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# TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY
   1.1 PROJECT OVERVIEW
   1.2 STUDY OBJECTIVES
   1.3 WATER SYSTEM OVERVIEW
      1.3.1 WELL SOURCE
      1.3.2 SPRING SOURCE
      1.3.3 BOOSTER PUMP SYSTEM
      1.3.4 WATER STORAGE TANK
   1.4 POPULATION GROWTH
      1.4.1 POPULATION GROWTH PROJECTIONS
      1.4.2 POPULATION GROWTH, ALTERNATIVE DEMAND PROJECTIONS
      1.4.3 POPULATION GROWN CONCLUSION
   1.5 WATER DEMAND PROJECTIONS
   1.6 RECOMMENDATIONS AND CONCLUSIONS
      1.6.1 RECOMMENDED BOOSTER PUMP SYSTEM IMPROVEMENTS
      1.6.2 RECOMMENDED DISTRIBUTION SYSTEM IMPROVEMENTS
      1.6.3 RECOMMENDED RATE ADJUSTMENTS
FIGURE 1.1
TOWN OF THAYNE
WATER SYSTEM OVERVIEW
1.1 PROJECT OVERVIEW

The Town of Thayne Water System was initially constructed in 1949 and has since been upgraded and expanded several times. The system consists of two ground water sources (one spring and one well), a 340,000-gallon steel storage tank, a booster pump station, and distribution piping ranging in size from 2-inch to 12-inch. The current water system is owned by the Town of Thayne and is governed by its Town Council.

The Wyoming Water Development Commission (WWDC) commissioned a Level II Study to determine the need for, amount of, and options for additional water storage for the Town of Thayne (Town). This study was based on anticipation for significant population growth in the area over the next several years and historically high water use issues identified in previous studies. Also, additional water storage in Thayne was identified in the “Star Valley Regional Master Plan Level I Study” as an opportunity to supply other communities in the area.

High water usage has been recorded in the existing water system over the past few years. Part of the approach to the study was to confirm and document this high water use and consider appropriate water conservation measures. Thayne has recently completed the installation of the majority of individual water meters in the district, which allows the confirmation of domestic water use by reconciling the main water meter with data from individual water meters. This information is key and prerequisite to properly defining the Town’s water demand and associated storage requirements.

1.2 STUDY OBJECTIVES

The scope of this project was originally focused on defining additional water storage for the Town of Thayne water system. At the time the project began, the Town of Thayne had obtained an additional 500 gpm water right to the Flat Creek Spring from the Star Valley Cheese Factory. It was speculated that this additional water right might also reduce the need for additional storage. It was also speculated that the limited capacity of the booster pump station would likely limit the ability to develop the additional water right. It was determined that the spring source should be evaluated for its ability and potential to consistently supply water to the maximum water right. It became apparent in the review of the spring source that the Town should utilize and develop the recently acquired water right as an interim alternative to adding tank storage. Accordingly, the focus of the original scope of the report changed from evaluation of an alternate tank site and sizing of a new tank to increase storage capacity, to the evaluation of the spring supply source, the existing and increased water rights associated with it, and the capacity of the transmission systems with focus on the existing booster pump station and its ability to meet DEQ requirements.

The data from the master supply meters shows unexpectedly high water use for the Town of Thayne. The evaluation of the master meter data and records from the recently installed water service meters allows the leakage and unmetered use in the system to be defined. This evaluation was considered to be important since the scope of the project includes a water conservation component.
The addition of the water meters to the Town system allows the Town to charge user fees that are directly related to water use for each service in the system.

Accordingly, this report summarizes the work efforts by JA to provide recommendations for the study objectives listed above. Please refer to the final report for additional information.

1.3 WATER SYSTEM OVERVIEW

The Town of Thayne water system is supplied by two sources: spring water from Flat Creek Spring and a groundwater well located near the Bear Hollow Subdivision. Water from the spring source is connected to a booster pump system that pumps the spring water to the finished storage tank. Water from the well is connected to the distribution system prior to transmission to the tank. The well and spring sources are connected to the tank independently via separate transmission mains. The distribution system includes water mains of various sizes, isolation valves, fire hydrants and water service connections.

