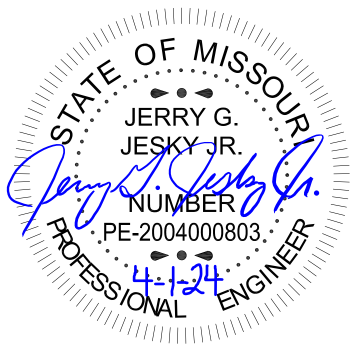
WATER SYSTEM ENGINEERING REPORT UPDATE

Prepared for:

City of Seligman, MO

Seligman, Missouri



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EXECUTIVE SUMMARY

In February 2023, the city of Seligman, Missouri authorized Olsson, Inc. to update the city's 2016 Water System Engineering Report and water system mapping to reflect current conditions. This report summarizes the current water system facilities, infrastructure and operation, historical water customers and demands, projects customer growth and water usage throughout the planning period and proposes system improvements associated with the city's water supply, treatment, storage, and distribution system to meet the projected water demands.

The main objectives of this report are:

- Update the city's water system maps with information provided by the city.
- Update the city's existing computerized hydraulic model.
- Determine current water demands and project future water needs based on historical trends in the number of in-service water meters, well pumping data, and metered water consumption.
- Establish the city's water service area and evaluate the ability of the existing system to meet current and future water demands over a 20-year planning period.
- Propose improvements that benefit current water customers and will position the city to accommodate future customer growth more easily within the service area.
- Develop preliminary OPCs in consideration of the current bidding climate and a fixed annual rate of inflation, as applicable.
- Prioritize improvements and develop an implementation schedule.

Existing Facilities

Seligman owns and operates its water system under the Public Water Supply Identification Number 5010730. Mr. Brian Nichols is the City Administrator for Seligman. The city's water system is considered a community water system and is regulated by the MoDNR central office in Jefferson City, Missouri. Regional MoDNR regulatory authority is provided by personnel staffed in the Southwest Regional Office of MoDNR, located in Springfield, Missouri.

Appendix A shows the extent of the water system and identifies major facilities, consisting of the city's three active groundwater supply wells, and one bolted standpipe. Seligman's distribution system was originally constructed in the 1950s and consists of mostly 2- and 4-inch diameter pipe. The city does not currently treat its water but pumps groundwater directly into the water system.

Seligman's water supply system consists of three active groundwater supply wells: Well No. 1, Well No. 3 and Well No. 4. Well No. 2 was formally plugged on January 26, 2016 due to high turbidity, very low water production, and bacteriologically-unsafe water.

For water system storage, Seligman has one 320,000-gallon bolted standpipe. This storage facility was installed in 1998 next to Well No. 4 to replace a 25,000-gallon elevated witch-hat storage tower that was built in the 1950s. The standpipe has a diameter of 29.6 feet, a height of 64 feet, and an overflow elevation of 1713 feet USGS. The standpipe has an air vent, roof hatch, safety ladder, manway, and overflow pipe, along with separate 8-inch inlet and outlet lines.

Well No. 4 pumps into a 8-inch waterline that connects to both the distribution system and the adjacent standpipe. With the standpipe being the only storage facility for the water system, when Wells No. 1 and 3 are in operation (via control timers), any pumped water not consumed directly by customers flows through the distribution system to the standpipe.

A more detailed discussion of the existing water system is included in Section 4.

Projected Water Demands

Olsson projected future water supply needs for the Seligman Water System based on the trends of historical water usage data and the projected number of future water customers. For the purpose of projecting demands, each meter category's average water supplied per meter was rounded up to a selected usage rate per meter. Similar to the 2016 Water Study, a maximum day peaking factor of 1.7 was determined by comparing the highest daily water pumped trends to the average daily value for water pumped.

Olsson based the projected demands on the following conclusions:

- The selected water usage per residential connection is 250 GPD.
- The selected water usage per commercial connection is 260 GPD.
- The selected water usage per public connection is 1,235 GPD.
- The selected water usage per public connection is 426 GPD.
- The number of residential meters will increase at a rate of 0.6%.
- The number of commercial meters will increase by two meters every five years.
- The number of public and fire owned meters will remain constant at 9 meters and 3 meters, respectively.
- The maximum day water usage will be 1.7 times the average day demand.
- The peak hour water usage will be 1.7 times maximum day demand.

In consideration of these parameters, the following total projected water demands were determined for the 5-year design horizons throughout the 20-year planning period:

- Current, Average Day Demand = 182,381 GPD.
- Current, Maximum Day Demand = 310,048 GPD.
- 2028, Average Day Demand = 187,588 GPD.
- 2028, Maximum Day Demand = 318,899 GPD.
- 2033, Average Day Demand = 192,928 GPD.
- 2033, Maximum Day Demand = 327,978 GPD.
- 2038, Average Day Demand = 198,407 GPD.
- 2038, Maximum Day Demand = 337,291 GPD.
- 2043, Average Day Demand = 204,027 GPD.
- 2043, Maximum Day Demand = 346,845 GPD.

These demands represent the total projected water supply needs for the entire planning area and were considered for evaluating water supply, treatment, storage, and distribution system improvements throughout the 20-year planning period.

A more detailed discussion of the existing and future demands is included in Section 5.3.

System Analysis

As a part of the 2016 Water Study, a hydraulic model was created using WaterCAD to analyze the hydraulic operation of Seligman's water system. Olsson has since transitioned to using InfoWater for master planning due to its improved usability. At the beginning of this engineering report update project, the existing WaterCAD model was converted to an InfoWater model. It is important to note that Autodesk has recently acquired InfoWater (an Innovyze product) and has switched to a new product called InfoWater Pro. At the conclusion of this project, the model was converted to InfoWater Pro to allow for a smooth start to future planning efforts.

Several demand scenarios were considered in the hydraulic analysis of the Seligman water system. Each scenario was analyzed using two methods: a snap-shot view and an extended period simulation. The snap-shot view involves analyzing the available flow at each node during a specific demand event, either average day or maximum day demand. This helps identify distribution system improvements that may be necessary in areas with insufficient flow and/or pressure. The extended period simulation (EPS) utilizes a diurnal curve that represents a typical pattern of water demand changes over the course of a day. A diurnal curve similar to the curve used in the 2016 water study was utilized for these EPS scenarios.

A more detailed discussion of the hydraulic model analysis is included in Section 6.

Summary of Recommended Improvements

Based on the analysis, several improvements are recommended to enable the city to meet its customers' needs for the next 20 years.

Recommended supply improvements include:

- Install a higher-capacity pump at Well No. 1 once the existing pump has reached the end of its useful life.
- Construct a new 300 GPM Well.

Recommended storage improvements include:

- Construct a new 400,000-Gal Elevated Storage Tank.

Recommended distribution system improvements include:

- Add looping by installing new 6-inch waterline to increase hydraulic connectivity:
  - Approximately 700 lineal feet (LF) along Finn Road between Roller Ridge Road and Lightfoot Road.
- Replace existing 2-inch waterline with 8-inch waterline at 2 locations to help convey higher flows and replace old waterlines:
  - Approximately 200 LF along Eggleston Road from Westview Road to Highway 37.
  - Approximately 1,100 LF along Highway 37 from Eggleston Road to Scott Street.
- Replace existing 4-inch waterline with 8-inch waterline at 4 locations to help convey higher flows and replace old waterlines:
  - Approximately 3,000 LF along Main St from North St to Frost Street.
  - Approximately 2,700 LF along Frost Street from Eggleston Road to Walnut Street.
  - Approximately 700 LF along Eggleston Road from Westview Road to Frost Street.
  - Approximately 1,500 LF along Stapleton Street from Hurd Street to E Roller Ridge.
- Replace existing 6-inch waterline with 8-inch waterline at 2 locations to help convey higher flows and replace old waterlines:
  - Approximately 2,500 LF along Main Street from Roller Ridge Road to North Street.
  - Approximately 850 LF along Highway 37 from the proposed elevated storage tower to Farm Road 1070.
- Install new 8-inch waterline to the proposed elevated storage tower:
  - Approximately 300 LF from Hwy 37, close to Ruark Road, connecting to the proposed water tower.

A more detailed discussion of the recommended improvements is included in Sections 6 and 7, with associated opinions of probable cost presented in Section 8.

1. INTRODUCTION

In February 2023, the city of Seligman, Missouri authorized Olsson, Inc. to update the city's 2016 Water System Engineering Report and water system mapping to reflect current conditions. This report summarizes the current water system facilities, infrastructure and operation, historical water customers and demands, projects customer growth and water usage throughout the planning period and proposes system improvements associated with the city's water supply, treatment, storage, and distribution system to meet the projected water demands. Additionally, this report presents the information necessary to submit to the Missouri Water and Wastewater Review Committee (MWWRC) for funding consideration, if the city chooses to pursue State and/or Federal funding. The proposed improvements are prioritized with a schedule and preliminary opinion of cost (OPC) for incorporation into the city's capital improvements plan (CIP).

1.1 Purpose and Scope

This engineering report serves as a planning guide to aid the city in preparing for water system improvements over the next 20 years to accommodate both existing and anticipated future water use. The main objectives of this report are:

- Update the city's water system maps with information provided by the city.
- Update the city's existing computerized hydraulic model.
- Determine current water demands and project future water needs based on historical trends in the number of in-service water meters, well pumping data, and metered water consumption.
- Establish the city's water service area and evaluate the ability of the existing system to meet current and future water demands.
- Propose improvements that benefit current water customers and will position the city to accommodate future customer growth more easily within the service area.
- Develop preliminary OPCs in consideration of the current bidding climate and a fixed annual rate of inflation, as applicable.
- Prioritize improvements and develop an implementation.

1.2 Planning Period

The planning period associated with this report extends to the year 2043, with intermediate analysis provided for the years 2028, 2033, and 2038 to enable the city to compare actual trends with projections stated herein.

2. PLANNING AREA

Seligman is in southern Barry County, in southwest Missouri. It is two miles north of the Arkansas State line along Highway 37. It is 18 miles north of Rogers, AR and 72 miles southeast of Joplin, MO. The area served by the Seligman water system is shown in Appendix A. Over 90% of the service connections are residential and several water customers reside outside the city's incorporated limits.

2.1 City History

In 1880, the Atlantic and Pacific Railroad built a rail line from Pierce City, Missouri to southern Barry County and gave 80 acres of land for the purpose of building a town in the area. Soon thereafter, a town was platted and named Seligman, which was then incorporated in 1881. Unfortunately, a series of fires in 1883 and 1884 destroyed many of the businesses throughout town, giving Seligman its first major setback. Seligman immediately began rebuilding, and in the process built the town's first public school, which was completed around 1892.

Seligman continued its rebirth well into the 20th century and by 1906, the railroad had extended south and east of Seligman well into Arkansas, which poised Seligman for greater growth and development. However, as more businesses, factories, and even a four-room hospital opened up in town, Seligman had another setback in the winter of 1922 when another fire decimated the heart of the downtown area. After the 1922 fire, the town struggled to regain its former prosperity, as the Great Depression and a steady decline in passenger rail service led to an overall decrease in the city's population. The post-war 1950s led to educational institution changes that relocated the area's high school to Washburn, Missouri, approximately 6 miles north of Seligman. This was followed by the Missouri and Northern Arkansas Railroad ceasing operations in 1958 after heavy rains washed out several bridges between Seligman and Beaver, Arkansas. Shortly thereafter, passenger trains stopped their daily runs and in 1966 the community's local Frisco Station was removed.

The city commissioned its public water system in 1954 when Well No. 1 and an adjacent 25,000-gallon elevated storage tower was constructed. Well No. 2 was drilled in 1967 followed by Well 3 in 1979. In the 1990s, Seligman started to rebuild their infrastructure again with a series of civic development projects such as a new library, a new standpipe for water storage, and various park improvements. It was during this time that Well No. 4 was brought online along with installing some of the first 8-inch waterline to the system. As needed over the last several years, the city has conducted "chlorine burns" of the distribution system to mitigate any positive coliform results and defer the implementation of full-time chlorination. Although currently considered a bedroom community for the surrounding larger cities in southwest Missouri and northwest Arkansas, a few businesses remain in the service area.

2.2 Area Demographics and Service Population

The city's population has grown from 387 people in 1960 to 813 in 2020. Between 1990 and 2000 when the civic development projects were being built, Seligman experienced its greatest growth rate from 593 people to an all-time high of 877. Since then, the population has experienced a slight decline, but has recently stabilized. In 2022, the Missouri Department of Transportation estimates that 3,200 vehicles travel through Seligman Missouri on Highway 37 each day, which could help bring future businesses and residents to the city. While there is no imminent development growth on the horizon other than a few additional residential homes, there is a significant amount of undeveloped land within and adjacent to the service area. Given the current economic, development, and land use outlook within the city's service area, the projected population throughout the planning period ending in 2043 will be based on a growth rate of 0.1% per year from the 2020 census population of 813 people. This modest growth rate is supported by the population figures exhibited over the last fifty years as well as the city's current business and infrastructure climate. Accordingly, the city's historical population is shown in Table 1 along with the projected population based on the above growth rate through the year 2043. If actual conditions change during the 20-year planning period, additional analysis may be needed at that time.

Table 1. Historical[1] and Projected[2] Service Population.

Year	Historical Population	Projected Population
1960	387	-
1970	424	-
1980	508	-
1990	593	-
2000	877	-
2010	851	-
2020	813	-
2023	-	815
2028	-	818
2033	-	821
2038	-	824
2043	-	827

[1]Historical Service Population from United States Census Bureau.
[2]Projected Service Population base on 0.1% growth.

The city has four water user categories: residential, commercial, public, and fire. Seligman has seen the total number of active meters increase from an average of 664 in 2016 to 688 in 2022. The majority of service connections are residential (~95%), with the next highest category being commercial (~3%), and the rest consisting of public and fire.

Analyzing the average number of active meters per month for each full year from 2016 to 2022, the average annual increase in the number of residential meters was 0.6%. The number of meters in the other user categories has remained relatively constant. Table 2 below summarizes the average number of meter connections for the four user categories from 2016 through 2023. The relatively low ratio of population to meter connections (~1.3 in 2020) is the result of several customers being located outside of the city's incorporated city limits.

Table 2. Average Number of Meter Connections per Year by User Category.

Year	Residential	Commercial	Public	Fire	Total Meters
2016	630	23	9	2	664
2017	633	21	9	3	666
2018	623	20	9	3	655
2019	625	19	9	3	655
2020	633	20	8	3	664
2021	643	20	9	3	675
2022	656	20	8	3	688
2023 (Jan. - July)	655	21	8	3	687
Average	**637**	**20**	**9**	**3**	**669**

Residential meter connections grew at an average rate of 0.6 percent per year between 2016 and 2022. This same growth rate was utilized for projecting future residential water meters throughout the planning period. The historical commercial meter connection growth rates have varied throughout the years. For the purposes of this study, the selected growth rate for commercial meter connections was an additional two meters every five years. Both public and fire meter connections have remained stable historically, so these two categories were selected to remain at nine meters and three meters, respectively. Table 3 shows the projected future water meters by user category utilizing these growth rates.

Table 3. Projected Number of Meter Connections by User Category.

Year	Residential	Commercial	Public	Fire	Total Meters
2023	655	21	9	3	689
2028	674	23	9	3	709
2033	693	25	9	3	731
2038	713	27	9	3	753
2043	734	29	9	3	775

These projected number of meter connections will be utilized to project average and maximum day water demands in Section 5.3.

3. TOPOGRAPHICAL, GEOLOGICAL, GROUNDWATER, AND CLIMATE CHARACTERISTICS

The usage trends and associated water system infrastructure needs can be impacted by the topographical, geological, groundwater, and climate characteristics of the area. This section summarizes those features for the city's service area.

3.1 Topology and Geology

The service area is located in south Barry County, Missouri and includes the city of Seligman. In 1994, the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) in cooperation with Missouri Department of Natural Resources, Missouri Agricultural Experiment Station, and the Missouri Department of Conservation issued the "Soil Survey of Barry County, Missouri", which references the major fieldwork performed throughout the county in 1994. Drainage is generally south, and the major rivers and creeks include Big Sugar Creek, Buffer Creek, and Beaver Creek.

Seligman is on a plateau that is around 1,500 feet in elevation and extends from Washburn to just south of Purdy and from Pleasant Ridge to south of Madry. The plateau is rounded and deeply dissected on the southeast side with slopes of 60% or more and is made up mostly of sedimentary rock and Devonian-age shale. There is also an underlayment of Mississippi-age limestone, stand stone, and shale.

Seligman is composed of the Beemont-Yelton-Lily and the Clarksville-Noark-Nixa soil associations. The Beemont-Yelton-Lily association consists of cherty sediments weathered from sandstone, shale or siltstone. There is also some fine sandy loam. The Clarksville-Noark-Nixa Association is characterized by cherty limestone residuum and some gravelly silt loam.

3.2 Groundwater

The deep groundwater is of acceptable drinking water quality, assuming reasonable wellhead protection efforts are in place. The groundwater table in the area experiences significant seasonal variations as well as dramatic fluctuations due to drawdown caused by the area wells.

MoDNR has numerous groundwater level monitoring wells throughout the state. Figures 1 through 4 below show how groundwater levels in the area's observation wells have fluctuated over the last few years, which have included both wet and dry seasons. Recent drought conditions have resulted in 20-foot to 150-foot fluctuations in the water table depending on the observation well. Seligman's existing and future wells will need to take these seasonal groundwater level fluctuations into account along with the localized drawdown caused by pumping the well. The long-term influence of the active wells in the area should also be considered when planning future wells to serve Seligman.

