part of the Town’s policy for protection of the water supply.

1) No water service connection to any premises shall be installed or maintained by the Town unless the water supply is protected as required by Chapter 12, Section 14, Subsection i of Wyoming Department of Environmental Quality Water Quality Rules and Regulations; State Statutes; and this Policy. Service of water to any premises shall be discontinued by the Town if a backflow prevention device required by this Policy is not installed, tested, and maintained at the customer’s expense; or if it is found that a backflow prevention device has been removed, by-passed; or if an unprotected cross-connection exists on the premises. Service will not be restored until such conditions or defects are corrected.

2) The customer’s system shall be open for inspection at all reasonable times to authorized representatives of the Town to determine whether cross-connections or other structural or sanitary hazards, including violations of this Policy exist. When such a condition becomes known, the Water Commissioner shall deny or immediately discontinue service to the premises by providing for a physical break in the service line until the customer has corrected the condition(s) in conformance with State and Town statutes relating to plumbing and water supplies and the regulations and codes adopted pursuant thereto.

3) An approved backflow prevention device shall also be installed, at the customer’s expense, on each service line to a customer’s water system at or near the property line or immediately inside the building being served; but, in all cases, before the first branch line leading off the service line wherever the following conditions are met:

   a) A new low hazard service connection is made or an existing low hazard service connection is modified, reconnected to a main, or activated.

   b) A high hazard service connection is identified through a hazard classification survey or other means and the facility owner is notified by the Water Commissioner that a backflow prevention device is needed. For existing facilities, owners shall have 30 days to install an approved device after the date of notification. New or modified services shall install an approved device prior to activation. Existing backflow prevention devices found to be defective or functioning improperly shall be immediately repaired or replaced.

   c) An extreme hazard connection is identified through a hazard survey or other means and the owner or operator is notified. The service connection to any facility identified as having an extreme hazard shall immediately be terminated.
Service shall not be restored until an approved device is installed or other modification made to the customer’s system to eliminate the extreme hazard.

d) The following table shows the type of backflow prevention device required to be installed based on the level of hazard associated with a service connection as determined by a hazard survey.

**Backflow Prevention Devices, Assemblies and Methods**

<table>
<thead>
<tr>
<th>Device, Assembly or Method</th>
<th>Low Hazard</th>
<th>High Hazard</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Back-Siphonage</td>
<td>Back-Pressure</td>
<td>Back-Siphonage</td>
</tr>
<tr>
<td>Air gap</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Atmospheric Vacuum Breaker</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Spill-proof Pressure-type Vacuum Breaker</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Double Check Valve Backflow Preventer</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Pressure Vacuum Breaker</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Reduced Pressure Principle Backflow Preventer</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dual Check</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1**: For spouts with an effective opening diameter of one-half inch or less, the minimum air gap when the discharge is not affected by side walls shall be one inch. The minimum air gap when the discharge is affected by sidewalls shall be one and one-half inches. For effective openings greater than one-half inch, the minimum air gap shall be two times the effective opening diameter when the discharge is not affected by side walls. The minimum air gap when the discharge is affected by sidewalls shall be three times the effective opening diameter.
All backflow prevention devices other than air gaps have the potential to damage piping systems if adequate pressure control mechanisms are not installed. The minimum devices that should be installed to assure potential damage to piping and water damage to property is reduced are an expansion tank and a pressure release valve which may be integral to the water heater. Plumbers should consult the plumbing code adopted by the Town and comply with requirements found therein to protect the customer’s system.

4) The type of protective device required under subsection (3) above shall depend upon the degree of hazard and type of use as follows:

   a) Residential service connections where no business is performed are considered to be low hazard back-siphonage connections, unless a hazard classification survey indicates that another hazard classification is applicable.

   b) Non-residential domestic services and home businesses are considered to be low hazard back-pressure connections, unless a hazard classification survey indicates that another hazard classification is applicable.