1.3.1 – WELL SOURCE

The Thayne Water Supply, Phase I Well was constructed in 2000. At that time, the spring was the only water source in the system. The well is 272 feet deep with a 12-inch diameter casing and 18-inch drive shoe. The Phase I Well is permitted for 650 gpm. Controls, flow meter, disinfection equipment, piping and appurtenances are enclosed in a small building adjacent to the well.

Operationally, the well is considered secondary supply and does not currently have a backup power source. The well pumps directly into the water system and to the storage tank via 10-inch and 12-inch transmission piping, and produces approximately 650 gpm utilizing a 40 horsepower submersible pump. The well pump is controlled by level sensing devices located in the tank. The well has chlorination equipment available, which appears to be in working order.

1.3.2 – SPRING SOURCE

The Flat Creek Spring is the primary source of water for the Town. The spring was originally developed in the late 1940’s and recently redeveloped in 2000. The redevelopment project (Phase II Water Supply) included an upgrade to the spring collection system and replacement of the 10-inch water main between the spring and booster pump station with a new 6,350 lineal foot 12-inch diameter PVC main. Water is collected from the spring utilizing an infiltration gallery network collected in a large concrete collection box. The collection box has two pipes that discharge into a pond to handle overflow. The collected water is conveyed to the town through the 12-inch main routed through the Flat Creek drainage to a booster pump station located on the south side of the town. From there, the booster pump station pumps the spring water approximately 138 feet vertically to the water storage tank via a 6-inch PVC pressure transmission main.
Originally, the Town of Thayne and the Star Valley Cheese Factory shared water rights to the Flat Creek Spring. The Town has acquired the 500 gpm water right from the Cheese Factory and now has an 800 gpm water right to the spring.

JA conducted field tests of the Flat Creek Spring at two different times of year to determine the specific capacity of the existing spring. The first inspection occurred in the fall of 2010 and the second occurred in the spring of 2011. For both inspections, JA placed a diffuser and water flow meter on a fire hydrant located on the upstream side of the booster pump station. This method provided a convenient flow test of existing infrastructure. Based on the two tests and associated flow data, the Flat Creek Spring source and 12-inch gravity pipeline appear to be capable of delivering the 800 gpm target to the booster pumps. For a more accurate account of the capacity of the spring, flow should be measured every month.

1.3.3 – BOOSTER PUMP STATION
The booster pump station is located on the south end of town on the northeast corner of Hokanson Avenue and Jerry Lane. The system was constructed in the mid-1980’s as part of the water storage and pump station project. The system consists of two small centrifugal pumps, motors, valving, chlorination equipment, and controls. The booster station and chlorination equipment is housed in separate prefabricated enclosures located within a 30’x30’ fenced area.

Electrical power is supplied by a single overhead service line connected to a utility pole adjacent to the pump station. There is an electrical meter and emergency disconnect on the utility pole. No redundant service power or emergency generator power supply is available.

The booster pump station is connected to the water storage tank via a 6-inch diameter PVC transmission main that was installed as part of the storage tank/pump station project.

The existing booster pump station is capable of pumping 278 gpm. In order to fully utilize the 800 gpm water right from the Flat Creek Spring, the Town will need to upgrade the existing booster pump facility.

1.3.4 – WATER STORAGE TANK
The Town of Thayne water system has one water storage tank located on a hill east of the Town (See Figure 1.1). The steel tank was constructed in the mid-1980’s as part of the Phase I Water Storage Project. The Phase I Water Storage Project included the tank, booster pump station, and transmission line between the booster station and the tank.

According to the record drawings, dated November 1985, the tank has an inside diameter of approximately 48 feet and a height of about 25 feet, providing a finished water storage volume of approximately 340,000 gallons. The tank was constructed on a deep foundation that consists of 37 18-inch diameter concrete filled steel piles driven approximately 40 feet deep into the underlain gravel stratum. The piles are spaced at approximately 8 feet on center and are capped with a 16-inch thick reinforced concrete slab.
The condition of the tank foundation was inspected as a part of this project in September of 2010. There were no major issues encountered during the inspection with regard to the condition of the visible portion of the concrete foundation and steel piles. Further investigation of the tank condition was not performed for this project.

