SUNRISE ENGINEERING

TOWN OF SPRINGDALE CULINARY WATER MASTER PLAN 2023

TOWN OF SPRINGDALE
CULINARY WATER MASTER PLAN UPDATE

October 2023

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I. INTRODUCTION

This Culinary Water Master Plan has been prepared for the Town of Springdale. Springdale is located in Washington County Utah, east of St. George, Utah along Highway 9 and adjacent to Zion Nation Park. The Town of Springdale has experienced periods of high growth rates in the past and has recently experienced high growth rates with respect to commercial development.

The considerable impact of the tourism industry requires that the Town take into account the ability to provide enough water during these peak times. With the Town being located at the entrance of Zion National Park, the number of commercial entities associated with their proximity to the park is relatively high for a Town of their size. As a result, the Town of Springdale experiences relatively high peak water usage during the summer months, and low usage during the winter months.

The culinary water system has been analyzed under the State of Utah Division of Drinking Water guidelines to determine the current system status and to evaluate possible system needs as the community grows during the next 20 years. As part of this plan, Sunrise Engineering, Inc. has recommended some improvements to the culinary water system.

II. SYSTEM USERS' ANALYSIS

A. LENGTH OF PLANNING PERIOD

It is typical for a master plan to use a 10 or 20-year planning period. For example, the first year of a 10-year planning period would be the year 2024 with the 10th and final year being 2033. This plan will use calendar years and will assume a 20-year (2024-2043) planning period for recommended improvements. This period will allow an adequate evaluation of the system for potential infrastructure improvements or other needs. Revenue sources should be carefully evaluated each year as budgets are set by the town council.

B. PROJECTED GROWTH RATE

An important element in the development of the water system and capacity analysis is the projection of the town or system's population growth rate on an annual basis. This projection gives the planner an idea of the potential future demands on the culinary water system for the length of the planning period.

Projecting the number of future culinary water connections can be a subjective process. A common method of estimating the number of future connections is analyzing past historical numbers of connections and population records. Figure II-1 below shows the historic population and connections in the Town. The historic population shown comes from United States Census Bureau's population data.

Figure II-1: Historic Population

Calendar year	Total Population	Est. Growth Rate
2018	606	2.36%
2019	629	3.80%
2020	523	-16.85%
2021	556	6.31%
2022	576	3.60%

The census data shown above indicates that the Town has had a negative growth rate. Based on discussion with Town staff and elected officials, a decrease in population has not been observed. Because the available population data that is available does not appear to accurately represent the Town, a different approach was used to determine a growth rate.

Town staff has accurate historical data for the number of connections to the water system for the current and past years. This plan focuses on the number of connections instead of population in projecting future growth. The water system is made up of different types of connections. Figure II-2 shows a breakdown of the number of connections for each type that have historically been in the system.

Figure II-2: System Connections by Type

Calendar Year	Total Connections	Residential	Commercial	Institutional
2018	443	297	126	20
2019	480	325	134	21
2020	483	332	130	21
2021	524	352	154	18
2022	552	358	175	19

The Town has experienced significant growth in the number of new connections for both residential and commercial connections. The total number of connections has grown by an average rate of approximately 5% each year over the last five years. This growth is higher than the 2% growth rate that was projected as part of the previous master plan. The Town has begun implementing land use strategies to control growth specifically for hotel and rental properties. Because of these strategies it is anticipated that growth will occur at a slower rate than it has in recent years.

Typically, a uniform growth rate would be chosen based on historical data. However, with the current land use strategies and zoning that are in place, the Town is not expecting each connection type to grow at the same rate. Specifically, the demographics of the Town and the impacts of tourism result in very different growth expectations for residential and commercial facilities. Therefore, a growth rate was determined for each connection type. The growth rates were determined through looking at historical data, current zoning and land use policies, and coordination with Town staff and officials. Figure II-3 shows the determined annual growth rates.

Figure II-3: Growth Rate per connection Type

Connection Type	Projected Growth Rate
Residential	2.50%
Commercial	1.25%
Institutional	0.10%

These different connection types are not equal in how much water they normally use. To accurately compare each of the connection types the connections are converted into equivalent residential units (ERU). This is done by taking the usage per connection of each connection type and dividing by the average usage per connection of residential connections. Figure II-3 shows a summary of the ERU calculations and Figure II-4 shows the historical number of ERUs by connection type. This plan will use the number of ERUs instead of the number of connections for analysis.