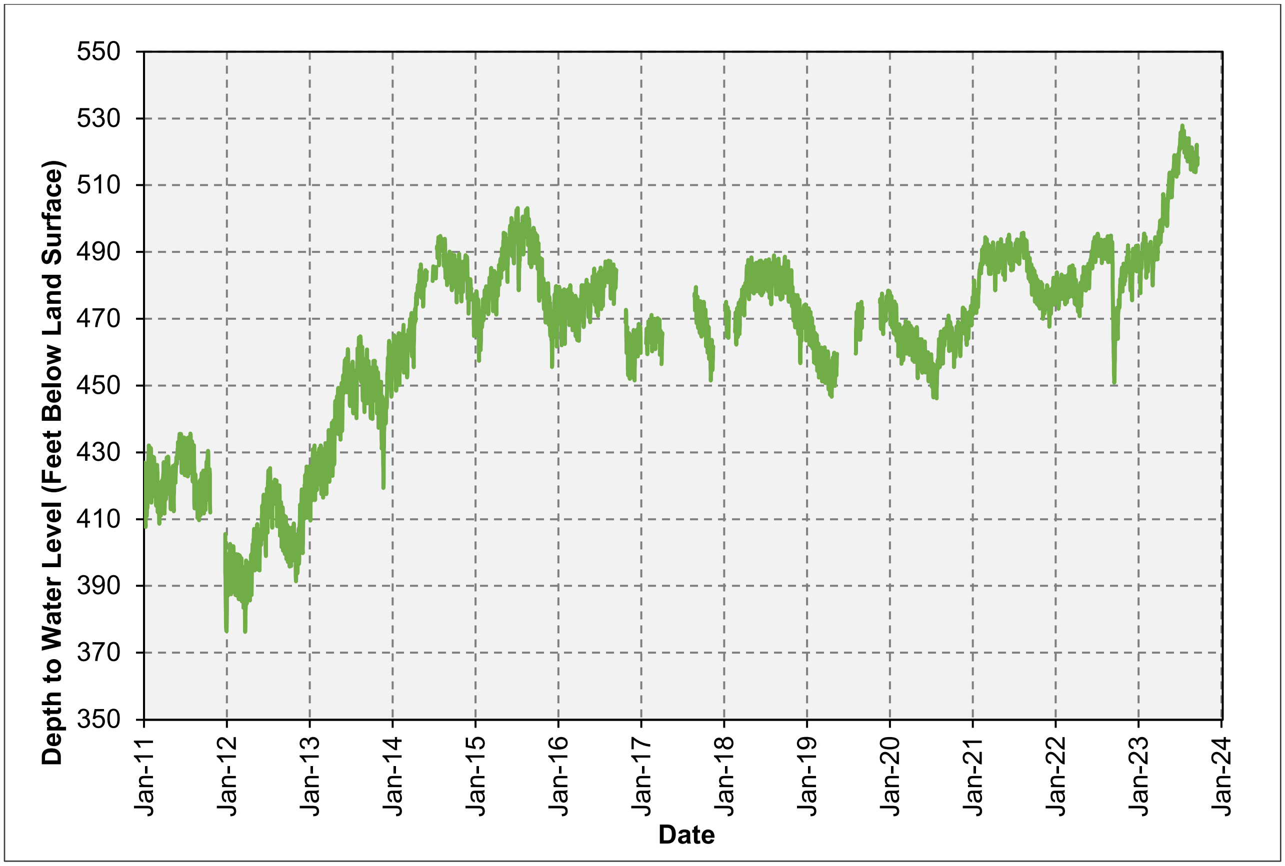


Figure 1. Water Levels at USGS Observation Well – 363236094290301 Noel

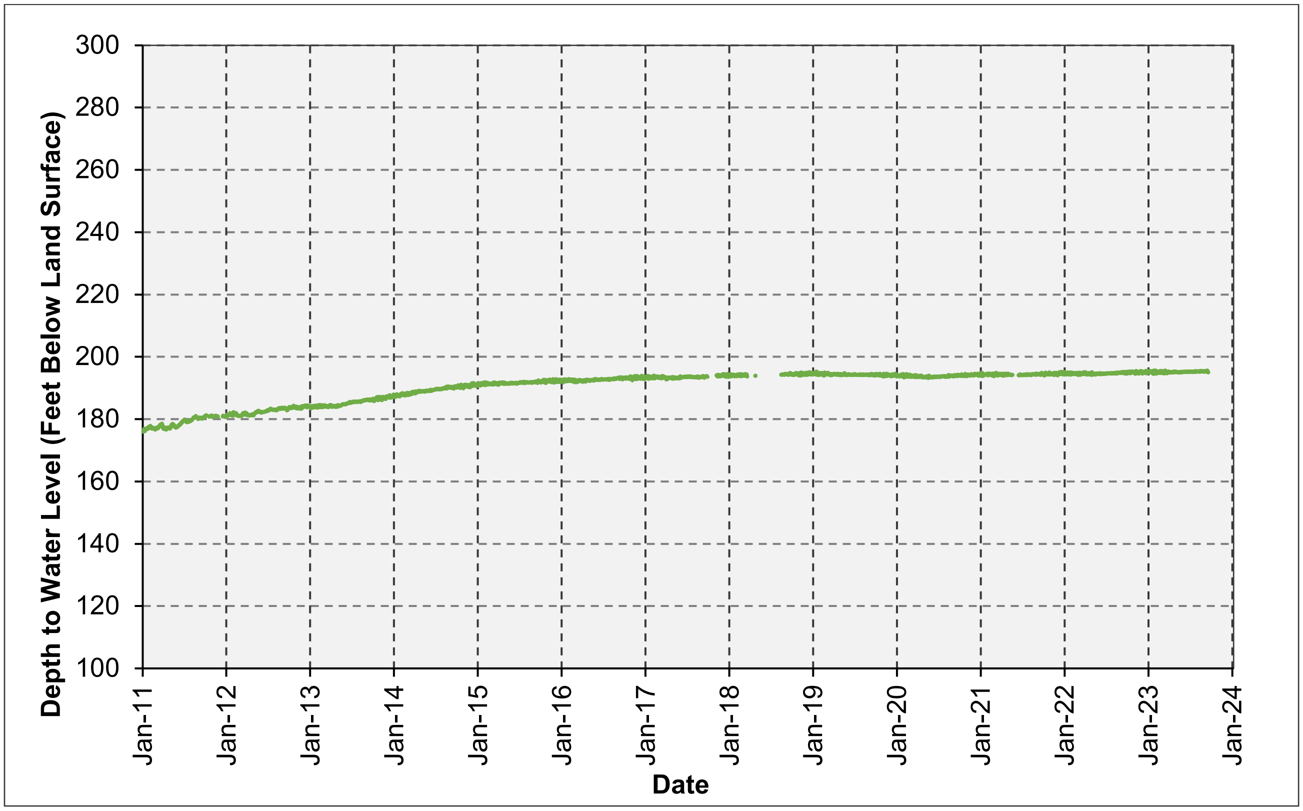


Figure 2. Water Levels at USGS Observation Well – 364313094121101 Longview

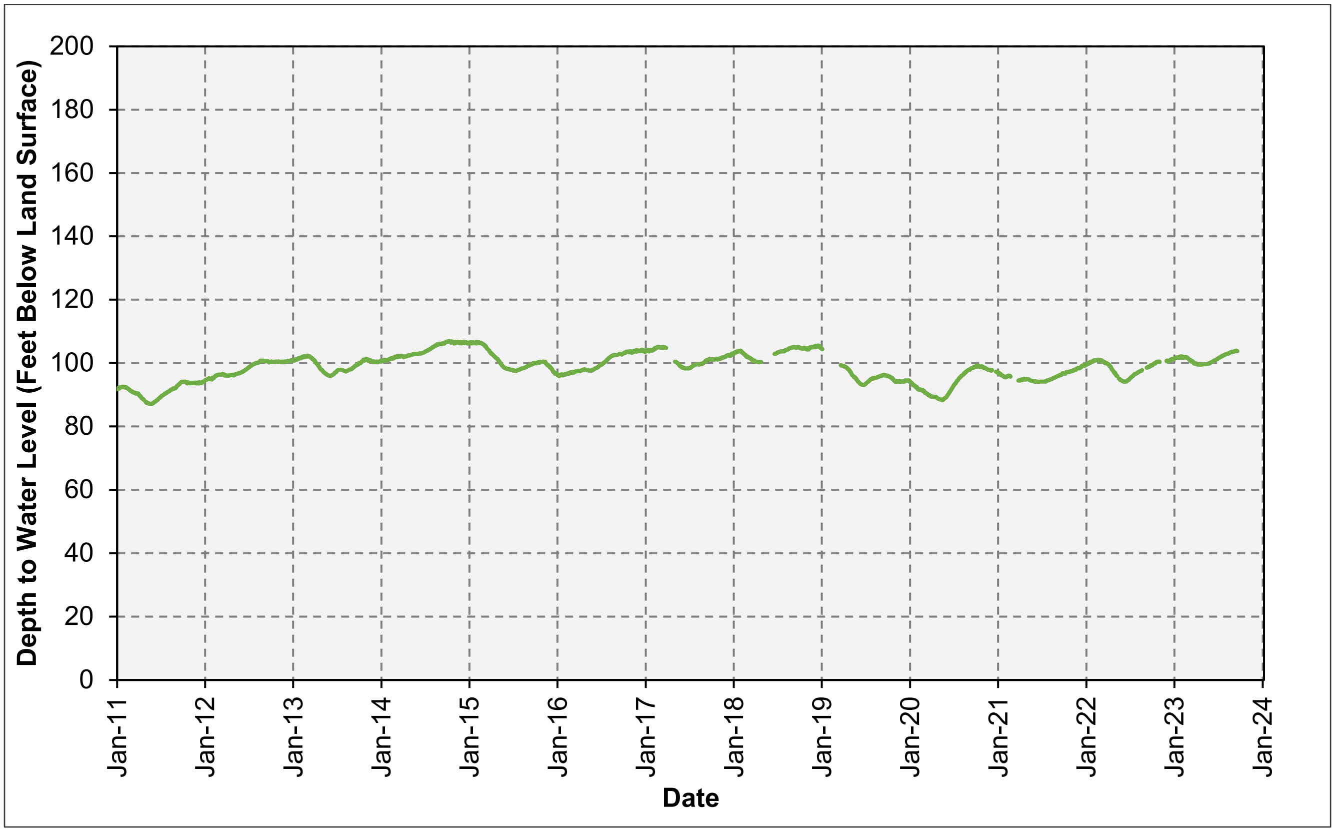


Figure 3. Water Levels at USGS Observation Well – 364818094185301 Neosho Springfield Plateau Aquifer

Figure 4. Water Levels at USGS Observation Well – 364818094185302 Neosho Ozark Aquifer

3.3 Climate

Seligman has a moderate climate similar to the county as a whole. Much of the climatological data summarized for the county in the 1994 USDA-NRCS Soil Survey was obtained from data collected at Cassville, MO between 1951 and 1986. From available records, the average winter temperature is 35°F and the average daily minimum temperature is 21°F. The lowest temperate on record, occurred in Cassville on January 19, 1984 with a temperature of -19°F. In the summer, the average temperature is 75°F and the average daily maximum temperature is 87°F. The highest recorded temperature occurred on July 31, 1980, is 106°F. Part of the summertime water demand is associated with lawn sprinkling and garden watering. Additionally, both extreme cold periods and extreme dry periods can result in an increase in waterline leaks due to soil movement and subsequent pipe stress.

The total annual precipitation is about 43 inches. Of this, more than 25 inches, or 60%, usually falls in April through September. The heaviest 1-day rainfall on record was 5.41 inches in Cassville on May 15, 1956. The average annual snowfall is about 10 inches. The highest snow depth at any time during the period of record was 14 inches. On average, three days of the year have at least one inch of snow on the ground. The average relative humidity in mid-afternoon is around 55%. Humidity is higher at night, and the average at dawn is around 80%. Average wind-speed is the highest at around 13 miles per hour in the spring.

4. EXISTING WATER SYSTEM

Seligman owns and operates its water system under the Public Water Supply Identification Number 5010730. Mr. Brian Nichols is the City Administrator for Seligman. The city's water system is considered a community water system and is regulated by the MoDNR central office in Jefferson City, Missouri. Regional MoDNR regulatory authority is provided by personnel staffed in the Southwest Regional Office of MoDNR, located in Springfield, Missouri.

The water system is owned by the city of Seligman and the Primary Operator is Kyle Fultz who meets the required DS-II certification for operation of the system. Mr. Fultz also manages and oversees the city's sewer and street departments. Mr. Fultz reports to the city's elected mayor and city council and is assisted by Keenan Roller and Jeffery Hobs. Brian Nichols, City Administrator, also has DS-II certification and can assist when necessary. Mr. Fultz is responsible for the city meeting MoDNR's Monitoring Program requirements. Once a year he also pulls a sample from each well.

Appendix A shows the extent of the water system and identifies major facilities, consisting of the city's three active groundwater supply wells, and one bolted standpipe. Seligman's distribution system was originally constructed in the 1950s and consists of mostly 2- and 4-inch diameter pipe. The city does not currently treat its water but pumps groundwater directly into the water system. Should the need for water supply disinfection or a distribution system "chlorine burn" arise in the future, the city does have the equipment installed at the active wellhouses to quickly implement hypochlorite treatment of the water supply.

4.1 Usage Rates and Finances

Seligman has two billing categories for water customers – inside the city and outside the city. The city utilizes RG3 radio-read water meters at all system connections which allows city staff to drive by each water customer location and the meter is read by equipment inside the vehicle. The city reads each customer's meter beginning around the 15th of each month to approximately the 14th of the next month. The current water use rate for water customers inside the city is $65.00 for the first 2,000 gallons and $2.25 for every 1,000 gallons thereafter. The rate associated with water sales outside the city is $70.00 for the first 2,000 gallons and $4.00 per 1,000 gallons thereafter. The city last increased water rates in 2023.

The city's 2024 water system operating budget is $305,000, and includes the essential items needed for water system operations. Reserves from the capital improvements sales tax fund have been used to supplement any shortfalls, which typically resulted from high, unexpected expenses such as replacement of a well pump that was struck by lightning.

The city has indicated that current water rates roughly compensate for the cost of operating and maintaining the existing infrastructure and account for emergency repairs, but do not allow for any significant improvements. Currently, if repairs exceed the allotted budget amount, money from the city's general fund (1-cent sales tax) is utilized to make up the difference.

4.2 Supply and Treatment

Seligman's water supply system consists of three active groundwater supply wells, Well No. 1, Well No. 3 and Well No. 4. Well No. 2 was formally abandoned on January 26, 2016 due to high turbidity, very low water production, and bacteriologically-unsafe water. Well No. 2's well house has since been demolished. The city's three active wells are summarized in Table 4.

Table 4. Well Supply Summary.

Well No.	1	3	4
Well ID No.	13753	13754	13755
Year Drilled	1953	1979	1990
Status	Active	Active	Active
Ground Elev. (ft)	1,560	1,540	1,645
Total Well Depth (ft)	1,693	1,925	2,150
Column Diameter (in)	3	3	4
Column Piping Length (ft)	987	1,029	1,008
Static WL (ft, approx.)	675	643	766
Pump Depth (ft)	987	1,029	1,008
Motor Type	Submersible	Submersible	Submersible
Pump Motor (hp)	40	50	100
Pumping Rate (GPM)	120	148	305
Pump Head (ft)	995	1,040	938

Drilled in 1953, Well No. 1 is located north of the intersection of East Roller Ridge and Main Streets in the south-central part of town. This well has a master meter, pump-to-waste piping, and timer controls housed in a small, masonry wellhouse. Current well control settings are based on a timer that operates this well from 5:00 am to 8:00 am and from 5:00 pm to 8:00 pm each day. There is no treatment of the groundwater at this well or anywhere else in the city's water system.

Drilled in 1979, Well No. 3 is located just west of the intersection of Main Street and State Highway DD, approximately 1,100 feet northwest of Well No. 1, in the south-central part of town. This well has a chlorine room that is not in use as no chemical treatment is currently being used in the system. This well is equipped with pump-to-waste piping, master meter, a breather pipe, and a control timer. Well No. 3 is set to run from 9:00 am to 3:00 pm each day.

Drilled in 1990, Well No. 4 is at the end of Doc Meyer Road on the southeast side of town, about 4,000 feet southeast from the midpoint of Wells No. 1 and 3. This well has a chlorine room that is not in use as no chemical treatment is currently being used in the system. The well is equipped with a screened casing vent, master meter, pump-to-waste piping, pressure gauge, shutoff valve, and check valve. This well is adjacent to a standpipe that serves as the city's only water storage facility. Well operation is controlled by a pressure transducer set to turn the well pump 'ON' when the hydraulic grade in the standpipe is at 1705 feet and to turn the well 'OFF' when the standpipe's hydraulic grade is at 1711 feet. The wellhouse and adjacent standpipe are surrounded by a 6-foot chain-link fence with lockable gate. There is a standby generator at this wellhouse and there is also a dedicated receptacle for a portable generator.

As evidenced by the deep pump settings for the city's three wells, the static water level in the area is relativity deep. At the wells, groundwater levels have only been measured once a year when Flynn Drilling performs the annual well tests. The city should have proper water level monitoring equipment installed at each well.

Each of the three active well capacities are summarized in Table 5.

Table 5. Well Supply Capacity Summary.

Well No.	Pumping Rate (GPM)	Capacity in 8 hrs (gal)	Capacity in 12 hrs (gal)	Capacity in 16 hrs (gal)
1	120	57,600	86,400	115,200
3	148	71,040	106,560	142,080
4	305	146,400	219,600	292,800
Total Well Capacity	573	275,040	412,560	550,080
Firm Well Capacity	168	128,640	192,960	257,280

4.3 Storage

Seligman has one 320,000-gallon bolted standpipe, summarized in Table 6. This storage facility was installed in 1998 next to Well No. 4 to replace a 25,000-gallon elevated witch-hat storage tower that was built in the 1950s. The standpipe has a diameter of 29.6 feet, a height of 64 feet, and an overflow elevation of 1713 feet USGS. The standpipe has an air vent, roof hatch, safety ladder, manway, and overflow pipe, along with separate 8-inch inlet and outlet lines. The storage tank is of a standpipe configuration, which is capable of holding large quantities of water, but the storage starts at ground level.

Well No. 4 pumps to both the adjacent standpipe and the distribution system via 8-inch waterlines. With the standpipe being the only storage facility for the water system, when Wells No. 1 and 3 are in operation (via control timers), any pumped water not consumed directly by customers flows through the distribution system to the standpipe.

Table 6. Water Storage Summary.

Storage Facility Designation	Tank Type	Total Volume (gal)	Ground Elevation (ft)	Overflow Elevation (ft)
Standpipe	Bolted Standpipe	320,000	1,648	1,713

As the only storage facility in the system, Seligman's standpipe establishes the pressure plane for the entire system. However, when Wells No. 1 and No. 3 are operating, water customers experience a slightly higher pressure due to the added energy provided by the well pumps.

Pittsburg Tank and Tower Maintenance Co, inc. inspected the standpipe in 2021 and identified safety and sanitary deficiencies. Overall, the standpipe was rated as in fair condition. Some of the critical deficiencies included were replacing the existing roof vent with a vacuum-pressure, frost proof vent and screen and performing a dry interior cleanout. Other non-critical deficiencies, OSHA requirements, and preventative maintenance are included to Appendix B.

4.4 Distribution System

Seligman's original distribution system was built in the 1950's, and currently consists of the sizes and approximate lengths of pipe shown in Table 7. The original waterlines were constructed of transite and galvanized steel pipe with diameters ranging from 1-inch to 6-inch, which have exhibited numerous leaks over the past few decades and are in need of replacement. More recently, newer waterlines were constructed with PVC piping**.**

Table 7. Distribution System Summary.

Nominal Pipe Diameter	Approximate Length of Pipe (ft)
1 inch	9,960
2 inch	130,217
3 inch	1,980
4 inch	51,147
6 inch	9,712
8 inch	7,014
12 inch	71
Total Length	210,100

The system has a significant quantity of 2-inch piping, which in a few cases is used to serve customers well beyond the city limits, stretching several hundred feet. Serving multiple customers with such a small diameter pipe greatly limits the amount of water available to the customer. Eventually these lines will need to be upsized and/or looped when there is a greater number of customers to be served along the edge of the city's service area.

Much of Seligman's distribution system is quite old, with repairs performed as needed when leaks are identified. While waterline repairs are performed by the city, most new waterline construction is performed by local contractors, either for the city directly, or for developers who then turn the waterlines over to the city upon successful testing and completion. There are approximately 39.8 miles of waterline mains in the city's current distribution system.

Seligman has a comprehensive map of the city's water system but there are a few discrepancies in the recollection of some of the installations and repairs that have occurred over the last few decades. When possible, the city should strive to improve upon the accuracy of the water system map using various methods such as water system isolation with valves, potholing, excavating, hydrant testing or other means as deemed appropriate. The system map presented in this report and used to analyze the water system was updated from the previous water system map created in 2016 with current revisions from city staff.

4.5 Fire Protection

Seligman relies on a volunteer fire department for its fire protection needs. The distribution system has several fire hydrants installed. The Insurance Services Office (ISO) is an advisory insurance rating organization that evaluates municipal fire protection to produce a numerical classification. These classifications are utilized by insurance companies to establish local fire insurance premiums. Seligman's ISO Public Protection Class rating is 6 based on a February 2023 ISO Report. The city's recent ISO report recommends a 2,000-GPM fire flow be provided based on a review of selected buildings in the community. While this flow is available in some areas of the system, there are many areas where the city's waterline sizing prevents this fire flow from being reached.

5. SUMMARY OF WATER USAGE

To project water usage rates through the 20-year planning period, Olsson reviewed historic well pumping records and billing records. Additionally, Olsson analyzed usage rates by large water users individually.

5.1 Historical Usage

Olsson analyzed the city's monthly well pump data and water usage records from January 2016 through December 2022 to determine average daily water demand, supply, and loss trends. Figure 5 shows the relationship between water pumped and accounted for water usage for these years.