1.4 POPULATION GROWTH

The Wyoming Department of Administration & Information Economic Analysis Division (EAD) published population forecasts, by county, until 2030. These forecasts are generally accepted population projections used in Wyoming. The following estimates are based on EAD population forecasts.

The EAD indicates there was a slight decline in Thayne residents between 2001 and 2004 where the annual percent growth rate dropped to -0.5% but the population increased modestly from 2004 to 2010 where the annual rate increased to 0.7% and an overall annual increase from 2000 to 2010 of 0.7% (EAD, Oct. 2011).

1.4.1 – POPULATION GROWTH PROJECTIONS

Data from the U.S. Census bureau reflects that the current population of Thayne, Wyoming is 366 people. The population from 2010 to 2030 is projected to increase to 422 people. According to the EAD/DA&I, the projections for all of Lincoln County indicate a total population variation of approximately 0.6% annually from 2010 to 2020 to 0.9% annually from 2020 to 2030, which shows an overall population increase for the Town of Thayne.

1.4.2 – POPULATION GROWTH, ALTERNATIVE DEMAND PROJECTIONS

Alternative 1:
The Lincoln County Comprehensive Plan, Appendix 6, Transportation and Access Management lists growth rates for Lincoln County divided up into specific areas that were used for the future 2030 roadway network. These growth rates for Lincoln County were also used as an alternative for demand projections as they relate to Thayne, Wyoming.

Overall, Lincoln Country is growing at different rates. Thayne would be considered in the Lower Valley portion of Lincoln County. This assumes an annual growth rate of 4.00%.

Alternative 2:
The Town of Thayne Municipal Master Plan uses three different potential growth scenarios, i.e., low, moderate, and high growth for the community. They were developed for a 10-year period, from 2009 to 2019 and were based on economic growth. The reason they only projected to 2019 is because they determined it was unreliable to estimate future employment opportunities.

1.4.3 – POPULATION GROWTH CONCLUSION

Given the above scenarios, the Wyoming Department of Administration & Economic Analysis Division (EAD) published data on Census information for 1990, 2000 and 2010 is considered to be the most accurate for projecting future water demand. From that data it appears that the
Town of Thayne has grown sporadically in the past 20 years, which is supported by actual population values. The 1990 census showed a population of 267 people in the corporate limits while the 2000 census indicated a population of 342 for Thayne. This is a 22% increase from 1990. The results for the 2010 Census shows the population of Thayne has increased to 366 people in that 10-year period, representing a 7% increase from 2000.

It is not expected that annexations will have a substantial effect on the water demand projection beyond the EAD/DA&I rate. However, there is an increased potential given that the annexations have occurred and the Town is motivated to expand. Consequently, this report utilizes a slightly higher growth rate of 1.5% for water demand projections as compared to the suggested EAD/DA&I expected growth rate of 0.9%.

1.5 WATER DEMAND PROJECTIONS

The current water use was analyzed under two conditions. The raw water supply into the system as well as the metered water use at the water service taps were considered. The comparison between the two allows the system to be examined for actual domestic use and helps identify the volume of unmetered water. This data combined with the population growth projections from the previous chapter, allows the water demand projections to be generated.

The Town of Thayne water system has flow meters installed on the well supply and on the booster pumps connected to the spring source. Weekly records measuring the raw water into the system were gathered for the period from January 2009 to April 2012. The maximum day demand was observed in July 2011 to be 792,500 gallons per day (gpd). The average demand over the equivalent time period was 410,000 gpd.

The Town of Thayne began a project installing water meters on individual water service connections to the Town water system in the summer of 2010. Construction and functional related setbacks have resulted in a delay in the completion of the individual water meter project. To date, the project is not entirely complete as several meters are either not reading properly or have known leaks. Based on data from September 2011 through April 2012 there are a total of 241 meters installed. Of the 241 meters, there are 11 meters that are not properly reading and 27 meters connected to a vacant lot or empty house. For the purpose of this analysis, an estimate based on similar connection types was used for the meters not properly reading. The average demand based on metered use was 215,000 gpd.