   c) Non-domestic commercial or industrial water service connections shall be considered to be high hazard back pressure connections, unless determined otherwise by a hazard survey. Examples include restaurants, refineries, chemical mixing facilities, sewage treatment plants, mortuaries, laboratories, laundries, dry cleaners, irrigation systems, facilities producing or utilizing hazardous substances, car washes, etc. For some of these service connections, a hazard survey may result in a determination of a low hazard back-siphonage or low hazard back-pressure classification. The backflow prevention device shall be appropriate to the hazard classification. Where potential high hazards exist within the non-residential water user’s system, even though such high hazards may be isolated at the point of use, an approved backflow prevention device shall be installed and maintained at the water service connection. The public water system shall be protected by an approved air-gap separation or an approved reduced pressure principle backflow prevention device, at the expense of the owner of the premises.

   d) In the case of any premises where there are “uncontrolled” cross-connections, either actual or potential, the public water system shall be protected by an approved air-gap separation or an approved reduced pressure principle backflow prevention device at the service connection, at the expense of the owner of the premises.

   e) In the case of any premises where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make a complete in-plant cross-connection survey, the public water system shall be protected against backflow from the premises by either an approved air-gap separation or an approved reduced pressure principle backflow prevention device on each service to the premises, at the expense of the owner of the premises.

5) Any backflow prevention device required herein shall be a model and size approved by the Water Commissioner and DEQ. The term “Approved Backflow
Prevention Device” shall mean a device that has been manufactured in full conformance with the latest revision of American Water Works Association (AWWA) Standard C510 for Double Check Valve Backflow Prevention Devices and/or AWWA Standard C511 for Reduced Pressure Principle Backflow Prevention Devices, and have met completely the laboratory and field performance specifications of the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California (USC-FCCCHR), International Association of Plumbing/Mechanical Officials (IAPMO), or American Society of Sanitary Engineers (ASSE).

Final approval shall be evidenced by a “Certificate of Approval” issued by an approved testing laboratory certifying full compliance with said AWWA standards and USC-FCCCHR, IAPMO, or ASSE specifications. Backflow preventers which may be subjected to back pressure or back siphonage that have been fully tested and have been granted a Certificate of Approval by said qualified laboratory and are listed on the laboratory’s current list of “Approved Backflow Prevention Devices” may be used without further test or qualification.

All devices, except dual checks meeting ASSE Standard #1024, shall be in-line serviceable, in-line testable, and installed according to manufacturer’s recommendations. ASSE Standard #1024 dual checks may be used by default on residential services and on domestic non-residential services if a hazard survey indicates that only a low hazard back-siphonage potential exists.

6) It shall be the duty of the customer-user at any premises where backflow prevention devices are installed on high hazard non-residential services to have certified inspections and operational tests made at least once per year. These inspections and tests shall be at the expense of the water user and shall be performed by a hazard classification surveyor certified by USC-FCCCHR, ASSE, or a DEQ approved certification program approved by the Water Commissioner. The customer-user shall notify the Water Commissioner in advance when the tests are to be undertaken so that Town representatives may witness the tests if so desired. These devices shall be repaired, overhauled, or replaced at the expense of the customer-user whenever said devices are found to be defective. Records of such tests, repairs and overhaul shall be submitted to the Water Commissioner before December 31 of each year and copies of the records for the most recent three years kept and made available at the Water Commissioner’s request.

7) Residential service connections which do not meet the requirements of this section, but that were approved devices for the purposes described herein at the time of installation, shall be excluded from the requirements of these rules so long as the Water Commissioner is assured that potential contamination of the Town’s water system is minimal. Whenever the existing service is moved from the present location, replaced, reconnected to a new main, or requires more than minimum maintenance, or when the Water Commissioner finds that the maintenance constitutes a hazard to health, an approved backflow prevention device meeting the requirements of this section shall be installed.
SECTION 5 Discontinuance of Service

The Town shall deny or discontinue water service to a premises if a required backflow prevention device is not installed or properly maintained. Water service shall not be restored to such premises until the deficiencies have been corrected or eliminated to the satisfaction of the Water Commissioner and/or DEQ.

PASSED, APPROVED AND ADOPTED this ___th day of December, 2005.

__________________________
Irene Hurley, Mayor

ATTEST:

__________________________
Kris Price, Clerk/Treasurer