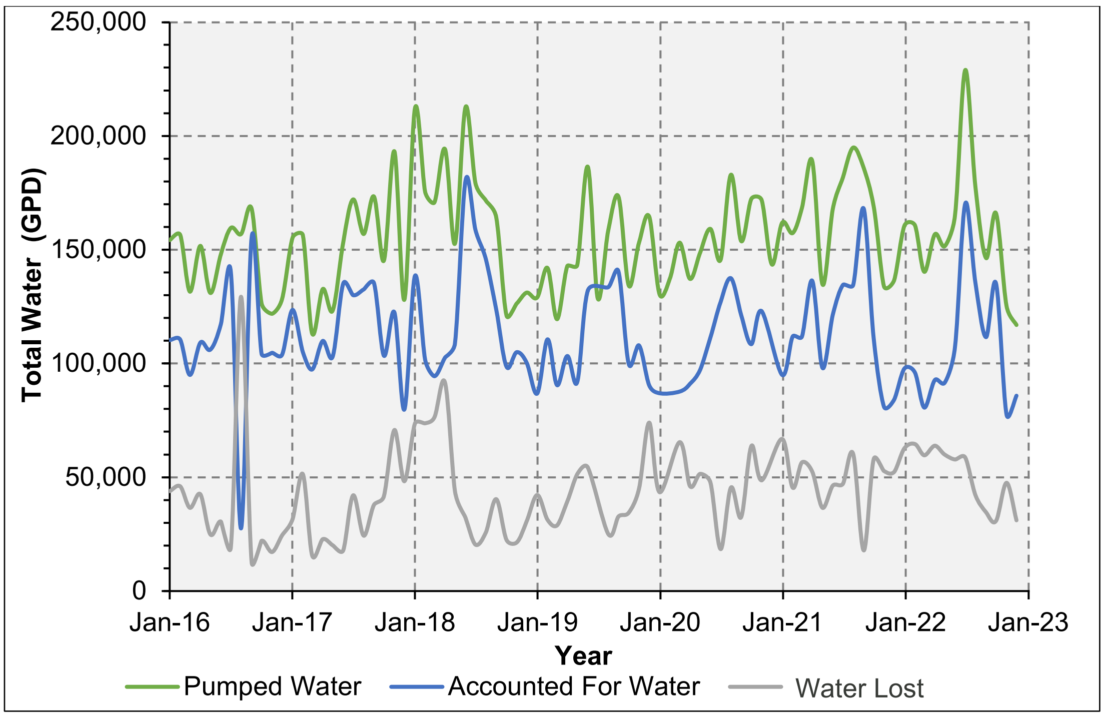


Figure 5. Historical Water Pumped, Water Accounted For, and Water Lost.

Table 8 summarizes the water pumped, accounted for, and lost. "Accounted for Water" includes water sold to customers and water used by the fire district or by the city. Water lost is the difference between water pumped and accounted for water. Olsson excluded outlier data from the months of July 2019, February 2020, and December 2020.

Table 8. Historical Daily Average Water Supplied, Water Accounted For, and Water Lost.

Year	Water Supplied (GPD)	Accounted For Water (GPD)	Water Lost (GPD)	Water Lost (%)
2016	144,453	106,884	37,569	26%
2017	150,088	114,818	35,270	23%
2018	167,526	121,647	45,879	27%
2019	149,653	107,807	41,846	28%
2020	155,570	109,174	46,397	30%
2021	165,184	115,627	49,557	30%
2022	158,130	107,066	51,064	33%
Average	155,193	107,996	42,346	28%

Between 2016 and 2022, there was an average of 28% percent of water pumped was lost. While water loss varied from year to year, the overall average is consistent over recent years. While reductions in water loss will result in the need to pump less water to meet the daily usage, for the purpose of projecting future water use, the annual average future water loss was selected to be 30%.

Water is generally lost through water line leaks, uncalibrated water meters, and any unbilled or untracked water use (such as at public pools, sprinkler systems, water main flushing, etc.). Achieving zero water loss is not a realistic goal. For a municipal system the size of Seligman's, a water loss rate less than 15 percent would be a practical goal to work towards. Olsson recommends the city continue identifying and repairing water leaks, recording unbilled water usage, and replacing under-registering meters.

5.2 Water Usage by Large Users

Large water users, defined as customers that are routinely billed for at least 60,000 gallons per month, generally have a more significant impact on a water supply and distribution system than the average residential or commercial customer. Accordingly, Olsson evaluated these customers individually, shown in Table 9.

Table 9. Large Water User Summary (>60,000 Gallons/Month).

Account Name	Avg. Gallons per Month	Avg. Gallons per Day	Avg. Gallons per Minute
Lightfoot Gary Anderson	141,000	4,700	3.26
FR 1070/Fence – Don Raucstadt	60,000	2,000	1.39
John Zito	234,000	7,800	5.42
Robert Catron	84,000	2,800	1.94

Table 9 above summaries the available usage data from January 2016 to February 2023 for each large user. The largest user by far was John Zito averaging 7,800 GPD. Each of these four large user demands in average GPM was distributed to the closest applicable junction in the hydraulic model based on their address.

5.3 Projected Water Demand

Olsson projected future water pumping rates for the Seligman Water System based on the trends of historical water usage data and the projected number of future water customers. Accordingly, Table 10 lists the accounted for average gallons per day demanded by water users, from January 2016 through December 2022, for the four types of meter categories in terms of gallons per day 'sold' or, in the case of the Public and Fire District usage, 'meter reading'.

Table 10. Historical Water Usage per Meter

Year	Residential (gpd)	Commercial (gpd)	Public (gpd)	Fire (gpd)
2016	148	198	910	542
2017	159	221	946	347
2018	176	185	810	286
2019	263	167	728	374
2020	154	170	1,242	282
2021	160	165	969	287
2022	149	164	634	147
Average	170	179	865	298

Table 10 above does not include the water loss that occurs in the system. In order to determine the actual water supplied per meter, the selected average future water loss percentage of 30% must be taken into account. Table 11 displays the average required water supplied for each of the meter categories when including 30% water loss.

Table 11. Average Water Usage per Meter Including Water Loss.

Meter Category	Average Accounted For Usage Per Meter (gpd)	Water Loss	Average Water Supplied Per Meter (gpd)
Residential	170	30 %	242
Commercial	179	30 %	255
Public	865	30 %	1,235
Fire	298	30 %	426

For the purpose of projecting demands, each category's average water supplied per meter was rounded up to a selected usage rate per meter. Similar to the 2016 Water Study, a maximum day peaking factor of 1.7 was determined by comparing the highest daily water pumped trends to the average daily value for water pumped. By utilizing this data as well as the data from Table 3 in Section 2.2 regarding the number of projected active water meters in all four meter categories, the anticipated future water demand was projected.

In summary, Olsson based the projected demands on the following conclusions:

- The selected water usage per residential connection is 250 GPD.
- The selected water usage per commercial connection is 260 GPD.
- The selected water usage per public connection is 1,235 GPD.
- The selected water usage per fire connection is 426 GPD.
- The number of residential meters will increase at a rate of 0.6%.
- The number of commercial meters will increase by two meters every five years.
- The number of public and fire owned meters will remain constant at 9 meters and 3 meters, respectively.
- The maximum day water usage will be 1.7 times the average day demand.
- The peak hour water usage will be 1.7 times maximum day demand.

In consideration of these parameters, Table 12 summarizes the projected water demand based on well pumpage needed for the entire water system under the city of Seligman's jurisdiction throughout the planning period ending in 2043. These demands represent the total needed water supply projected for the entire planning area and will be considered for evaluating water supply, treatment, storage, and distribution system improvements.

Table 12. Projected Water Pumped – Average Day Demand.

Year	Projected Population (From Table 1)	Projected Average Day Demand (GPD)	Projected Maximum Day Demand (GPD) – (1.7 x Avg. Day Demand)
2023	815	182,381	310,048
2028	818	187,588	318,899
2033	821	192,928	327,978
2038	824	198,407	337,291
2043	827	204,027	346,846

Figure 6 summarizes these average day and maximum day demand in graphical format.

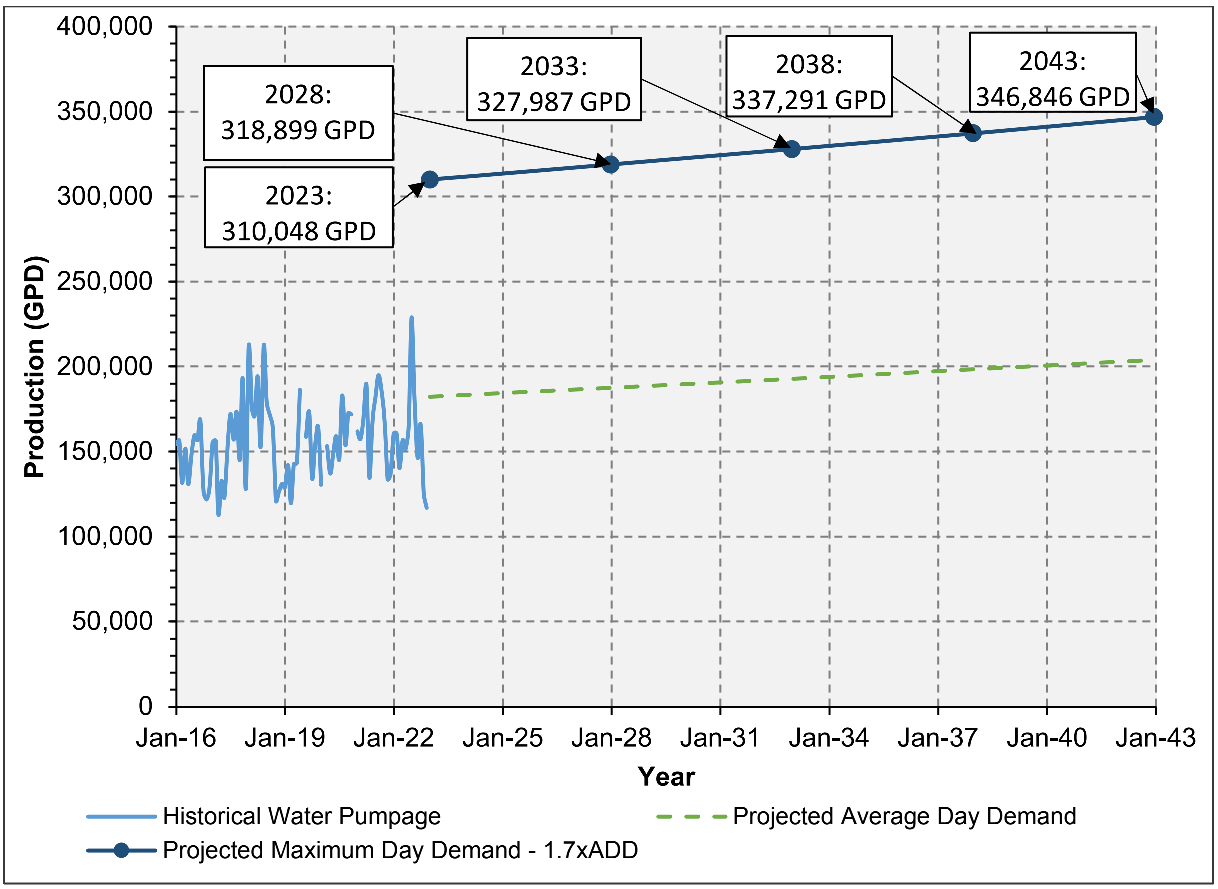


Figure 6. Projected Average and Maximum Day Demands.

The demands shown in Table 12 and Figure 6, represent the total projected water pumped usage for the entire planning area and will be considered in the following Section for evaluating water supply, storage, and distribution system improvements.

6. HYDRAULIC MODEL ANALYSIS

As a part of the 2016 Water Study, a hydraulic model was created using WaterCAD to analyze the hydraulic operation of the Seligman system. Olsson has since transitioned to using InfoWater for master planning due to its usability. At the beginning of the 2023 Water Study project, the existing WaterCAD model was converted to an InfoWater model.

It is important to note that Autodesk has recently acquired InfoWater (an Innovyze product) and has switched to a new product called InfoWater Pro. At the conclusion of this project, the model will be converted to InfoWater Pro to allow for a smooth start to future planning efforts.

6.1 Model Conversion and Update

Olsson converted the existing WaterCAD model to an InfoWater model, which involved exporting the WaterCAD model to EPANET and then importing it to InfoWater through the InfoWater EPANET 2.0 Import Manager. The converted InfoWater model was then thoroughly checked to ensure the infrastructure was imported accurately. In particular, the pipes in the Seligman System were verified against the current GIS data and the tower and well layouts were cross-checked with the 2016 WaterCAD model and other available records. The well information and pump curves for the system were confirmed with the 2022 well inspection reports completed by Flynn Drilling Company and pump manufacturers' pump curves, respectively. Where other sources were not available, information from MoDNR was utilized. The MoDNR reports can be found in Appendix C.

6.2 Model Scenarios

Several demand scenarios were considered in the hydraulic analysis of the Seligman water system. Each scenario was analyzed in two ways: a snap-shot view and an extended period simulation. The snap-shot view involves analyzing the available flow at each node during a specific demand event, either average day or maximum day demand. This helps identify distribution system improvements that may be necessary in areas with insufficient flow and/or pressure. The extended period simulation (EPS) utilizes a diurnal curve that represents a typical pattern of water demand changes over the course of a day. A diurnal curve similar to the curve used in the 2016 water study was utilized for these EPS scenarios, and is shown below in Figure 7.

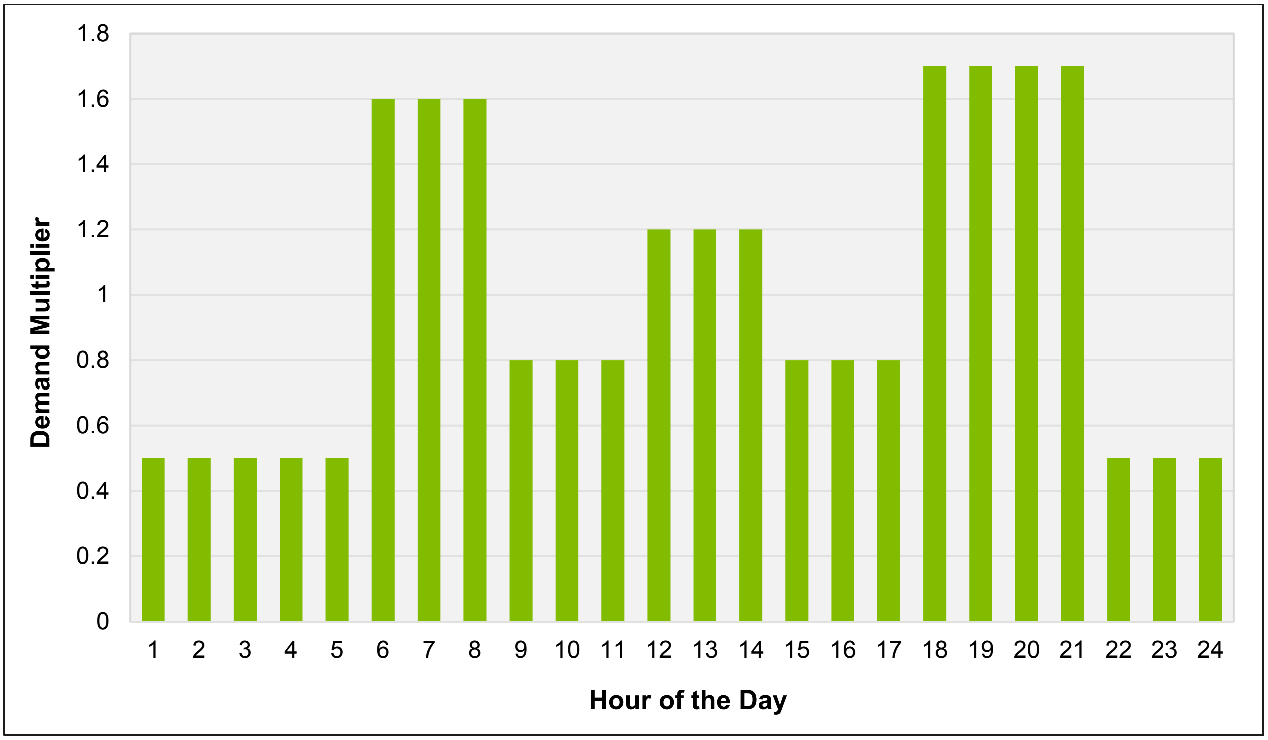


Figure 7. Diurnal Curve Utilized in Hydraulic Model.

An EPS analysis can simulate any number of consecutive day demands. The results of a four-day simulation are shown in this Master Plan. The EPS scenarios allow the operation of the wells and towers to be viewed under changing conditions over several hours or days so potential improvements can be analyzed and evaluated. The various aspects of the system that were analyzed during the runs were the on/off operation of the existing wells, the fluctuating water level in the existing water storage tower, and the pressure and available flow at various nodes throughout the system. The following is a listing of the various demand scenarios that were run for analysis of the system:

- Existing (2023) Average Day Demand.
- Existing (2023) Maximum Day Demand.
- 2028 Average Day Demand.
- 2028 Maximum Day Demand.
- 2033 Average Day Demand.
- 2033 Maximum Day Demand.
- 2038 Average Day Demand.
- 2038 Maximum Day Demand.
- 2043 Average Day Demand.
- 2043 Maximum Day Demand.

6.3 Supply Analysis

The city currently has a total developed well capacity of 573 GPM, and a firm well capacity of 268 GPM. Section 3.2.1.2.b of the 2013 MoDNR Design Standards states that "public drinking water systems that require continuous service and serve 500 or more people shall have more than one well and shall be capable of meeting design average day demand with the largest producing well out of service." Table 13 compares the city's firm well capacity requirements with the projected average day demands (from Table 12) throughout the planning period. The fourth column in Table 13 represents the additional firm well capacity needed based on an 8 hour/day well run time to provide the projected average day demand, shown in the second column. A negative number in the fourth column would indicate that excess well capacity is currently available. As shown in Table 13, the city currently has a firm well supply deficit.

Table 13. Projected Average Day Firm Capacity Requirements.

Year	Projected Average Day Demand (GPD)	Required Firm Well Capacity (8 hr/day, GPM)	Additional Required Firm Well Capacity (GPM)*
2023	182,381	380	112
2028	187,588	391	123
2033	192,928	402	134
2038	198,407	413	145
2043	204,027	425	157

*Negative number indicates a surplus capacity.

Section 3.2.1.1 of the 2013 MoDNR Design Standards states that public drinking water systems shall have a total developed groundwater source capacity equal to or exceeding the design maximum day demand. The city currently has a total developed well capacity of 573 GPM. The projected 2043 maximum day demand is 346,846 GPD, which results in a total well capacity surplus of 91 GPM based on 12 hour/day of pumping. Accordingly, the city has adequate total well capacity to meet future demand. This adequate total well capacity is displayed in Table 14.

Table 14. Projected Maximum Day Total Capacity Requirements.

Year	Projected Maximum Day Demand (GPD)	Required Total Well Capacity (12hr/day, GPM)	Additional Required Total Well Capacity (GPM)*
2023	310,048	431	-142
2028	318,899	443	-130
2033	327,978	456	-117
2038	337,291	468	-105
2043	346,846	482	-91

*Negative number indicates a surplus capacity.

The conclusion drawn from the firm and total well capacity comparisons shown in Tables 13 and 14 is that the city has a firm well capacity deficit of 157 GPM that should be addressed. With the firm well capacity being provided by two relatively low-producing wells (No. 1 and No. 3), and a projected deficit of 157 GPM in 20 years, it is recommended that modifications be made at Well No. 1 to install a higher-capacity pump to increase the supply capacity of the well. Based on the Well No. 1's casing size of 8 inches the largest recommended pump capacity would be 150 GPM, Well No. 3's 150-S500-28 Grundfos pump has a capacity of 150 GPM. Increasing Well No. 1's capacity to 150 GPM, would leave a remaining capacity deficit of 127 GPM. This deficit could be achieved by installing a new well at site of the storage improvements discussed in Section 6.4. Although only 127 GPM is needed to achieve firm capacity, it is recommended to install a well with similar capacity to Well No. 4 of 300 GPM to allow for greater redundancy and flexibility. The cost for these improvements is included in Section 8.

In 2006, the city started becoming concerned with the possible depletion of its water source during drought conditions. During this time several private wells in the area were adversely affected by the dry weather. The 2012 drought reinforced the city's concerns. Accordingly, the city needs to have proper water level monitoring equipment installed in each well. It is recommended that all three wells be equipped to allow for measuring the depth to the groundwater table. Due to the consequences of area drought on the water system, groundwater level measurements should be taken on a weekly basis at each well to ensure there is adequate water above each submersible pump.

6.4 Storage Analysis

The city's existing storage tank provides the service area with a volume of 320,000 gallons of water storage. This storage tank is a standpipe that does not provide 35 psi at the base of the tank or to all users in the system. While there are several valleys in Seligman where the water pressure is much greater than 35 psi due to the elevation difference throughout the service area, there are also areas of high elevation that will never be able to experience 35 psi with the existing overflow elevation of the city's standpipe.

Additionally, the standpipe has very little usable storage volume that provides a minimum of 20 psi to all users in the system per MoDNR Design Standards' Chapter 7 – Minimum Design Standards for Finished Water Storage Tanks and Reservoirs. A standpipe configuration is well-serving when the standpipe is placed on a high hill and all of the water customers are at a much lower elevation, but not when numerous customers are at elevations above the tank's ground elevation. Building a taller storage tank in this area is not very practical due to how close the existing standpipe is to the area of high elevations.