The difference between the raw water into the system and the metered water use for the same period is the volume of unmetered water. For the time period analyzed for this project, the unmetered water represents approximately 40%. As previously mentioned, there are several meters that are known to have errors in metered data collection and average values are used in place of erroneous information. This is one potential source of lost water in the system but the majority of the unmetered water is likely water lost to leakage in the distribution system. Typically, water systems of this size have between 10-15% loss. Given the age of this system, it is expected that the values would be beyond the norm.
The Town has recently adopted a new fee structure using similar values to the average use for the base monthly rate. The base rate of $23.75/month ($0.79/1000 gallons) will cover a base volume of 30,000 gallons/month for a standard residential ¾-inch water service connection. Variations of this rate will be applied to non-residential connections. An overage rate of $0.50/1000 gallons will apply to use in excess of the base volume. For more information related to the adopted fee schedule, please refer to the recently completed Town of Thayne Water Fee Study.

1.6 RECOMMENDATIONS AND CONCLUSIONS

The Town of Thayne water system appears to be in good order and additional water storage is not necessary at this time provided the booster pump system upgrades are completed. However, the current water use is far beyond national averages and the Town should pursue conservation efforts to reduce the demand on the system.

1.6.1 – RECOMMENDED BOOSTER PUMP SYSTEM IMPROVEMENTS

In order to fully utilize the 800 gpm water right from the Flat Creek Spring and increase the water supply into the system, it is recommended that the Town upgrade the existing booster pump facility to accommodate the additional flow.

New pumps and appurtenances including valves, meters, and controls should be housed in a small building (18’X24’) along with chlorination equipment and a new backup power generator. The new building will allow the operators to perform maintenance and respond to emergency situations in all weather conditions.

The proposed upgrade to the booster pump station was analyzed under four scenarios. Alternatives utilizing duplex and triplex pump systems as well as making use of the existing 6-inch main versus upsizing to a 10-inch main were included in the analysis. It is the recommendation of this report that the Town pursue Alternative 2b, a triplex booster pump system and upsize the existing transmission main from 6-inch to 10-inch.

This system should include a backup generator with fuel storage capable of a minimum of 24 hour run time to provide the alternative power source that the DEQ requires. The generator should be sized to run the full permitted flow and other incidental loads to operate the system. The existing chlorination equipment should be integrated into the proposed booster pump upgrade and new building to the extent possible. The existing equipment appears to be in good condition and may be modified to fit the operational conditions of the new system.

The Interim Report prepared by this study outlining the upgrade to the booster pump system in lieu of tank storage was distributed to the Thayne Town Council in September of 2011. During the September council meeting, the council agreed to pursue Alternative 2a, an upgrade of the booster pump station to include a triplex pump system with alternative power capable of pumping 800 gpm with one pump out of service. The council also agreed to pursue replacement of the existing transmission line with a 10-inch diameter line. In addition, the council agreed to
pursue a WWDC grant and SRF loan to fund the project. The Town has secured funding through the SRF. The Town is currently permitting the upgrade to the booster pump system with the DEQ as recommended by this report and plans to construct the new system upon approval.

1.6.2 – RECOMMENDED DISTRIBUTION SYSTEM IMPROVEMENTS

Because of the large volume of unmetered use in the system, it is recommended that the Town identify and fix leaks in the distribution system to conserve water and avoid the cost of pumping excess water into the system. The Town should consider purchasing leak detection equipment or hiring a company that specializes in identifying leaks in a system of this size. Once leaks are identified by location and estimated volume, the Town should catalog the system and estimate a budget to repair leaks and prioritize an order of importance. It is recommended that the Town work toward a system with a minimum of 15% total loss. It is also suggested that the Town set up a proposed timeline and modify the water system budget to specifically account for this task.

1.6.3 – RECOMMENDED RATE ADJUSTMENTS

It is recommended that the Town implement a tiered rate structure that would apply higher fees for the overage volume as compared to the base volume. In that scenario, any use in excess of an established base would lead to a higher bill, thus encouraging conservation and bringing average use closer to industry averages. An overage rate of $1.00/1000 gallons beyond the base volume of 30,000 gallons/month would be consistent with rates in surrounding communities.