Figure II-4: ERU Calculations

Number of ERU Calculations			
	Residential	Commercial	Institutional
Usage (gal)	15,689,746	69,846,254	3,704,172
# of Connections	358	175	19
Avg Annual Usage Per Connection	43,826	399,121	194,956
ERUs	1.0	9.1	4.4
# of ERUs	358	1,594	85

Figure II-5: Historical ERU by Connection Type

Calendar Year	Total	Residential	Commercial	Institutional
2018	1627	297	1193	136
2019	1808	325	1372	111
2020	1415	332	1023	60
2021	1765	352	1341	72
2022	2036	358	1594	85

C. PROJECTED NUMBER OF ERU's

Based on the forecasted growth rates referenced in the previous section, the number of ERU's the Town will need to plan for can be calculated with the compound interest formula shown below:

$$F = P(1+i)^N$$

F = Future Population P = Present Population
i = Projected Growth Rate N = Years

This equation was used to project the number of ERU's for each year in the planning period. Figure II-6 below shows a summary of the growth rate analysis. Appendix A shows the full analysis.

Figure II-6: Growth Rate Analysis Summary

Calendar Year	Residential ERUs	Commercial ERUs	Institutional ERUs	Total ERUs
2022	358	1,594	85	2,036
2023	367	1,614	85	2,066
2024	377	1,635	86	2,098
2025	387	1,656	87	2,130
2026	397	1,677	88	2,162
2027	407	1,698	89	2,194
2028	418	1,720	90	2,228
2029	429	1,742	91	2,262
2030	440	1,764	92	2,296
2031	451	1,787	93	2,331
2032	463	1,810	94	2,367
2033	475	1,833	95	2,403
2034	487	1,856	96	2,439
2035	500	1,880	97	2,477
2036	513	1,904	98	2,515
2037	526	1,928	99	2,553
2038	540	1,953	100	2,593
2039	554	1,978	101	2,633
2040	568	2,003	102	2,673
2041	583	2,029	103	2,715
2042	598	2,055	104	2,757
2043	613	2,081	105	2,799

It is recommended that projected growth rates be reviewed in 3 to 5 years and adjusted based on actual growth and to account for any unforeseen changes.

D. BUILDOUT

As the Town continues to grow eventually there will be a point where all the available land has been developed, and there is no more capacity for new connections. This point is referred to as buildout. When constructing new infrastructure projects, it is typical to size some elements of the infrastructure to handle the projected build out demand. A previous analysis was performed by Town staff to calculate anticipated buildout for the Town.

For the Town's buildout analysis the number of buildout ERU's was calculated to be 2,297. This number of build out ERU's was also used for the 2021 Wastewater Master Plan. The Town's analysis was based on zoning densities with the land use zones from the most recent master plan. According to the growth rate analysis in this report, and the Town's calculated buildout ERU's of 2,297 the Town will be at buildout by 2030. However, in this study, the number of ERU's is based on historical water usage, not zoning densities.

As stated in Section II.B the ERU's calculated and projected in this study are a function of usage and number of connections. It is possible for the number of ERU's to increase without any increase in the number of connections. For example, if commercial usage increases and residential usage remains the same or decreases, and no new connections are added, the commercial ERUs will increase resulting in a higher total number of ERUs. Figure II-7 shows a summary of the number of ERU's per connection type for 2020 and 2022. The same calculation used for Figure II-4 to get the number of 2022 ERU's was used to calculate the 2020 ERU's.

Figure II-7: ERU's per connection Type

Calendar Year	Residential	Commercial	Institutional
2020	1.0	7.9	2.8
2022	1.0	9.1	4.4

The number of ERU's for the Town has increased at a higher rate than the number of connections over the last several years. Based on the information in Section II, since 2020 the number of connections has increase by approximately 14% and ERU's have increased by approximately 43%.

Because of the difference in ERU calculation methodology, it is likely that the 2,297 projected in this plan in 2030 will not be equal to the buildout ERU's previously calculated by the Town. This plan looks at a 20-year planning window and assumes that Buildout will happen after the 20-year planning window.

E. HISTORICAL CULINARY WATER USAGE

The historical usage of the Town is from the usage data that has been reported to the state over the past 5 years (2018-2022). The average usage per ERU was calculated from the historical usage. The total average usage over the past 5 years was divided by the average number of ERU's and then converted to gpd/ERU as shown in the calculations below.

88,840,000 gallons / 1,730 ERU = 51,300 gallon/ERU/year
51,300 gallon/ERU/year / 365 days/year = 141 gpd/ERU

Figure II-8 shows a summary of the average usage and historical data as explained above.

Figure II-8: Springdale Historical Usage Summary

Calendar Year	Total Usage (Thousand gallons)	Number of Connections	Usage per Conn. (gpd/conn)	Number of ERUs	Usage Per ERU (gpd/ERU)
2018	81,495	443	504	1,627	137
2019	102,311	480	584	1,808	155
2020	80,300	483	455	1,415	156
2021	90,867	524	475	1,765	141
2022	89,240	552	443	2,036	120
5-Year Avg:	88,843	496	492	1,730	141

The 141 gpd/ERU average usage calculated from the Town's historical usage is lower than states minimum sizing requirements. Therefore, the historical usage is not the usage demand used for the analyses in this plan. The following sections describe the usage demands that were used for this plan.