Two options have been developed for consideration to serve the southeast area of the city with higher water pressure than is currently experienced:

- Option 1 – Have affected homeowners install booster pumps at their home to boost the incoming water pressure.
- Option 2 – Construct a regional booster pump station that would boost the water pressure for the high elevation areas in the southeast portion of the city.

Homeowners affected by low pressures may be inclined to utilize Option 1 and install individual booster pumps with a hydropneumatic tank to increase the water pressure on the property. The city may want to discuss with these homeowners the potential consequences of this action as an individual booster pump may create extremely low pressures along the service line when running and affect not only that home's water supply, but the water supply of others in the area.

Utilizing Option 2 and installing a regional booster pump will result in the city incurring additional maintenance costs for what appears to be very minimal issue for the affected water customers. Accordingly, based on the city reporting no significant complaints concerning pressure in this area of town and without a simple, low-cost solution available, specific improvements to address this situation will not be included in the proposed project recommended in this report.

Due to the impracticality of providing usable storage and fire flow to this high elevation area without individual or regional booster pumps, these customers were not considered during the evaluation of storage improvements. The high elevation area not considered is shown in red in Figure 8.

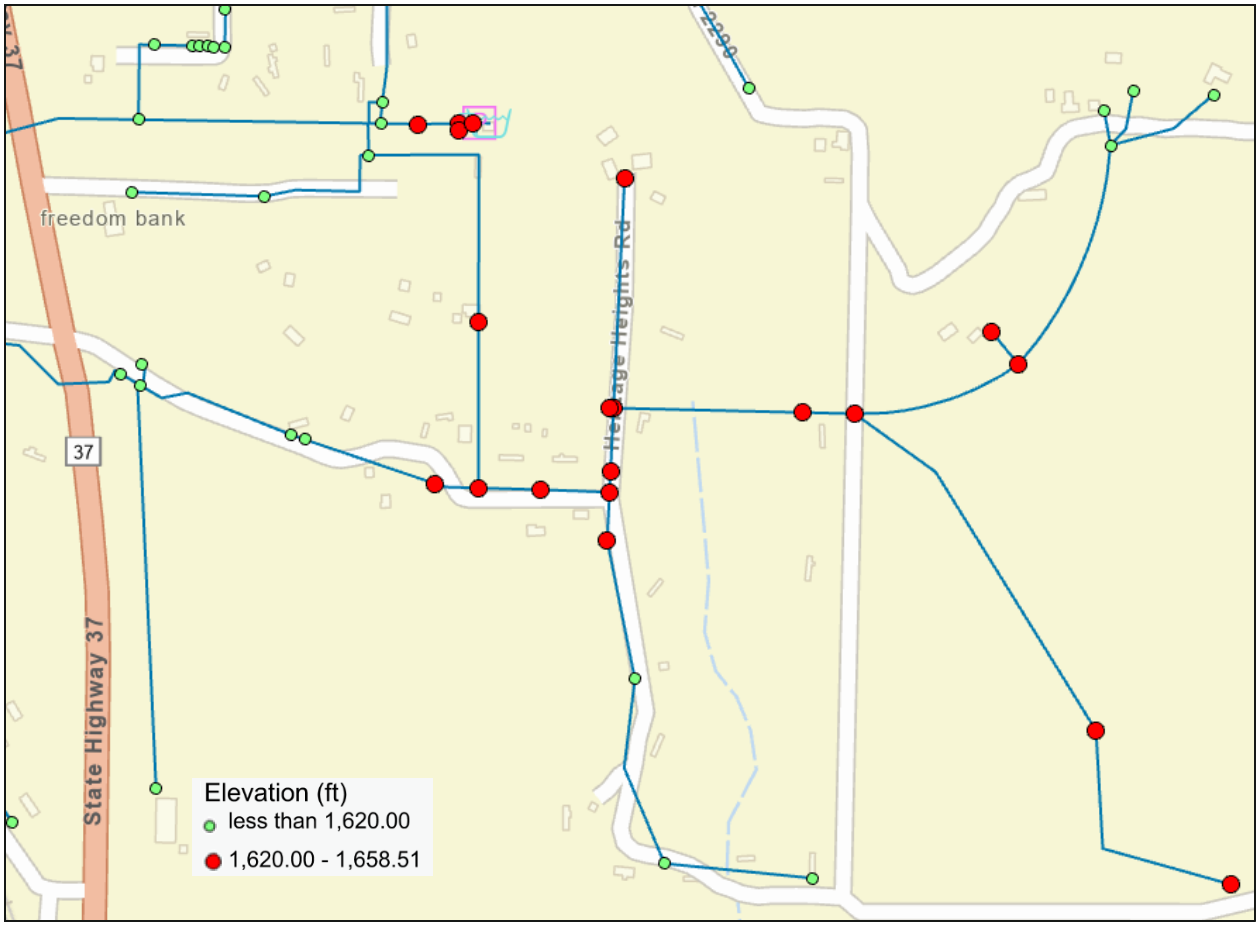


Figure 8. Highest elevation in Southeast System.

For the purpose of determining storage improvements in this study, the highest elevation considered was 1620 ft.

In order to meet the diurnal water demand fluctuations experienced throughout the year, the minimum amount of useable water storage recommended for a community is typically based on a volume equal to the average day demand.

Additionally, since Seligman is provided with fire protection, the ISO-recommended fire flow of 2,000 GPM for 2 hours should also be considered when determining the water system's recommended storage capacity.

Table 15. Projected Average Day Usable Storage Requirements.

Year	Average Day Demand (GPD)	Fire Flow (2,000 GPM for 2hrs, Gal)	Usable Storage (Gallons)	Additional Storage Recommendation (Gallons)
2023	182,381	240,000	99,401	322,980
2028	187,588	240,000	99,401	328,187
2033	192,928	240,000	99,401	333,527
2038	198,407	240,000	99,401	339,006
2043	204,027	240,000	99,401	344,626

Accordingly, per Section 7.1.1 of the 2013 MoDNR Design Standards, Seligman should plan for providing an additional usable storage capacity for the projected 2043 average day demand of about 204,027 gallons along with 240,000 gallons of fire flow volume, minus the roughly 99,500 gallons available in the standpipe above 20 psi for the highest-elevation customer (excluding the high elevation customers in the south east of the system), a minimum of 400,000 gallons is needed above the hydraulic grade that provides the highest customer with at least 20 psi. That minimum hydraulic grade is approximately 1,666 feet USGS. To achieve this additional storage capacity most cost-effectively, a 400,000-gallon elevated tower with a head range of up to 47 feet is recommended to achieve a storage volume above 20 psi that provides the average day demand and a 2-hr, 2,000-GPM fire flow without utilizing the system's firm well capacity. A second tank will also provide the city with redundant storage capacity for when one of the tanks needs to be taken offline for maintenance.

The above recommendation is based on setting the overflow of the proposed storage tower at the same elevation as the existing standpipe and maintaining at least 20 psi throughout the considered system during a fire flow condition. If the new storage tower is constructed with an overflow elevation greater than the existing standpipe, the city would then have to add additional infrastructure and operational efforts to maintain two pressure zones in the system.

Based on the recommendation for the city to invest in one new 400,000-gallon elevated storage tower, the criteria for locating the new tower should include:

- Near large-diameter water lines;
- Situated at a high elevation to provide the greatest usable pressure with the shortest structure;
- Near high-demand areas;
- Readily accessible by tower erection equipment and city personnel;
- Already owned by the city or available for purchase by the city.

In consideration of these criteria and the discussion that occurred in the 2016 Water Study report, the recommended site is located on the north side of Highway 37 near the car wash associated with the Seligman Super Stop.

The recommended tower site along Highway 37 (approx. elev. of 1560 USGS) is predicated on the distribution system improvements recommended in this report, which includes constructing an 8-inch loop along Frost Street and Highway 37 as well as upgrading the water system's backbone along Main Street to connect the north-side improvements to the existing wells and tank in the southern area of town. The recommended distribution system improvements are discussed in more detail in the next subsection. This location helps distribute the water storage throughout town and places the tower along a significant highway where commercial development is expected to be most prevalent.

An opinion of probable cost for constructing the recommended distribution system improvements is included in Section 8.

6.5 Distribution System

The city's original distribution system, much of which is still in use, appears to be the source of most of the city's water leaks. The recommended actions in this report include increasing efforts to identify and reduce water losses in the system and replacing old, undersized waterlines with new, larger-diameter water mains that can more efficiently convey flows.

The results of the hydraulic model show that line replacement (upsizing) and looping will significantly increase available flows in the system and help sustain higher residual pressures. Replacing existing waterlines allows construction to occur within existing utility easements and provides an opportunity to replace inadequate service connections and service lines as well. The city has already begun the process of verifying and obtaining the proper utility easements throughout town.

Based on the conclusions reached in this study and in consideration of the priority areas identified by city staff, the proposed distribution system improvements should be constructed as follows:

- Add looping by installing new 6-inch waterline to increase hydraulic connectivity:
    - Approximately 700 lineal feet (LF) along Finn Road between Roller Ridge Road and Lightfoot Road.

- Replace existing 4-inch waterline with 8-inch waterline at 4 locations to help convey higher flows and replace old waterlines:
    - Approximately 3,000 LF along Main St from North St to Frost Street.
    - Approximately 1,500 LF along Stapleton Street from Hurd Street to E Roller Ridge.
- Replace existing 6-inch waterline with 8-inch waterline at 3 locations to help convey higher flows and replace old waterlines:
    - Approximately 2,500 LF along Main Street from Roller Ridge Road to North Street.
- Install new 8-inch waterline to the proposed elevated storage tower:
    - Approximately 2,400 LF north of Hwy 37 from Farm Road 1070 to Ross Rd.
    - Approximately 300 LF from Hwy 37 connecting to the proposed water tower.
    - Approximately 300 LF along St Hwy 12 from Main St to Hickory Street

These improvements are shown in Appendix F and an opinion of probable cost for constructing the recommended distribution system improvements is included in Section 8.

6.6 Analysis of Recommended Improvements

To demonstrate the improved system hydraulics as a result of the proposed improvements, this section discusses the available flow in the system with and without improvements, the pressures seen in the system with and without improvements, and the well and tanks function with improvements.

The results of the hydraulic model analysis for Seligman's water system for current and 20-year projected flows are shown for both the existing system and for the system after the proposed short-term waterline replacements described in Section 6.5, the new 400,000-gallon elevated storage tower (EST) described in Section 6.4, and the new supply improvements discussed in Section 6.3 have been implemented. For the analysis, Wells No. 1 and No. 3 were still set to run on a clock timer with the same increments as the existing system, described previously. Well No. 4 was still controlled by the tank level in the 320,000-gallon existing standpipe and the proposed well was controlled by the proposed elevated storage tank. The associated demand was applied to each scenario for both the current (Year 2023) demand and the projected (Year 2043) demand.

Table 16 shows the results for average day steady state and maximum day steady state demand are presented with available fire flow percentages of the junctions in the hydraulic model that support a fire flow greater than 1,000 GPM and 2,000 GPM.

Table 16. Hydraulic Model Available Flow Results.

System Layout	Scenario	Demand Conditions (GPD)	Percent of System with Available Flow > 1000 GPM (%)	Percent of System with Available Flow > 2000 GPM (%)
Existing System	Current Average Day	182,381	1.3 %	0 %
	Current Maximum Day	310,048	1.3 %	0 %
	2043 Average Day	204,027	1.3 %	0 %
	2043 Maximum Day	346,846	1.3 %	0%
System with Proposed Improvements	Current Average Day	182,381	15.5 %	8.4 %
	Current Maximum Day	310,048	15.5 %	8.4 %
	2043 Average Day	204,027	15.5 %	8.4 %
	2043 Maximum Day	346,846	15.5 %	8.4 %

As evidenced in Table 16, the recommended improvements increase available flows and will result in reduced water loss due to the replacement of old, leaking waterlines. The areas that see the most improvement in available flows are around each well, tower, and along the backbone of the system mostly following Main St. The increase in available flow following the proposed improvements is shown graphically in Appendix D for the Current and 2043 maximum day demand.

To demonstrate how the proposed water system improvements increase pressures in the system during peak demand times during current and 2043 average day and maximum day scenarios, Table 17 shows the percentage of junctions in the system with a minimum pressure above 35 psi.

Table 17. System Pressure Analysis with and without Proposed Improvements.

System Layout	Scenario	Demand Conditions (GPD)	Percent of System with Pressure > 35 psi (%)
Existing System	Current Average Day	182,381	96.3 %
	Current Maximum Day	310,048	77.2 %
	2043 Average Day	204,027	96.3 %
	2043 Maximum Day	346,846	59.6 %
System with Proposed Improvements	Current Average Day	182,381	96.3 %
	Current Maximum Day	310,048	96.3 %
	2043 Average Day	204,027	96.3 %
	2043 Maximum Day	346,846	95.9 %

As shown in Table 17, the minimum system pressures remain consistent regardless of the improvement on the average day scenarios. However, the recommended improvements significantly increase the minimum pressures in the system on both current and 2043 maximum day scenarios. The areas that see the most improvement in available flows are around each well, tower, and along the backbone of the system mostly following Main St.

Additionally, Figure 9 shows graphically when the four wells turn ‘ON’ and ‘OFF’ and the corresponding hydraulic grade of the two tanks when modeled for a four-day extended period with the 2043 maximum day diurnal demand. This figure demonstrates how the two tanks work together to maintain suitable hydraulic grades throughout the day with the four supply wells operating as shown.

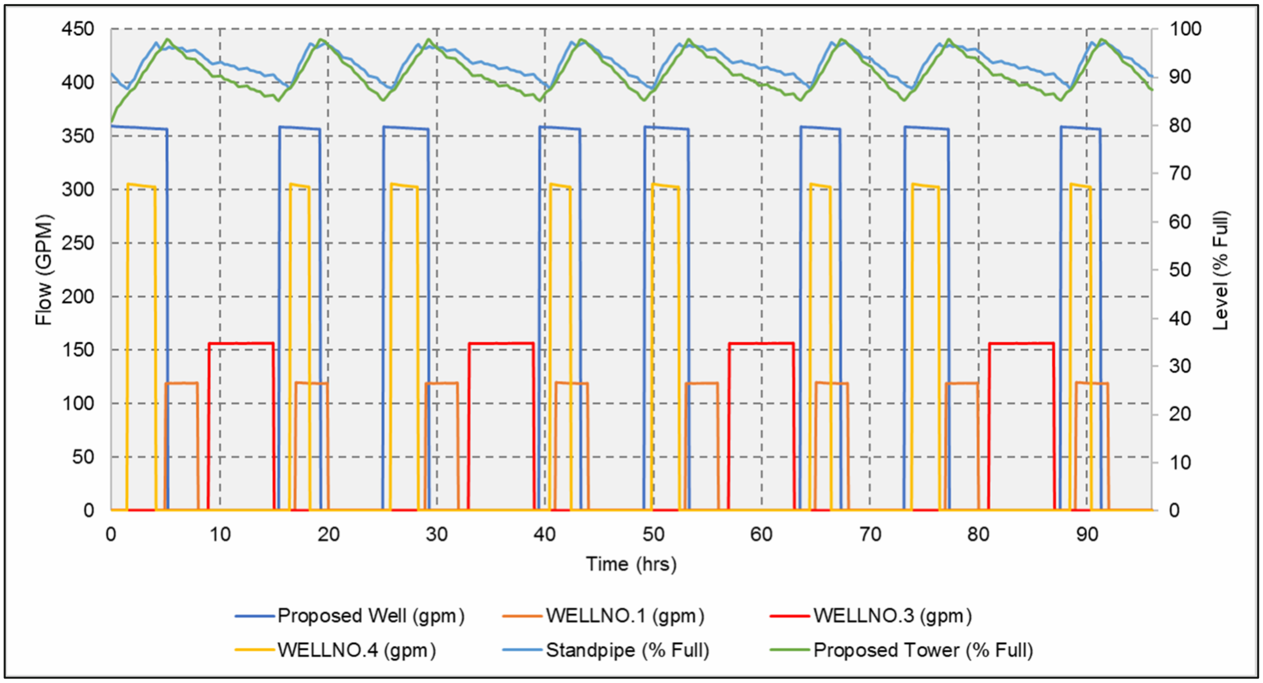


Figure 9. 2043 Maximum Day Well and Tank Function.

6.7 Other Recommended Technical, Managerial, and Financial Capability Improvements

The Missouri Department of Natural Resources is implementing new groundwater regulations based on the Environmental Protection Agency's (EPA) promulgation of the Groundwater Rule (GWR). The GWR requires improved monitoring and compliance for water systems that use groundwater as their water supply source. The purpose of the GWR is to reduce the risk of illness caused by microbial contamination in public groundwater systems (GWS). The GWR establishes a risk-targeted approach to identify GWS susceptible to fecal contamination and requires corrective action to correct significant deficiencies and source water fecal contamination in all public GWS. The GWR applies to all public water systems (PWS) that use groundwater.

The GWR is based around a standard of achieving 4-log treatment of viruses (99.99% inactivation). While bacterial contamination is more common in groundwater than viral contamination, achieving 4-log treatment of viruses is a standard established to ensure that a high degree of both viruses and the most rugged of bacteria are inactivated. However, instead of requiring disinfection for all GWS, the GWR establishes a risk-targeted approach with monitoring being a key element. The main means of monitoring and developing action-steps include Sanitary Surveys, Compliance Monitoring and/or Triggered Source Water Monitoring, and Corrective Actions. While Sanitary Surveys are the responsibility of the State, GWS are responsible for the other requirements.

Each GWS that currently disinfects its groundwater source can perform either Compliance Monitoring or conduct Triggered Source Water Monitoring. A GWS that chooses to perform Compliance Monitoring as a result of the GWR is required to show it can achieve 4-log treatment of viruses by submitting Contact-Time (CT) calculations similar to a surface water treatment plant. For most groundwater sources, which are around 10 degrees C with a pH between 6 and 9, the CT value associated with 4-log treatment of viruses using free chlorine as a disinfectant is 6 mg*min/L, as shown in MoDNR's 1992 "Guidance Manual for Surface Water System Treatment Requirements". A GWS would determine its own achieved CT value by multiplying the free chlorine residual near the point of disinfection by the detention time provided prior to the water reaching the first customer. For example, a free chlorine residual of 1 mg/L would require a detention time of 6 minutes to achieve a CT of 6 mg*min/L and therefore provide 4-log treatment of viruses. Hydraulic baffling factors must also be considered when determining detention time.

For GWSs serving 3,300 or fewer that utilize disinfection, the ability of the system to prove it can meet 4-log inactivation of viruses must be done on a daily basis and a grab sample during the hour of peak flow must also be analyzed. Therefore, any GWS choosing to perform Compliance Monitoring or required to by corrective action will need to invest significant time and money for equipment to monitor the disinfectant residual on a frequent basis in order to verify that the 4-log treatment is consistently being provided by the system.

Since Seligman does not currently disinfect its water supply, Compliance Monitoring is not applicable and is not required. Accordingly, Seligman must follow the other option for a GWS, which is the Triggered Source Water Monitoring route, and is essentially a "do as you're currently doing" approach but with the added monitoring requirements associated with the GWR if any water sample tests positive for Total Coliform.

Given Seligman's current water system operations, it is recommended that the city continue its current bacteriological monitoring program and plan to abide by the conditions of the Triggered Source Monitoring requirements if any water sample tests positive for Total Coliform. Accordingly, the water system should be closely monitored to ensure that appropriate sampling techniques are being practiced to minimize the chances of a Total Coliform Rule violation, especially given the age of the system and any upcoming construction efforts to the water system. The conditions of the Triggered Source Monitoring requirements for Missouri can be obtained from MoDNR, with additional information provided on the EPA's website.

The city has a written operation and maintenance plan and budget and should continue investing in efforts to reduce water losses by replacing inadequate waterlines, fittings, valves, fire hydrants and meters, as well as implement a routine preventive maintenance plan for the valves identified throughout the system. The city should also strive to document any un-metered water use permitted, such as waterline flushing. This will allow water losses to be calculated more accurately. If areas are encountered where there are difficulties maintaining adequate waterline flushing velocities or pressures, the system valves should be checked to ensure they are fully opened. A systematic flushing procedure that starts near the tank and moves outward should clear the system. Heavy obstructions, such as rocks in the line (from past construction efforts) may be present and subsequently hinder flows.

The city is working toward GPSing more of its utility infrastructure and incorporating this information into a geographical information system (GIS) for easier access. In the future, the city may also benefit from upgrading its water system controls and incorporate a SCADA system to allow centralized monitoring with electronic trending and logging capabilities.

Overall, the technical, managerial, and financial capability of the water system is adequate. The City Administrator, Mayor and City Council are kept up-to-date on water system conditions and have a role in decision-making. Water rates should be adjusted based on results gleaned from MoDNR's Drinking Water User Charge Methodology spreadsheet to allow the system to be self-sufficient. The city should make provisions for backup personnel who can continue proper operations throughout the planning period.

7. PROPOSED IMPROVEMENTS SUMMARY

This section provides a summary of all the improvements discussed in detail in Section 6.

7.1 Supply

The recommended supply improvements for the city to invest in over the next 5 to 10 years, discussed in Section 6.3, include increasing the capacity of Well No. 1 and installing a new well alongside the storage improvements to provide adequate firm capacity for the system. These improvements are summarized in Table 18.

Table 18. Supply Improvement Summary

Improvement	Location	Proposed Capacity	Existing Capacity	Capacity After Improvement
Install a Higher-Capacity Pump at Well No. 1	Existing Well No. 1 Location	150 GPM, similar to Well No. 3's Capacity	120 GPM	150 GPM
New Well	Proposed EST Location	300 GPM, similar to Well No. 4's Capacity	-	300 GPM

As discussed previously, there is currently a firm capacity deficit that is projected to grow throughout the design horizon. The installation of the higher capacity pump at Well No. 1 should take place during the next major repair for Well No. 1. The costs for the proposed supply improvements are discussed in Section 8.

7.2 Storage

The recommended storage improvements, discussed in Section 6.4, include a new elevated storage tank to provide adequate useable storage and the addition of individual or regional booster pump stations to improve pressures in the southeast of the system. These improvements are summarized in Table 19.

Table 19. Storage Improvement Summary

Improvement	Location	Proposed Volume (Gallons)	Proposed Overflow Elevation (ft)	Proposed Minimum Water Elevation (ft)
New Elevated Storage Tank	North of Hwy 39, near the Seligman Super Stop	400,000	1,713	1,666

The costs for these proposed storage improvements are discussed in Section 8.

7.3 Distribution System

The recommended distribution system improvements, discussed in Section 6.5, include many line upsizes along the backbone of Seligman's system and increased looping in the system. These improvements are summarized in Table 20.

Table 20. Distribution System Improvement Summary

Improvement	Proposed Size (in)
Install approximately 700 lineal feet (LF) of new waterline along Finn Road between Roller Ridge Road and Lightfoot Road	6
Replace approximately 3,000 LF along Main St from North St to Frost Street	8
Replace approximately 1,500 LF along Stapleton Street from Hurd Street to E Roller Ridge	8
Replace approximately 2,500 LF along Main Street from Roller Ridge Road to North Street	8
Install new waterline approximately 2,400 LF north of Hwy 37 from Farm Road 1070 to Ross Rd	8
Install new waterline approximately 300 LF along St Hwy 12 from Main St to Hickory Street	8
Install new waterline approximately 300 LF from Hwy 37 connecting to the proposed elevated storage tower	8

The costs for these proposed distribution system improvements are discussed in Section 8. Additionally, although the city has not received pressure complaints from the high elevation customers in the southeast of the system, it is currently not possible to maintain pressures above 35 psi in this area. Seligman should consider having customers install individual booster pumps at their homes or consider installing a regional booster pump station in this area in near future if significant pressure issues arise.

8. OPINION OF PROBABLE COST AND SCHEDULE

The water system improvements discussed in Section 7 are shown in this section with an opinion of probable costs for each improvement. A detailed breakdown of the cost opinion in today's dollars for each improvement can be found in Appendix E. These opinions of costs are provided to facilitate the city's budgeting and planning; however, market conditions can be volatile, and costs should be reevaluated during the design of improvements.

The improvements included in the cost opinion are broken into two phases, current (near-term improvements) and Year 2034 (future improvements). Phase 1 improvements include the various distribution system improvements and proposed elevated storage tank with a new SCADA system. Phase 2 improvements include installation of the higher-capacity pump at Well 1, and a new well and wellhouse at the proposed elevated storage tank site. Table 21 summarizes the costs associated with these improvements. The Phase 2 costs have been projected to Year 2034 pricing.

Table 21. Opinion of Probable Cost Overview

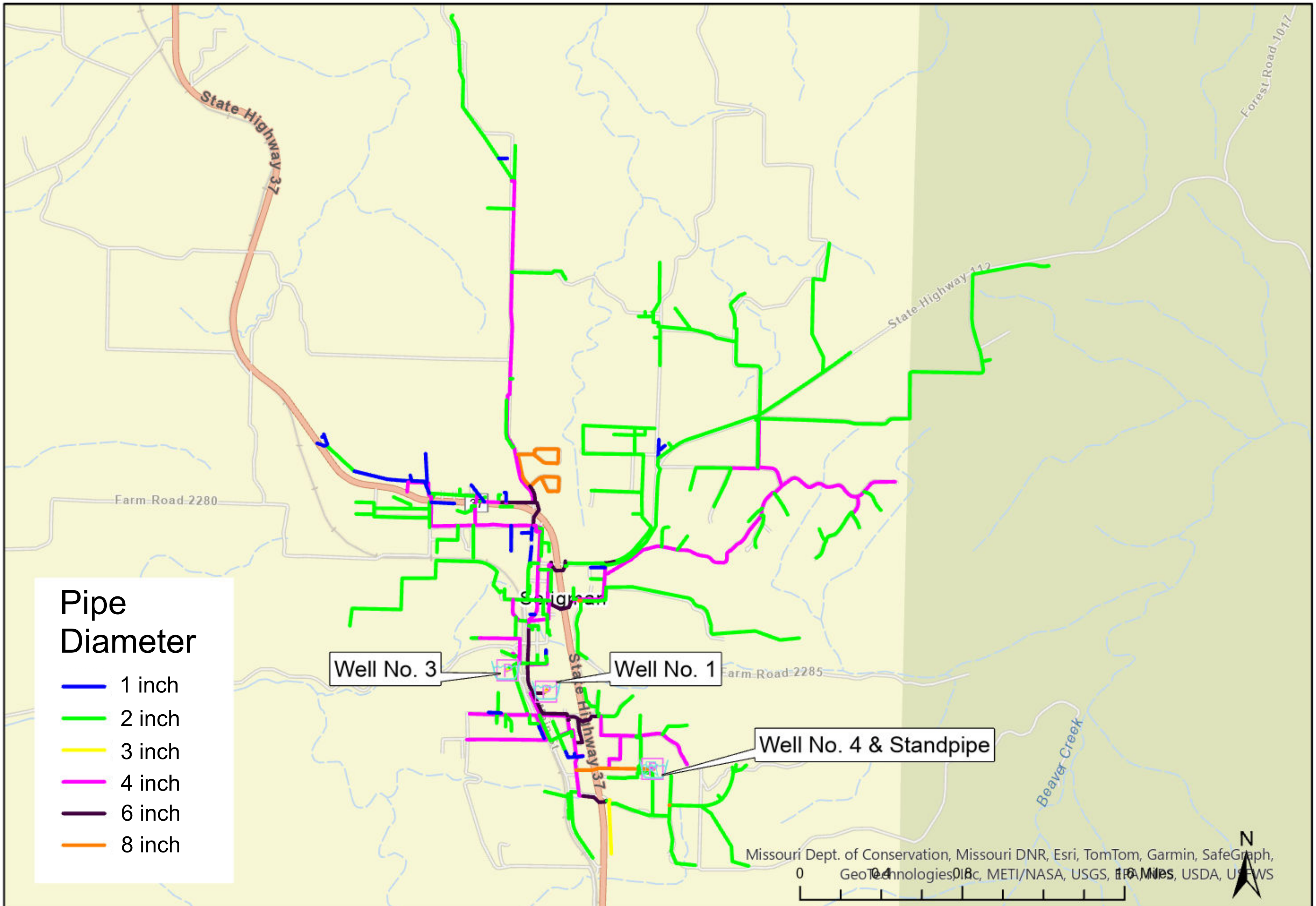
Phase	Improvement	Cost
Phase 1, Current	Distribution System Improvements	$ 1,485,000
	400,000-gal Elevated Storage Tank	$ 2,450,000
	Non-Construction Costs	$ 1,643,000
	Phase 1 Total	**$ 5,578,000**
Phase 2, 2034	Install Higher-Capacity Pump at Well No. 1	$ 65,500
	New 300-gpm Groundwater Well	$ 552,100
	Wellhouse and Sitework for New Well	$ 788,600
	Non-Construction Costs	$ 566,800
	Phase 2 Total	**$ 1,973,000**

Once the city has decided on a proposed project in consideration of the improvements listed in this report, a schedule for the city to efficiently implement the recommended improvements would involve the following sequence of events shown in Table 22.

Table 22. Recommended Schedule

Date	Action
Spring 2024	Confirm selected improvement project(s) and develop anticipated funding route (such as private financing with CDBG grant funds)
Spring/Summer 2024	Coordinate with regional planning commission to administer CDBG application
Summer/Fall 2024	Contract with a professional engineering firm to survey and design the selected improvement project(s)
2025	Acquire property(ies) and/or easements as needed for selected improvement project(s)
2025 - 2026	Complete funding requirements as needed and obtain a MoDNR construction permit for the selected improvement project(s)
2026	Bid permitted improvement project(s)
2026 - 2027	Construct permitted improvement project(s)

APPENDIX A
SELIGMAN WATER SYSTEM



Project No: 023-00953	
Drawn By: QRH	
Date: 02/12/24	

Existing Seligman Water System

APPENDIX B
TANK MAINTENANCE REPORT

PITTSBURG TANK & TOWER GROUP
MAINTENANCE DIVISION Since 1919
"100 years and still climbing"

1 Watertank Place
PO Box 1849
Henderson, KY 42419
P: 270-826-9000
F: 270-767-6912
www.pttg.com

Thursday, November 12, 2020

Brian Nichols
Account Manager
City of Seligman
29144 S Main Street
Seligman, MO 65745
417-662-3600
417-342-6554
cityofseligman@yahoo.com

Brian,

Since 1919, Pittsburg Tank & Tower Group Maintenance Division has been providing tank services to our customers in over 60 countries, proudly making us a Global Company. Our wealth of experience encompasses all aspects of tank maintenance services, from paint and repair to dismantle and inspections. Our expertise expands beyond maintenance to tank design, fabrication, erection and professional engineering services for new tanks and modifications to existing tanks, including raising, lowering and moving services.

Having been ranked in the Top 600 Specialty Contractors and among the top 15 steel erectors according to Engineering News Record, it was natural to expand our offerings into the Custom Engineering and Manufacturing Industry. Our sister company, Allstate Tower Inc., manufactures structural steel components for towers and agricultural material handling, including complete turn-key systems and installation services.

At Pittsburg Tank & Tower Group, it is not only about the products we produce, but the people as well. Being a family-operated company with a commitment to the Safety and Health of our family of employees, we have worked with the Commonwealth of Kentucky's Labor Cabinet to achieve our SHARP Certification (Safety and Health Achievement Recognition Program), and we are recognized as a Drug Free Workplace in accordance with the standards set forth by the regulation; 803 KAR 25:280 Certification of Drug-Free Workplace.

We are proud to provide you with this proposal and look forward to working with you should you decide to accept it. To accept the proposal, simply sign and date one (1) copy and return it to our Henderson, KY office either by mail, fax or email.

Please feel free to contact us should you have any questions or concerns, or simply want to discuss the proposal further.

Respectfully,

Pittsburg Tank & Tower Group
Maintenance Division

Mark Moesner
National Accounts Manager
270-869-9400 Ext: 4612
270-873-8302 Fax
mmoesner@pttg.com

PITTSBURG TANK & TOWER GROUP
MAINTENANCE DIVISION Since 1919
"100 years and still climbing"

1 Watertank Place
PO Box 1849
Henderson, KY 42419
P: 270-826-9000
F: 270-767-6912
www.pttg.com

Thursday, November 12, 2020

TO : City of Seligman
29144 S Main Street
Seligman, MO 65745
EMAIL : cityofseligman@yahoo.com

ATTN : Brian Nichols
Account Manager
PHONE : 417-662-3600
CELL : 417-342-6554

Re: Maintenance Repairs for tank located at 8198 Doc Meyer Rd, Seligman, MO 64745

In accordance with price, terms and conditions quoted below, we propose to furnish all labor, material, equipment and insurance necessary to complete the following: **one (1) 350,000-gallon bolted standpipe storage tank (30'9"D x 65'HT).**

SCOPE OF WORK

Price	Work Proposed (Prevailing Wages)	Critical Deficiency	Non-Critical Deficiency	OSHA	Structural	Preventive Maintenance
By Owner	Post a **No Trespassing** sign.		X			
$2,300.00	Caulk/Grout around the base of the tank to foundation connection.					X
	Seal the foundation with a sealant.					X
By Owner	Backfill where dirt has been washed out from under the tank foundation. *This should be done by others*.					X
$2,700.00	Clean the area around the anchor bolts, tighten the anchor nuts to specifications, then tack weld on the circumference of the nutto-base plate connections and bolt-to-nut connections (20).					X
$2,645.00	Install a frost proof drain valve near the shell-to-floor connection, complete with a locking device and a splash pad. *Splash pad to be installed by owner*		X			
$6,000.00	Install 30" secondary shell manway 180° from primary manway		X	X		
$1,500.00	Install davit arm on suggested secondary shell manway.			X		
$100.00 Ea.	Post **Confined Space Entry** sign on primary and suggested shell manways.			X		
$350.00	Install a new screen on the overflow pipe.		X			
$2,600.00 Ea.	Install cable type ladder safety devices on exterior shell access ladders.			X		
$100.00	Post **Fall Protection Required** sign at base of exterior shell access ladder.			X		
$675.00 Ea.	Install swing gates at the exterior shell access standoff platforms.			X		
$12,170.00	Extend the handrails around the circumference of the tank roof, complete with intermediate rail, toeboard and a swing gate at the junction of the shell-to-roof access ladder and tank roof.			X		

Depending on the number of items accepted, prices may vary. Please refer to applicable codes.

PTTG MAINTENANCE DIVISION

1 Watertank Place, PO Box 1849, Henderson, KY 42419
P: 270-826-9000 F: 270-767-6912 www.pttg.com

Thursday, November 12, 2020

TO : City of Seligman
29144 S Main Street
Seligman, MO 65745
EMAIL : cityofseligman@yahoo.com

ATTN : Brian Nichols
Account Manager
PHONE : 417-662-3600
CELL : 417-342-6554

Re: Maintenance Repairs for tank located at 8198 Doc Meyer Rd, Seligman, MO 64745

In accordance with price, terms and conditions quoted below, we propose to furnish all labor, material, equipment and insurance necessary to complete the following: **one (1) 350,000-gallon bolted standpipe storage tank (30'9"D x 65'HT).**

SCOPE OF WORK

Price	Work Proposed (Prevailing Wages)	Critical Deficiency	Non-Critical Deficiency	OSHA	Structural	Preventive Maintenance
$4,500.00	Install 30" secondary roof hatch 180° from primary hatch.		X	X		
$100.00 Ea.	Post **Confined Space Entry** signs on primary and suggested secondary roof hatches.			X		
$12,450.00 Ea.	Install compliant interior access ladders complete with standoffs every 10' on center at the primary and suggested secondary roof hatches. In cold climates it is up to the owner's discretion on placement of internal ladders.			X		
	Install cable type ladder safety devices on primary and secondary interior access ladders.			X		
$6,215.00	Replace the existing roof vent with a vacuum-pressure, frost proof vent and screen. This work should be performed on an emergency basis.	X			X	
$19,420.00	Install a Gridbee mixing system. Electrical work to be done by others if required.		X			
$3,125.00	Perform a dry interior cleanout, up to 3" of sediment. **Due to the bolts on the floor of the tank, a robotic in-service cleanout cannot be performed.** This work should be performed on an emergency basis. Additional accumulation will be $300 per hour to remove. In the event the tank has to be drained, it should be drained by the owner prior to our arrival.	X				
$10,635.00	Install a passive cathodic protection system.					X
$106,762.00	Clean the interior seams, then as needed apply a high solids CIM 1000 Trowel grade rubberized coating to all horizontal and vertical seams on the tank interior shell, floor and around the circumference of the shell-to-floor connection. Excludes the roof.					X

Depending on the number of items accepted, prices may vary. Please refer to applicable codes.

- Warning: Do not attach any additional loading to your tank/tower unless structural integrity is known to be sufficient. For analysis call PTTM.
- Our welders are certified in accordance with ASME section IX code.
- In the event the tank must be drained, it should be drained by the owner, prior to our arrival (refer to Item #2 on our Terms & Conditions page).
- Debris generated from repairs and/or painting will be placed in containers provided by the owner and to be disposed of by owner.

PTTG MAINTENANCE DIVISION

1 Watertank Place, PO Box 1849, Henderson, KY 42419
P: 270-826-9000 F: 270-767-6912 www.pttg.com

Thursday, November 12, 2020

Terms & Conditions

1) Prior to start of work, Owner will be furnished a certificate of insurance covering Workman's Compensation, Occupational Disease, Employer's Liability, and General Liability.
2) If tank is to be drained prior to our arrival, it shall be drained by owner, if it becomes necessary to drain the tank while on site, it must be drained by the Owner/Customer.
3) If needed a pressure release valve will be furnished during the cleaning and painting operation. Owner required to notify PTTM prior to mobilization if required.
4) In the event interior and/or exterior complete tank repainting is not included in this scope of work, all new tank appurtenances furnished and installed by PTTM as part of this scope of work shall be field primed and finish coated to match existing coating system(s), unless specifically excluded from our scope of work. Color to match as close as possible.
5) No paint shall be applied during wet, damp, or inclement weather.
6) All paint will be delivered to the job site in original containers with contents identified by the manufacturer.
7) If necessary, customer will be required to clear/move vehicles and equipment a safe distance from the job site to prevent damage and place physical barricades around the perimeter to restrict access.
8) Work to be performed using our prevailing wage scale with Open Shop personnel, by mechanics skilled in their trade.
9) All workmanship is guaranteed for twelve (12) months after completion.
10) Owner is to provide dumpster(s) for trash, paint consumables, blast media, and all other waste produced during course of job, including disposal of said waste.
11) Handling, removal, and/or disposal of hazardous or contaminated material (e.g., asbestos, lead, chemicals, heavy metals, etc.) requiring special handling or transportation to a specific disposal site are not included in the submitted quotation for work. Unless specifically included in our scope of work.
12) This quote does not provide for the shrouding or containment of blast media and paint.
13) Owner understands and agrees any Federal, State, and Municipal taxes imposed on Contractor with respect to the outlined work are additional expenses not included in the contract and further assumes the obligation of paying said additional costs incurred by Contractor. PTTM does not include costs for any permits, local licenses, fees, etc. in this proposal.
14) OWNER / CONTRACTOR agree that the exclusive venue for any litigation arising out of or relating to this Agreement shall be in the Circuit Court of Henderson County, Kentucky and that this Agreement and any litigation arising thereunder shall be governed, construed and interpreted according to Kentucky law.
15) In the event OWNER initiates any litigation against PTTM in contravention of this venue provision, OWNER shall pay PTTM's attorney's fees and costs incurred in obtaining a dismissal and transfer of the litigation to the proper venue in the Circuit Court of Henderson County, Kentucky.
16) OWNER and PTTM hereby waive any right they may otherwise have to venue in a federal court including, but not limited to, any right arising under federal question or diversity jurisdiction.

TERMS

50% with Order; Balance upon Completion OR Mutually Agreed Payment Terms

MasterCard, Visa and American Express are accepted, with prior authorization

Payments made by credit card will be subject to a processing fee of 3%.

Interest will be applied to payments not received in accordance to payment terms.

The parties approving this contract certify that they are fully authorized to do so, and that all legal requirements have been complied with. You are hereby authorized to furnish all labor, material, equipment and insurance required to complete the work mentioned in the above proposal, for which the undersigned agrees to pay the amount mentioned in said proposal. OWNER / CONTRACTOR agree that the exclusive venue for any litigation arising out of or relating to this Agreement shall be in the Circuit Court of Henderson County, Kentucky and that this Agreement and any litigation arising thereunder shall be governed, construed and interpreted according to Kentucky law. In the event OWNER initiates any litigation against PTTM in contravention of this venue provision, OWNER shall pay PTTM's attorney's fees and costs incurred in obtaining a dismissal and transfer of the litigation to the proper venue in the Circuit Court of Henderson County, Kentucky. OWNER and PTTM hereby waive any right they may otherwise have to venue in a federal court including, but not limited to, any right arising under federal question or diversity jurisdiction.

ALL QUOTATIONS SUBJECT TO ACCEPTANCE WITHIN 60 DAYS

Accepted : ______________________________, 2020

Company : City of Seligman

By : ______________________________

Title : ______________________________

Respectfully Submitted by:

Pittsburg Tank & Tower Group
Maintenance Division

By : ______________________________

Jordan Pyles, Executive Director of Sales
jpyles@pttg.com
270-869-9400 Ext: 4601

Paint • Repair • Dismantle • Inspect • Reinsulate • Tanks Raised, Lowered, and Moved
New and Used Tanks

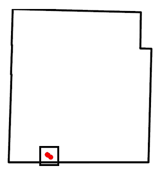
APPENDIX C
MODNR SOURCE WATER ASSESSMENT

Seligman

General System Information

PWSS No. 5010730

Prepared by CARES, University of Missouri Extension

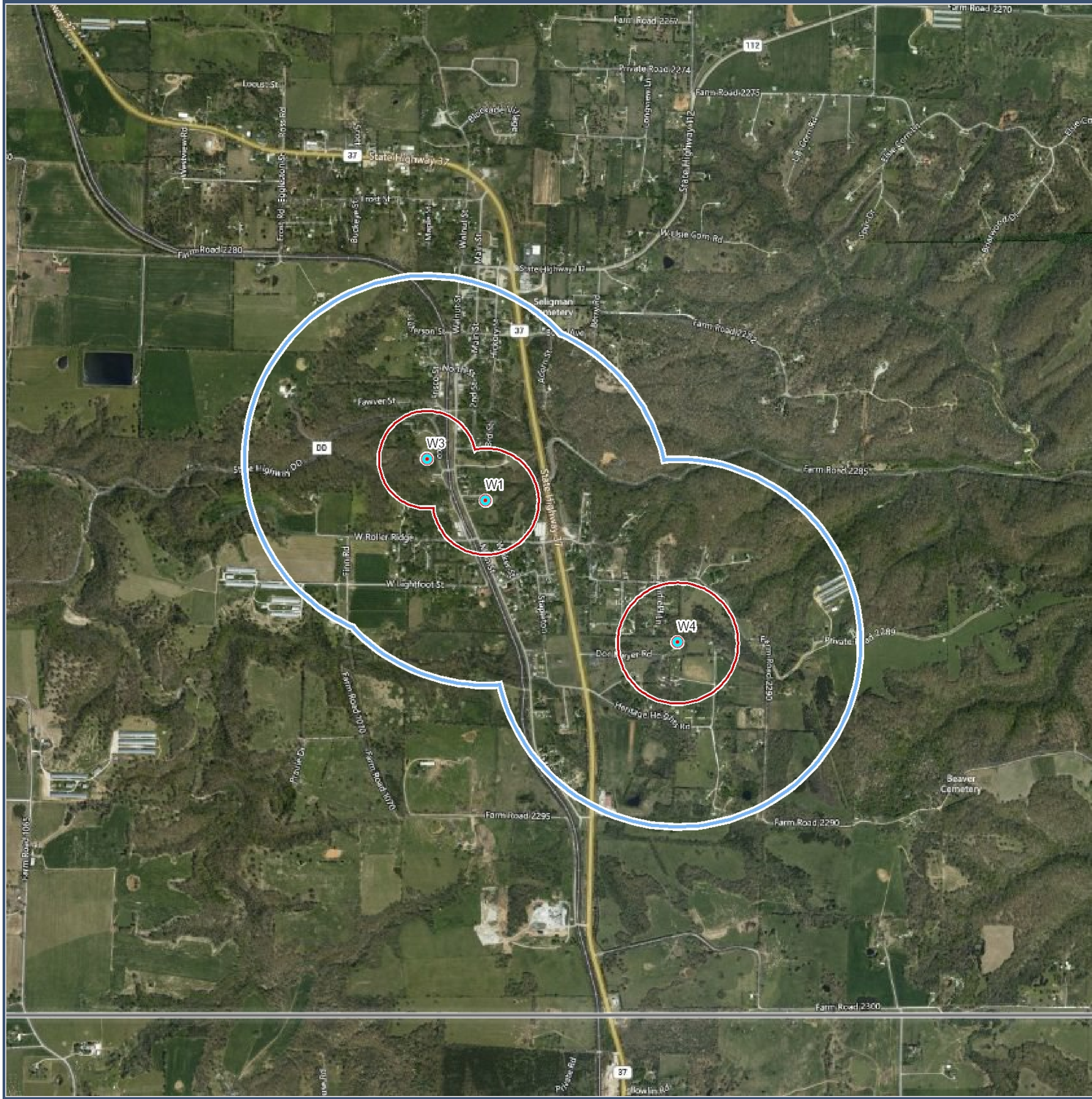
Name	Seligman
PWSSID	MO5010730
Population Served	890
Primary County Served	Barry
Service Connections	658
Source(s) of Water	Springfield Plateau
USDA-NRCS Source Water Protection Priority Area?[7]	No
System Classification	Community (C)
Primary Source Type	Groundwater (GW)
System Type	Municipality
System Treatment	no treatment provided
DNR Region of Operations	Southwest Regional Office (SWRO)
Source Water/Wellhead Protection Plan	No
Drinking Water Watch	Drinking Water Watch
Reference Maps	 

Seligman

Overview Map (Aerial)
PWSS No. 5010730 - 3 Wells, Barry County

Map Prepared: Apr 09, 2023
Data Release: Mar 24, 2023

MISSOURI DEPARTMENT OF NATURAL RESOURCES
Prepared by CARES, University of Missouri Extension



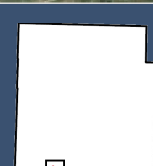
Groundwater System

System Well

Source Water Protection Boundary

20-Year Time of Travel

Half-Mile Buffer



0 2400 4800

Feet

Although the data in this data set have been compiled, in part or in whole, by the Missouri Department of Natural Resources, no warranty, expressed or implied, is made by the department as to the accuracy of the data or related materials. The act of distribution shall not constitute any such warranty, and no responsibility is assumed by the department in the use of these data or related materials. This map and related information are subject to change as additional information is acquired. For additional information, please contact the Department's Drinking Water Branch (Water Protection Program).

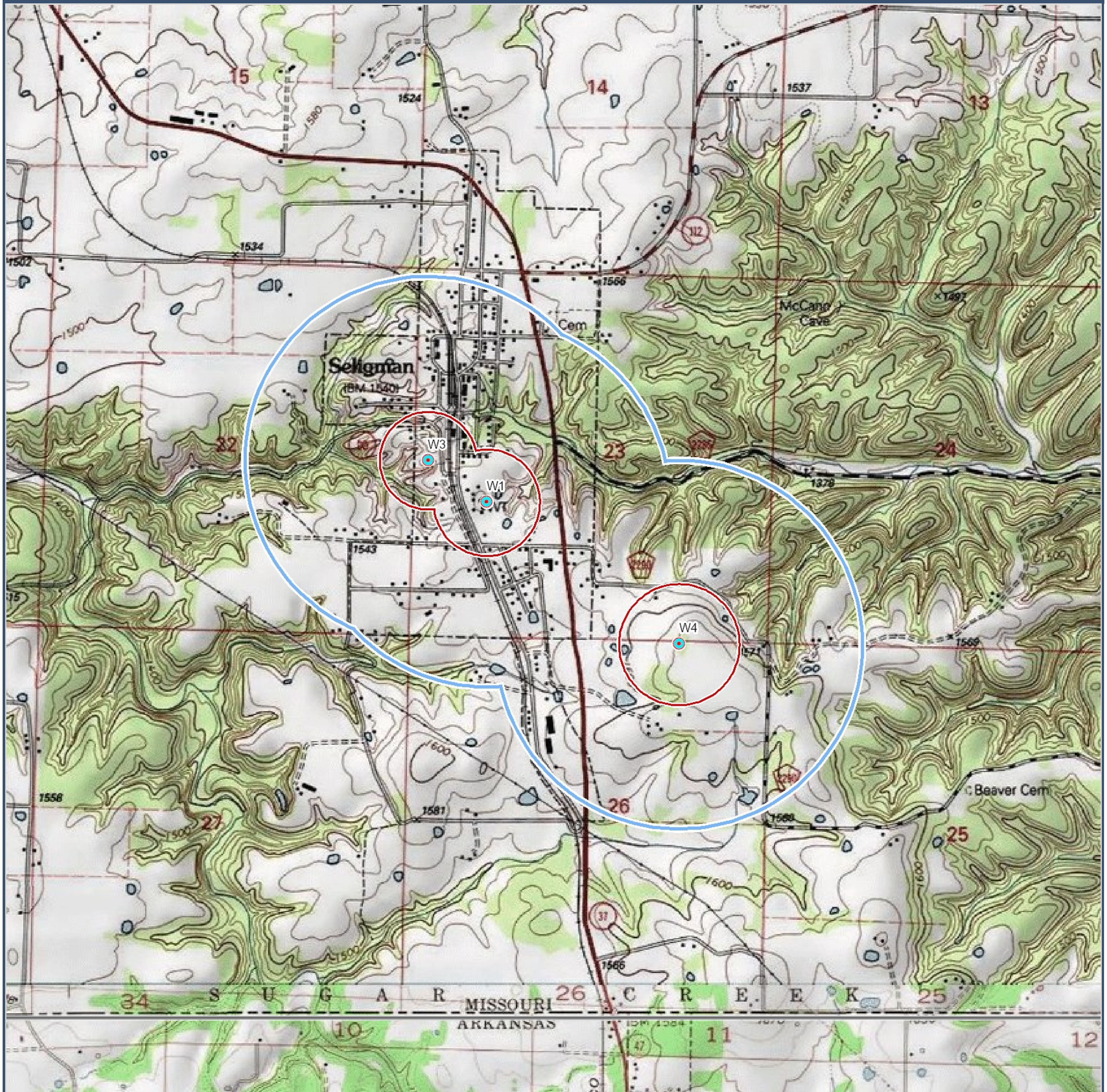
SWAP - Source Water Assessment Plan -
http://drinkingwater.missouri.edu/swap
Aerial Photos: Bing Maps, Microsoft. Apr 09, 2023.

Seligman

Overview Map (Topo)
PWSS No. 5010730 - 3 Wells, Barry County

Map Prepared: Apr 09, 2023
Data Release: Mar 24, 2023

MISSOURI DEPARTMENT OF NATURAL RESOURCES
Prepared by CARES, University of Missouri Extension



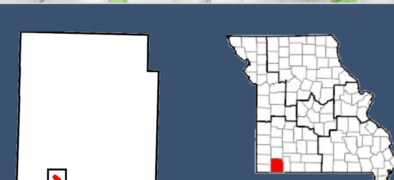
Groundwater System

System Well

Source Water Protection Boundary

20-Year Time of Travel

Half-Mile Buffer



0 2400 4800
Feet

SWAP - Source Water Assessment Plan - http://drinkingwater.missouri.edu/swap
For basemap symbols, see the U.S. Geological Survey (USGS) publication: Topographic Map Symbols.

Seligman

Well/Intake Map (Aerial) - Well #1 (W1)
PWSS No. 5010730, well 1 of 3

Map Prepared: Apr 09, 2023
Data Release: Mar 24, 2023

MISSOURI DEPARTMENT OF NATURAL RESOURCES
Prepared by CARES, University of Missouri Extension

Groundwater System

System Well

Source Water Protection Boundary

20-Year Time of Travel

Half-Mile Buffer

Potential Contaminant Source

State / Federal Data Source

SWIP Confirmed Data (1999 - 2003)

0 900 1800

Feet

Boundaries for individual wells indicated by dashed line.
SWAP - Source Water Assessment Plan -
http://drinkingwater.missouri.edu/swap
Aerial Photos: Bing Maps, Microsoft. Apr 09, 2023.

Seligman

Well/Intake Map (Aerial) - Well #3 (W3)
PWSS No. 5010730, well 2 of 3

Map Prepared: Apr 09, 2023
Data Release: Mar 24, 2023

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Prepared by CARES, University of Missouri Extension

Groundwater System

System Well

Source Water Protection Boundary

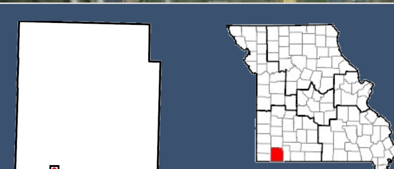
20-Year Time of Travel

Half-Mile Buffer

Potential Contaminant Source

State / Federal Data Source

SWIP Confirmed Data (1999 - 2003)



0 900 1800

Feet

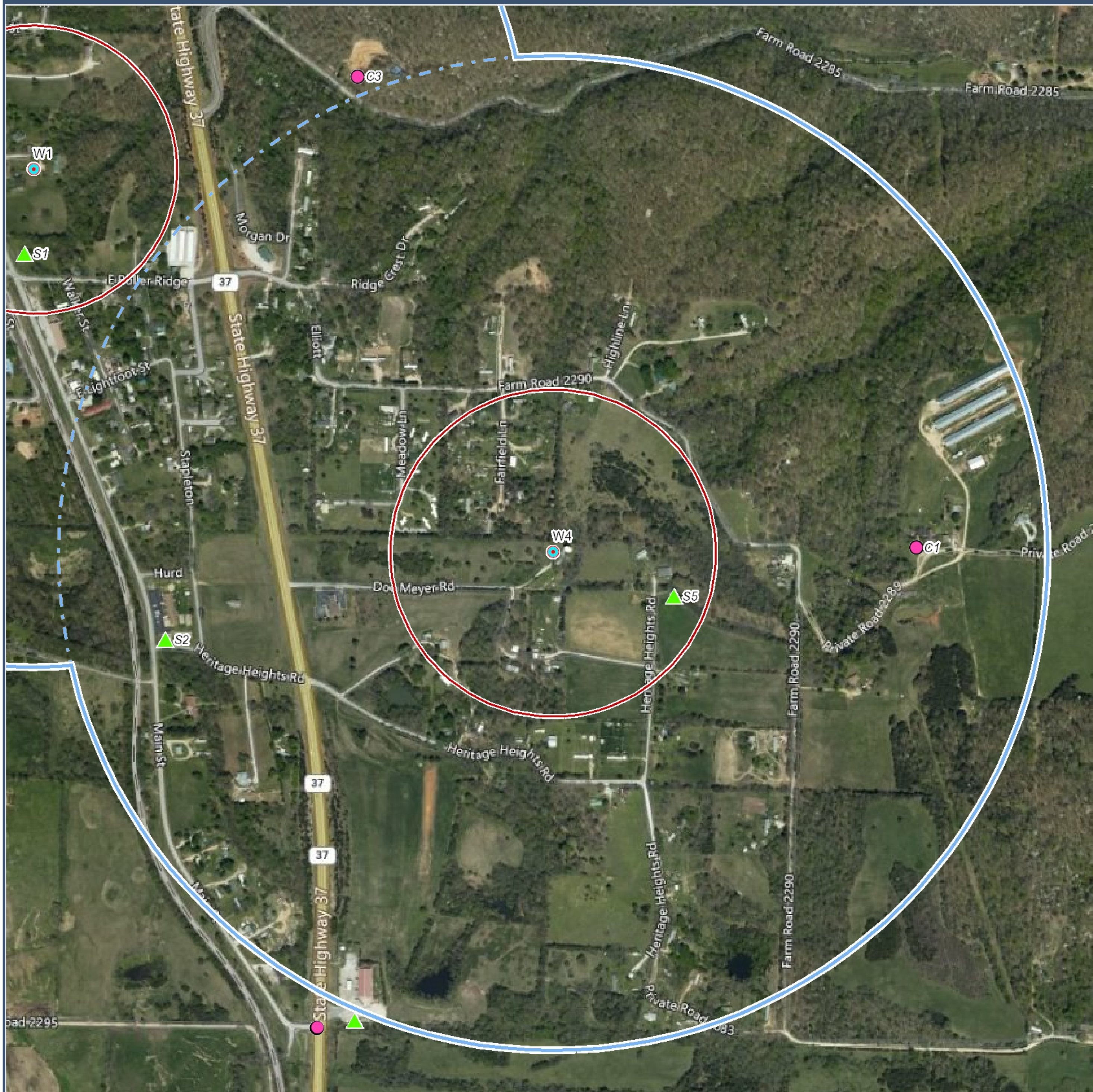
Boundaries for individual wells indicated by dashed line.
SWAP - Source Water Assessment Plan -
http://drinkingwater.missouri.edu/swap
Aerial Photos: Bing Maps, Microsoft. Apr 09, 2023.

Seligman

Well/Intake Map (Aerial) - Well #4 (W4)
PWSS No. 5010730, well 3 of 3

Map Prepared: Apr 09, 2023
Data Release: Mar 24, 2023

MISSOURI DEPARTMENT OF NATURAL RESOURCES
Prepared by CARES, University of Missouri Extension



Groundwater System

System Well

Source Water Protection Boundary

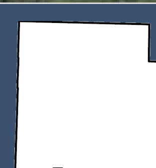
20-Year Time of Travel

Half-Mile Buffer

Potential Contaminant Source

State / Federal Data Source

SWIP Confirmed Data (1999 - 2003)



0 900 1800

Feet

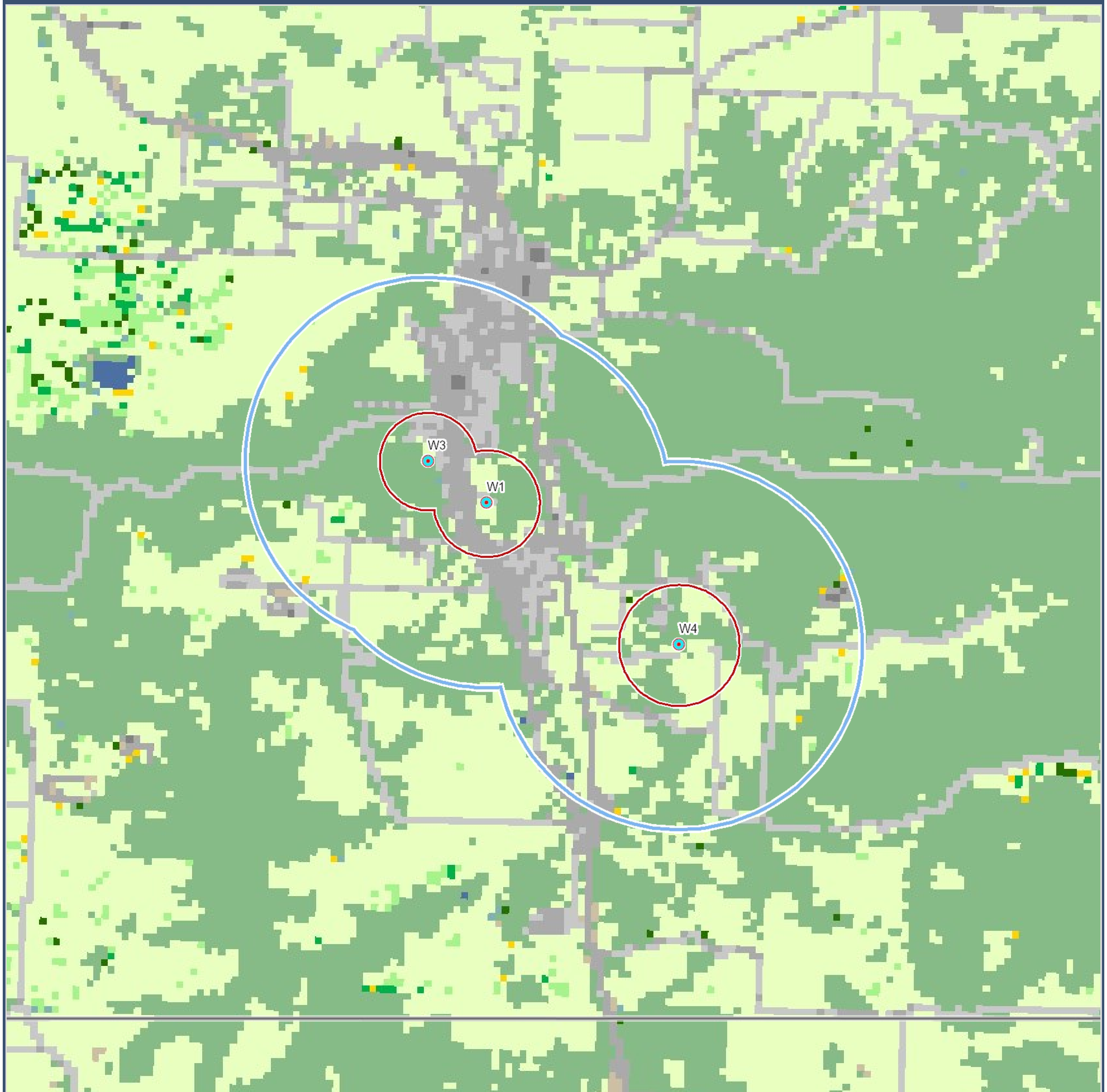
Boundaries for individual wells indicated by dashed line.
SWAP - Source Water Assessment Plan -
http://drinkingwater.missouri.edu/swap
Aerial Photos: Bing Maps, Microsoft. Apr 09, 2023.

Seligman

Overview Map (Land Use)
PWSS No. 5010730 - 3 Wells, Barry County

Map Prepared: Apr 09, 2023
Data Release: Mar 24, 2023

MISSOURI DEPARTMENT OF NATURAL RESOURCES
Prepared by CARES, University of Missouri Extension



Groundwater System
System Well

Source Water Protection Boundary
20-Year Time of Travel
Half-Mile Buffer

Land Use

Corn	Forest/Shrubland
Cotton	Developed/High Intensity
Rice	Developed/Low-Med Intensity
Soybeans	Developed/Open Space
Other Crop	Open Water
Other Hay/Non Alfalfa	Wetlands
Grassland/Pasture	Barren

0 2400 4800
Feet

SWAP - Source Water Assessment Plan - http://drinkingwater.missouri.edu/swap
Aerial Photos: Bing Maps, Microsoft. Apr 09, 2023.

Seligman

Land Use Statistics
PWSS No. 5010730

Map Prepared: Apr 09, 2023
Data Release: Mar 24, 2023

MISSOURI DEPARTMENT OF NATURAL RESOURCES
Prepared by CARES, University of Missouri Extension

Land Use	% Land Area, 2020	% Land Area, 2021	% Land Area, 2022	Avg. % Land Area
Corn	0.11	0.06	0.04	0.07
Cotton	0	0	0	0
Rice	0	0	0	0
Soybeans	0.09	0.01	0.17	0.09
Other Crop	0.07	0.01	0.01	0.03
Other Hay/Non-Alfalfa	0.85	0.44	1.61	0.97
Grassland/Pasture	26.4	30.01	27.99	28.13
Forest/Shrubland	48.17	41.02	41.83	43.68
Developed/High Intensity	0.17	0.3	0.3	0.26
Developed/Low-Med Intensity	12.16	16.06	15.98	14.73
Developed/Open Space	11.87	12.05	12.02	11.98
Open Water	0.07	0.04	0.03	0.05
Wetlands	0.04	0	0.01	0.02
Barren	0	0	0	0

Seligman

Well/Intake Data - PWSS No. 5010730
Barry County, Sheet 1 of 1

Sheet Prepared: Apr 09, 2023

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Prepared by CARES, University of Missouri Extension

Well Number	W1	W3	W4
Local Well Name	Well #1	Well #3	Well #4
Well ID #	13753	13754	13755
DGLS ID #	0012513	0028263	0028701
Status	Active	Active	Active
Latitude	36.519050	36.520700	36.513460
Longitude	-93.938030	-93.940900	-93.928600
12-Digit Hydrologic Unit	110100010801	110702080101	110100010801
County	Barry	Barry	Barry
MoDNR Region	Southwest	Southwest	Southwest
Groundwater Province[1]	Springfield Plateau	Springfield Plateau	Springfield Plateau
Source Aquifer(s)[2]	Ozark	Ozark	Ozark
Confined/Unconfined[3]	Confined	Confined	Confined
Regional Drilling Area[4]	Area 1	Area 1	Area 1
Date Drilled (year)	1953	1979	1990
Material (C/U)	Consolidated	Consolidated	Consolidated
Casing Base Formation	Cotter Dol.	Cotter Dol.	Jefferson City Dol.
Total Depth Formation	Gasconade Dol.	Eminence Dol.	Derby-Doerun Fm.
Total Depth	1695	1925	2150
Ground Elevation (ft)	1560	1540	1645
Casing Depth (ft)	455	550	1100
Casing Size (in)	8	8	10
Casing Type	Steel	Steel	Steel
Elev. of Casing Top (ft)	1560	1540	1645
Screen Length (ft)	________________	________________	________________
Screen Size (in)	________________	________________	________________
Static Water Level (ft)	570	563	665
Well Yield (gpm)	200	150	400
Head (ft)	417	466	322
Draw Down (ft)	________________	________________	________________
Pump Depth (ft)	987	1029	987
Pump Capacity (gpm)	150	140	300
Surface Drainage	________________	________________	________________
State Approved (Y/N)	Y	Y	Y
Liquefaction Risk	Low	Low	Low
Landslide Risk	Low	Low	Low
Collapse Risk	Low	Low	Low
Flood Risk	Low	Low	Low
Surface Contamination Risk	Low	Low	Low
Conduit Flow Risk[6]	K1	K1	K1

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State/Federal Contaminants - PWSS # 5010730 Sheet Prepared: Apr 09, 2023
3 potential contaminant sources, Sheet 1 of 1

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Map No.	Site Name	Type	Database Code
C1	CATRON FARMS	STATE MASTER	MO-DNR
		ICIS-NPDES NON-MAJOR	NPDES
		STORM WATER CONSTRUCTION	NPDES
C2	HILLTOP AUTO SALES & SERVICE	VSQG	RCRAINFO
C3	JAMES CRUSE	ICIS-NPDES NON-MAJOR	NPDES
		STORM WATER CONSTRUCTION	NPDES

Database Codes

ACRES	Assessment, Cleanup And Redevelopment Exchange System
AIR	Integrated Compliance Information System-Air
AIRS/AFS	Air Facility System
AIRS/AQS	Air Quality System
BR	Biennial Reporters
BRAC	Base Realignment And Closure
CAMDBS	Clean Air Markets Division Business Systems
CEDRI	Compliance And Emissions Data Reporting Interface
ECRM	Enforcement Criminal Records Management
E-GGRT	Electronic Greenhouse Gas Reporting Tool
EGRID	Emissions & Generation Resource Integrated Database
EIA-860	Energy Information Administration-860 Database
EIS	Emission Inventory System
FFDOCKET	Federal Facility Hazardous Waste Compliance Docket
ICIS	Integrated Compliance Information System
LMOP	Landfill Methane Outreach Program
LUST-ARRA	Leaking Underground Storage Tank - American Recovery And Reinvestment Act
MN-TEMPO	Minnesota - Permitting, Compliance, & Enforcement
MO-DNR	Missouri Department Of Natural Resources
NCDB	National Compliance Database
NPDES	National Pollutant Discharge Elimination System
OTAQREG	Office Of Transportation And Air Quality Fuels Registration
RADINFO	Radiation Information System
RBLC	Ract/Bact/Laer Clearinghouse
RCRAINFO	Resource Conservation And Recovery Act Information System
RFS	Renewable Fuel Standard
RMP	Risk Management Plan
SEMS	Superfund Enterprise Management System
SFDW	Safe Drinking Water Information System
SSTS	Section Seven Tracking System
STATE	State Systems
SWIP	Source Water Inventory Project Field Inventory
TRIS	Toxics Release Inventory System
TSCA	Toxic Substances Control Act

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Contaminant Summary
PWSS No. 5010730

Sheet Prepared: Apr 09, 2023

Prepared by CARES, University of Missouri Extension

3 potential contaminant sources in the listed databases (multiple databases may list the same contaminant source):

	Database		Database
	ACRES (Assessment, Cleanup And Redevelopment Exchange System)		MN-TEMPO (Minnesota - Permitting, Compliance, & Enforcement)
	AIR (Integrated Compliance Information System-Air)	✔	MO-DNR (Missouri Department Of Natural Resources)
	AIRS/AFS (Air Facility System)		NCDB (National Compliance Database)
	AIRS/AQS (Air Quality System)	✔	NPDES (National Pollutant Discharge Elimination System)
	BR (Biennial Reporters)		OTAQREG (Office Of Transportation And Air Quality Fuels Registration)
	BRAC (Base Realignment And Closure)		RADINFO (Radiation Information System)
	CAMDBS (Clean Air Markets Division Business Systems)		RBLC (Ract/Bact/Laer Clearinghouse)
	CEDRI (Compliance And Emissions Data Reporting Interface)	✔	RCRAINFO (Resource Conservation And Recovery Act Information System)
	ECRM (Enforcement Criminal Records Management)		RFS (Renewable Fuel Standard)
	E-GGRT (Electronic Greenhouse Gas Reporting Tool)		RMP (Risk Management Plan)
	EGRID (Emissions & Generation Resource Integrated Database)		SEMS (Superfund Enterprise Management System)
	EIA-860 (Energy Information Administration-860 Database)		SFDW (Safe Drinking Water Information System)
	EIS (Emission Inventory System)		SSTS (Section Seven Tracking System)
	FFDOCKET (Federal Facility Hazardous Waste Compliance Docket)		STATE (State Systems)
	ICIS (Integrated Compliance Information System)		TRIS (Toxics Release Inventory System)
	LMOP (Landfill Methane Outreach Program)		TSCA (Toxic Substances Control Act)
	LUST-ARRA (Leaking Underground Storage Tank - American Recovery And Reinvestment Act)	✔	SWIP (Source Water Inventory Project Field Inventory - see below)

5 potential contaminant sources in the SWIP Field Inventory:

Count	Site Type	Count	Site Type
0	Airport or abandoned airfield	0	Laundromat
0	Animal feedlot	0	Livestock auction
0	Apartments and condominiums	0	Machine or metalworking shop
0	Asphalt plant	0	Manufacturing (general)
0	Auto repair shop	0	Material stockpile (industrial)
0	Automotive dealership	0	Medical institution
0	Barber and beauty shop	0	Metal production facility
0	Boat yard and marina	0	Mining operation
0	CAFO	0	Other
0	Campground	0	Paint store
0	Car wash	0	Park land
0	Cement Plant	0	Parking lot
0	Cemetery	0	Petroleum production or storage
0	Communication equipment mfg	0	Pharmacies
0	Country club	0	Photography shop or processing lab
0	Dry cleaner	0	Pit toilet
0	Dumping and/or burning site	0	Plastic material and synthetic mfg
0	Electric equipment mfg or storage	0	Print shop
0	Electric substation	0	Railroad yard
0	Farm machinery storage	0	Recycling/reduction facility
0	Feed/Fertilizer/Co-op	0	Research lab
1	Fire station	0	Restaurant
0	Funeral service and crematory	0	Sawdust pile
0	Furniture manufacturer	0	School
0	Furniture repair or finishing shop	0	Sports and hobby shop
0	Garden and/or nursery	0	Swimming pool
0	Garden, nursery, and/or florist	0	Tailing pond
1	Gasoline service station	2	Tank (above-ground fuel)
0	Golf courses	0	Tank (other)
0	Government office	0	Tank (pesticide)
0	Grain bin	0	Tank (underground fuel)
0	Hardware and lumber store	0	Trucking terminal
0	Hazardous waste (Federal facility)	0	Veterinary service
0	Highway maintenance facility	0	Wastewater treatment facility
0	Jewelry or metal plating shop	0	Well (abandoned)
0	Junk yard or salvage yard	1	Well (domestic)
0	Lagoon (commercial)	0	Well (irrigation)
0	Lagoon (industrial)	0	Well (livestock)
0	Lagoon (municipal)	0	Well (monitoring)
0	Lagoon (residential)	0	Well (public water supply)
0	Landfill (municipal)	0	Well (unknown)

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Susceptibility Determination
PWSS No. 5010730

Sheet Prepared: Apr 09, 2023

Prepared by CARES, University of Missouri Extension

The Missouri Department of Natural Resources (MoDNR) has assembled this information to assess the susceptibility of drinking water sources to contamination. There are many unforseen and unpredictable factors that may cause a source to be contaminated. MoDNR routinely monitors all public supplies to ensure public health is protected. Public water systems and local communities are encouraged to take all measures possible to reduce the susceptibility of their drinking water source to chemical contamination. For more information, call 1-800-361-4827.

Dots containing numeric values correspond to the number of individual wells or surface water intakes.

GROUND WATER

	Minimally Susceptible	Moderately Susceptible	Highly Susceptible	Undetermined
Geological and Hydrogeological Assessment Criteria				
Are any system wells deemed by the Public Drinking Water Branch to be under the direct influence of surface water?				●
Are any system wells potentially prone to karst conditions or solution flow?	●			
Do any system wells draw water from a source with high total dissolved solids (TDS)?	●			
Are any system wells located proximal to known subsurface or groundwater contamination?				●
Do any system wells draw water from an unconfined aquifer?		●		
Based on known stratigraphic relationships for each well, the risk of contamination from surface sources is:	3			
Well Construction and Maintenance Assessment Criteria				
Are all system wells state-approved?	●			
Do any system wells exhibit structural defects, construction deficiencies, or other conditions that might allow contamination to enter the well at the wellhead?				●
Are security measures in place to prevent unauthorized tampering with all system wells?				●
Does the system have back-up, emergency power available?		●		
Monitoring Assessment Criteria				
Have any system wells exhibited consistent detections for any of the following parameters in raw water?				
Volatile Organic Chemicals (VOC):	●			
Synthetic Organic Chemicals (SOC):	●			
Inorganic Compounds (IOC):	●			
Nitrates/Nitrites:	●			
Radionuclides:	●			
Bacteria/Viruses/Microbial Pathogens:				●
Natural Hazard Assessment Criteria				
The number of system wells located in a region prone to flooding.	3			
The number of system wells located in a region that may experience the following conditions in the event of a large-scale earthquake.				
Potential liquefaction risk:	3			
Potential landslide risk:	3			
Potential subsurface collapse/instability risk:	3			
Are any system wells prone to declining water levels during a prolonged drought?				●
Do all system wells have lightning surge protection?				●
Potential Contaminant Inventory Assessment Criteria				
Potential sources of contamination exist within the wellhead protection area:	●			
A system well is located in an area with a high density of transportation corridors:	3			
A system well is located in an area that may have improperly maintained or faulty on-site septic systems:				●
Additional Assessment Criteria				
Does the system have a wellhead/source water protection plan endorsed by the Department of Natural Resources?		●		
Does the system have an emergency interconnection with a neighboring public water system?		●		

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Notes
PWSS No. 5010730

Map Prepared: Apr 09, 2023
Data Release: Mar 24, 2023

MISSOURI DEPARTMENT OF NATURAL RESOURCES
Prepared by CARES, University of Missouri Extension

Ground Water Notes:

1 For additional information about Missouri's regional groundwater provinces, please visit the Missouri Department of Natural Resources' Water Resources Center Web page or contact the Missouri Geological Survey.

2 Source aquifers are determined from well log information, where available, and on general water quality characteristics for the regional groundwater province within which each well is located. Source aquifers for wells with little or no well log information are inferred based on best available information.

Additional Source Aquifer Notes:

- Water sources labeled "Cincinnatian, Pennsylvanian, or Devonian/Silurian" are not regionally extensive aquifer systems in Missouri. These represent isolated, localized water-bearing formations. Broad water quality descriptions are Not currently available for these sources. "Precambrian" water sources exhibit water quality characteristics similar to the St. Francois aquifer.
- The Springfield Plateau aquifer is regionally extensive only in southwest and west-central Missouri. Aquifers labeled "Mississippian" or "Springfield Plateau (equivalent)" refer to wells that draw water from the same geological formations that comprise the Springfield Plateau aquifer, but are located in areas of the state not hydraulically connected to the regional aquifer system. Broad water quality generalizations are not available for these isolated, localized water-bearing units.

3 Unconfined aquifers are generally more vulnerable to surface or shallow subsurface contamination and warrant additional protections around the wellhead. Confined aquifers are not as vulnerable to surface or shallow subsurface contamination, but may exhibit naturally elevated levels of dissolved minerals, radionuclides, or variations in other water quality parameters such as dissolved oxygen and pH.

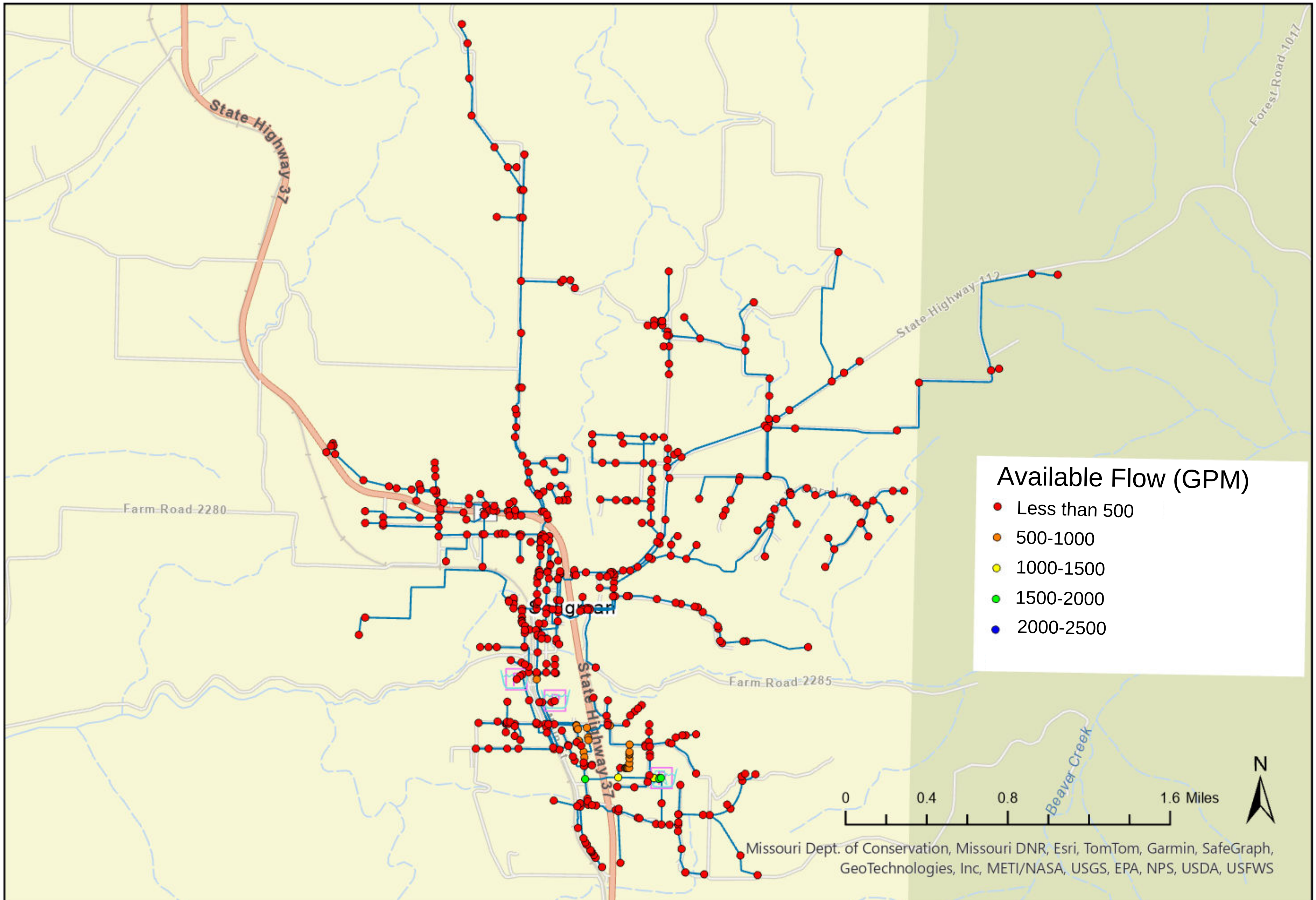
4 Please refer to 10 CSR 23-3.090 and 10 CSR 23-3.100 for additional information about well construction standards for Missouri's regional well drilling areas.

5

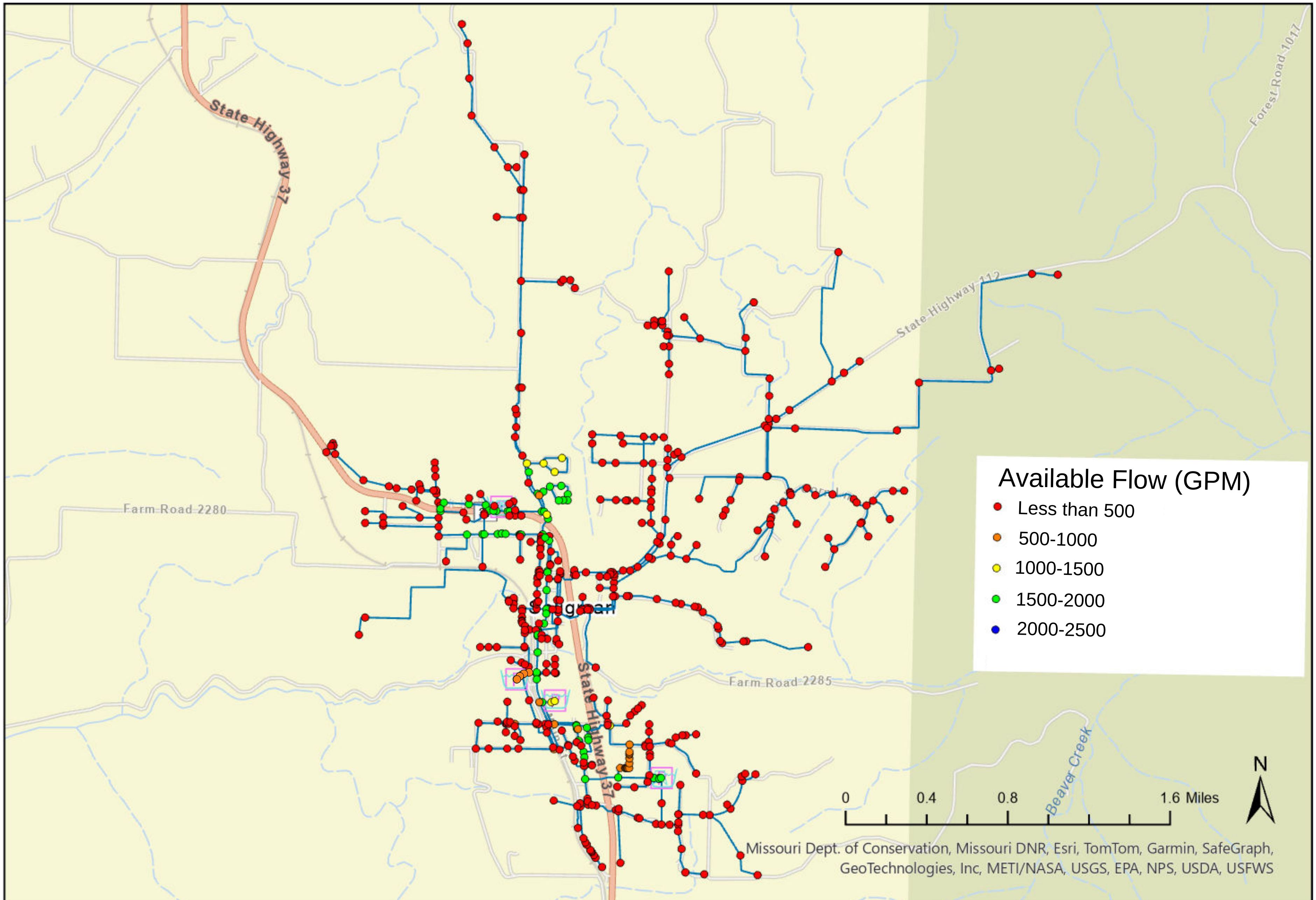
6

7 All or a portion of the source water protection area lies within an area designated by the USDAs Natural Resource Conservation Service as a priority source water protection watershed. Enhanced cost-share opportunities for eligible best management practices on agricultural or pasture land may be available to producers in these areas. Please contact your local Natural Resource Conservation Service office to learn more or visit https://offices.sc.egov.usda.gov/locator/app . You may also contact the Source Water Protection and Assessment Coordinator for additional questions at sourcewaterprotection@dnr.mo.gov.

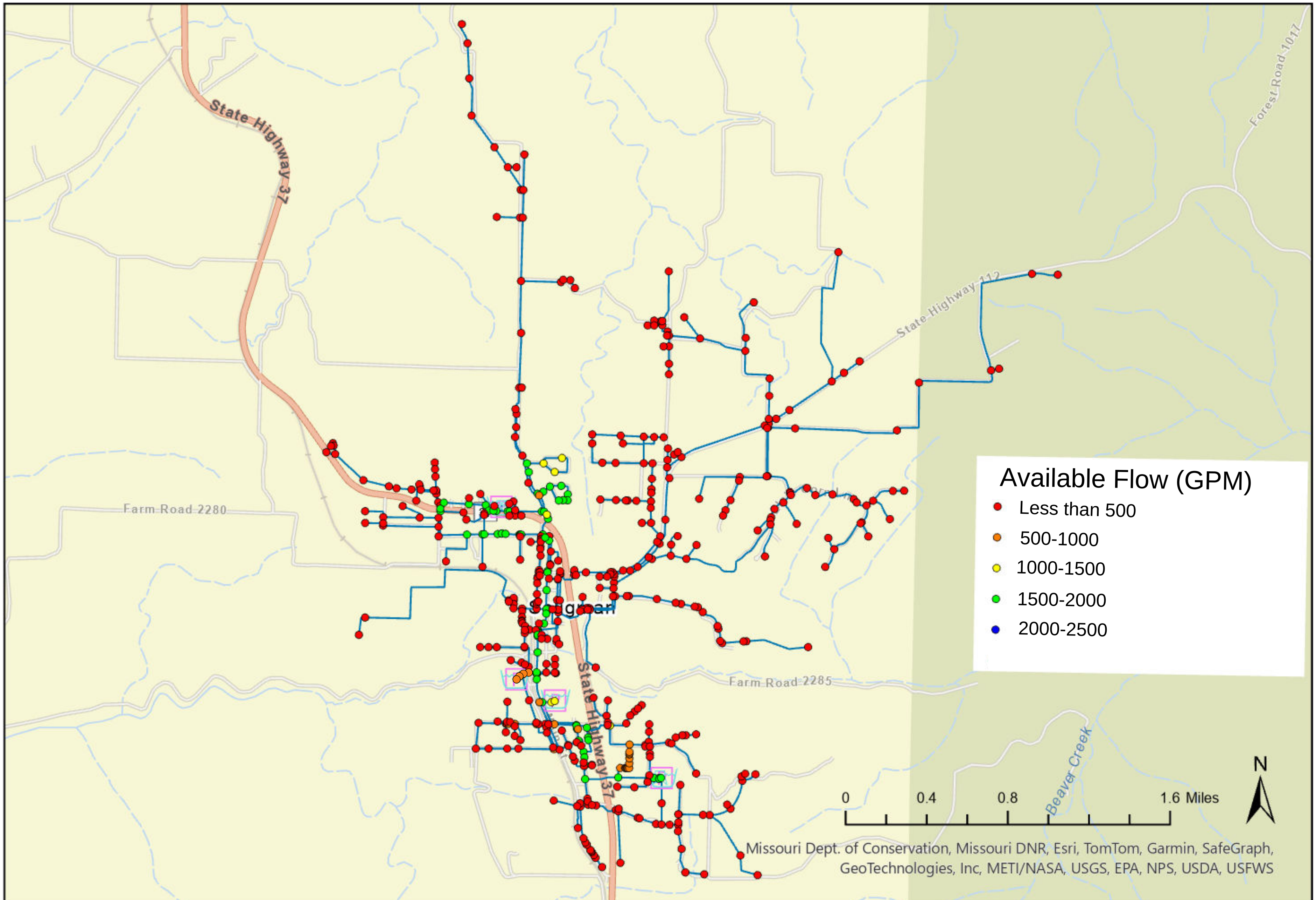
APPENDIX D
AVAILABLE FLOW



Project No: 023-00953	Current Maximum Day Demand - Available Flow with Existing System	olsson
Drawn By: QRH		
Date: 02/12/24		



Project No: 023-00953	Current Maximum Day Demand - Available Flow with Proposed Improvements	olsson
Drawn By: QRH		
Date: 02/12/24		



Project No: 023-00953	2043 Maximum Day Demand - Available Flow with Proposed Improvements
Drawn By: QRH	
Date: 02/12/24	

olsson

APPENDIX E
OPINION OF PROBABLE COSTS

olsson®

Client Information

Client: City of Seligman, MO
Project Name: Water System Engineering Report Update
Project Number: 023-00953

Olsson Information

Calculations by: QRH
Date: 3/28/24

Item	Item Description	Qty	Unit	Unit Price	Total Cost
Phase 1 (Current) Construction Costs - Proposed Water System Improvements					
Distribution System Improvements					
1	8" PVC Waterline, Complete	10,000	LF	$ 80	$ 800,000
2	6" PVC Waterline, Complete	700	LF	$ 70	$ 49,000
3	Tie to Existing Water System, Complete	18	EA	$ 4,000	$ 72,000
4	Road Bore - 14" Steel Casing	950	LF	$ 400	$ 380,000
5	Fire Hydrants	27	EA	$ 5,000	$ 135,000
6	Gate Valve with Box, Complete	14	EA	$ 3,500	$ 49,000
Construction Subtotal - Distribution System Improvements					**$ 1,485,000**
Elevated Storage Tank					
1	400,000-gallon Elevated Storage Tank, Complete	1	LS	$2,250,000	$ 2,250,000
2	Sitework, Yard Piping, and Fencing	1	LS	$ 50,000	$ 50,000
3	New SCADA System, Complete	1	LS	$ 150,000	$ 150,000
Construction Subtotal - Elevated Storage Tank					**$ 2,450,000**
Phase 1 (Current) Total Opinion of Probable Construction Costs					**$ 3,935,000**

Phase 1 (Current) Non-Construction Costs - Proposed Water System Improvements		
	Survey, Engineering Design, Permitting (12%)	$ 472,200
	Bidding/Construction Administration (8%)	$ 314,800
	Legal and Easement (2%)	$ 78,700
	Tank and Well Site Land Acquisition	$ 50,000
	Project Contingency (15%)	$ 727,300
Phase 1 (Current) Total Opinion of Probable Non-Construction Costs		**$ 1,643,000**
Phase 1 (Current) Total Opinion of Probable Project Cost		**$ 5,578,000**

Client Information

Client: City of Seligman, MO
Project Name: Water System Engineering Report Update
Project Number: 023-00953

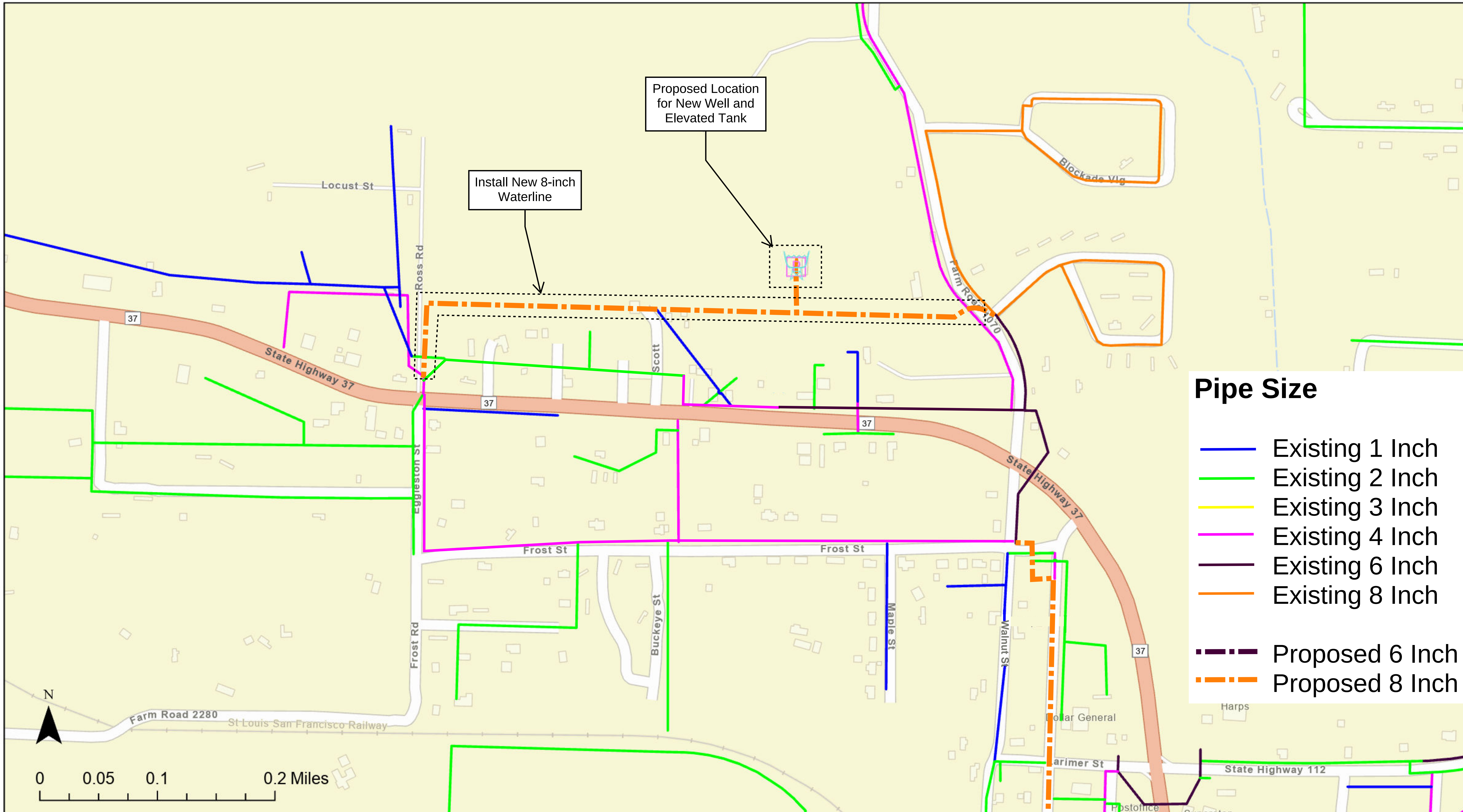
Olsson Information

Calculations by: QRH
Date: 3/28/24

Item	Item Description	Qty	Unit	Unit Price	Total Cost
Phase 2 (2034) Construction Costs - Proposed Water System Improvements					
Install Higher-Capacity Pump at Well 1					
1	Submersible Well Pump and Setting	1	LS	$ 63,100	$ 63,100
2	Disinfect Well	1	LS	$ 2,400	$ 2,400
Construction Subtotal - Higher-Capacity Pump at Well 1					**$ 65,500**
New 300-gpm Groundwater Well					
1	Drill 16" Plus Hole for Surface Casing	50	VF	$ 400	$ 20,600
2	16" OD Surface Casing	50	VF	$ 100	$ 6,100
3	Drill 16" Hole for Casing	500	VF	$ 200	$ 91,000
4	10" ID Well Casing	550	VF	$ 100	$ 60,100
5	Grout Well Casing	500	SKS	$ 100	$ 36,400
6	Drill 10" Hole	1,200	VF	$ 100	$ 138,300
7	Well Yield Test	1	LS	$ 34,000	$ 34,000
8	Submersible Well Pump and Setting	1	LS	$ 163,800	$ 163,800
9	Disinfect Well	1	LS	$ 1,800	$ 1,800
Construction Subtotal - New 300-gpm Groundwater Well					**$ 552,100**
Wellhouse and Sitework for New Well					
1	Wellhouse, Piping, Elec.	1	LS	$ 606,600	$ 606,600
2	Sitework, Yard Piping, and Fencing	1	LS	$ 60,700	$ 60,700
3	Generator	1	LS	$ 121,300	$ 121,300
Construction Subtotal - Wellhouse and Sitework for New Well					**$ 788,600**
Phase 2 (2034) Total Opinion of Probable Construction Costs					**$ 1,406,200**
Phase 2 (2034) Non-Construction Costs - Proposed Water System Improvements					
	Survey, Engineering Design, Permitting (12%)				$ 168,700
	Bidding/Construction Administration (8%)				$ 112,500
	Legal and Easement (2%)				$ 28,100
	Project Contingency (15%)				$ 257,500
Phase 2 (2034) Total Opinion of Probable Non-Construction Costs					**$ 566,800**
Phase 2 (2034) Total Opinion of Probable Project Cost					**$ 1,973,000**

** Phase 2 Unit Prices are calculated using today's dollars projected forward with a 2% growth rate. Market conditions can be volatile and costs should be reevaluated during the design of improvements.*

APPENDIX F
RECOMMENDED IMPROVEMENTS

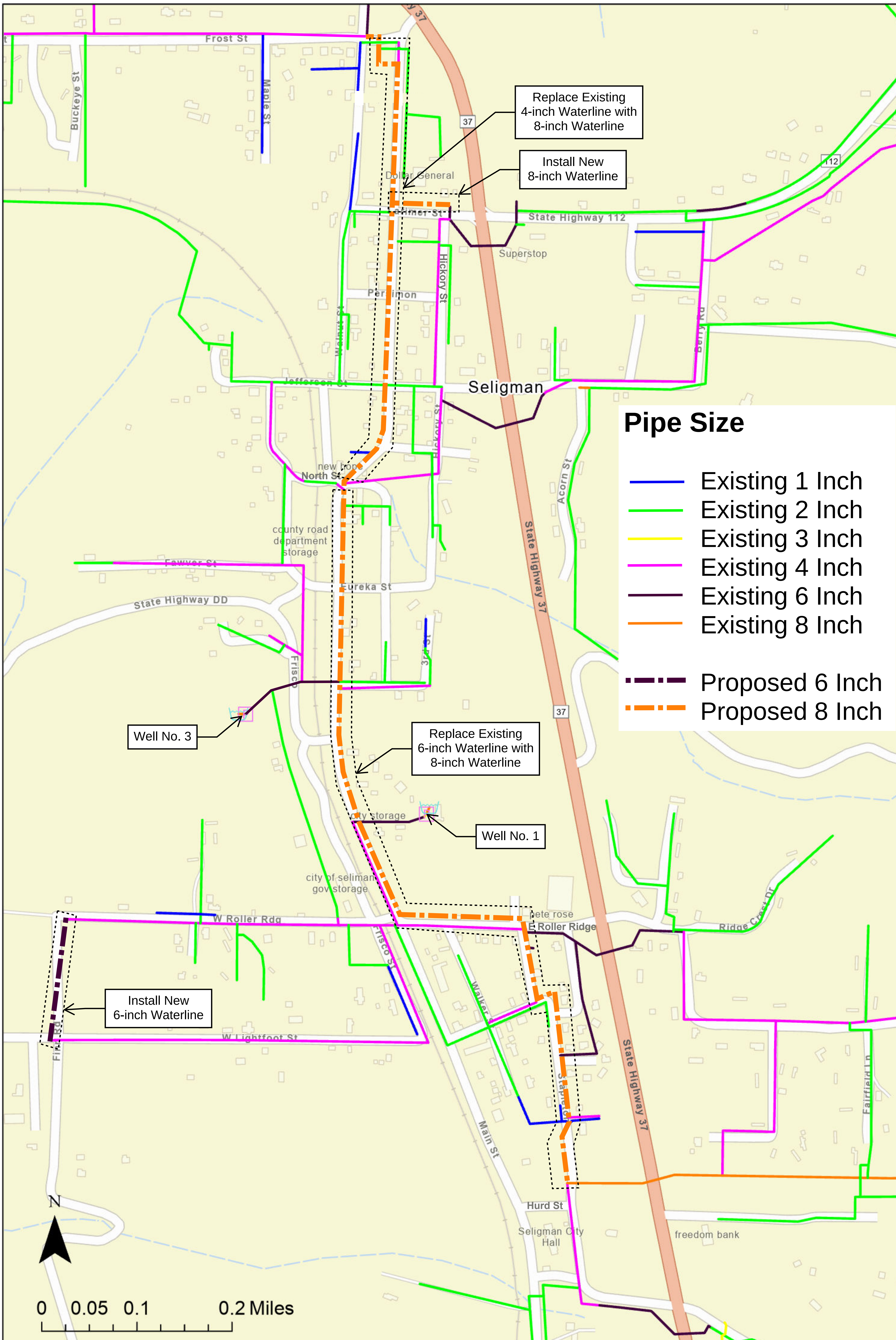


Project No: 023-00953

Drawn By: QRH

Date: 03/16/24

Recommended Improvements Map 1 of 2



Project No: 023-00953	
Drawn By: QRH	
Date: 03/16/24	

Recommended Improvements
Map 2 of 2

olsson

WATER SYSTEM MASTER PLAN UPDATE

Seligman, MO - 2023

April 2024

Olsson Project No. 023-00953