F. AVERAGE CULINARY WATER USAGE

The State of Utah Public Drinking Water regulations require public water system to meet requirements based upon usage. These requirements are found in the State R309 Code. The code provides a standard usage based upon the types of connections serviced in a system. For a standard residential connection, the code says to assume an average day usage of 400 gallons per day (gpd) per ERU.

However, DDW recently has been creating individual minimum sizing standards for smaller systems. DDW has provided the Town Minimum Sizing Standards for the Springdale Town Water System. This minimum sizing standard states that an average usage of 255 gpd/ERU should be used . This plan will use the DDW Minimum Sizing Standard's average usage demand in analyzing the water system.

G. PEAK DAY DEMAND CULINARY WATER USAGE

Peak Day Demand (PDD) is defined by the Utah Administrative Code as the "anticipated water demand on the day of the highest water consumption". The DDW Minimum Sizing Standard for the Springdale Town Water System states that a PDD of 405 gpd/ERU be used. This plan will use the DDW Minimum Sizing Standard's peak day usage demand in analyzing the water system.

H. PEAK INSTANTANEOUS DEMAND CULINARY WATER USAGE

Peak Instantaneous Demand (PID) can be described as the highest demand at any one instance in the system. This can be determined based on hourly usage if such data is available. Where hourly usage data does not exist, which is the case in this study, the State Code provides the following method to calculate the PID:

Indoor Usage:

$$Q_{peak\ indoor} = 10.8\ x\ N^{0.64}$$

Where N is the number of connections and Q is the flow in gpm.

This equation results in an existing (2022) PID of 1,443 gpm .

Outdoor water use is not included in the PID demand calculation as the Town has a separate system for irrigation water. The PID is used to check that minimum pressures are maintained in the system during a moment of high usage in the water system. Peak usage in the irrigation system would not directly affect the pressure in the culinary water system because outdoor watering is through a different system.

I. CONSERVATION

The Town of Springdale adopted a Water Management and Conservation Plan in March of 2023. The plan outlines multiple goals that the Town is seeking to achieve, namely the goal of reducing water use by 14% by the year 2030. The Town will achieve that goal by focusing on land use and planning, irrigation overwatering, irrigation accountability and metering, monitoring leakage and losses in the system, and drought mitigation response. This will have an impact on the average and peak day demand usage in the future. This is not expected to have any impact on the PID because the conservation efforts do not directly impact the amount of water that can be used at any given moment.

Because this plan uses the minimum sizing requirements provided by DDW, conservation measures are not included in the demand calculations. The minimum sizing requirements are calculated based on the Town's reported water usage. As the Town works towards conservation, it is possible that as usage decreases the minimum sizing requirements could also decrease in the future. Future plan updates are recommended to evaluate and update the impacts of conservation efforts.

III. WATER RIGHTS ANALYSIS

A. EXISTING WATER RIGHTS

The Town has water rights for Virgin River water as well as a few springs and wells in the area. All the water diverted from the river is pumped into the irrigation system where it goes to the settling ponds above the culinary water treatment plant or directly to the irrigation users. The Town's water rights are identified in Figure III-1. These rights are for both culinary water and secondary water (irrigation) use.

Figure III-1: Springdale Existing Water Rights

W.R. #	Name/#	Flow (CFS)	Flow (gpm)	Duty (ac-ft)
Springdale Town				
81-105	Spring Above ZNP Campground	0.016	7	11.58
81-220	Birch Springs East - West of ZNP Museum	0.042	19	30.41
81-274	Birch Springs West - West of ZNP Museum	0.070	31	50.68
81-585	Hummingbird Well	0.330	148	238.91
81-1326	Cemetery Well*	0.000	0	0
81-2413	Big Springs	0.525	236	380.08
81-3392	North Fork Virgin River	1.330	597	365.95
81-1142	40 SCIC Shares	0.090	40	65.2
Total Source		2.403	1078	1142.81

*Cemetery Well water right is in the process of being transferred to the wastewater lagoons to be used for O&M purposes. It will not be used for culinary or irrigation water.

The Springdale Consolidated Irrigation Company (SCIC) also holds water rights for Virgin River water that is used by its shareholders. This water is combined with the water the Town takes from the river. The Town is a shareholder in the SCIC and owns 40 shares at 1.63 acre-feet/share. This equates to 65.2 additional acre-ft of water rights available for the Town. The remainder of the shares are not metered or monitored by the Town and are only used for non-culinary use. Except for the 65.2 Acre-ft the town has access to the SCIC water rights are not included as part of this plan. The Town is actively trying to acquire additional shares in the SCIC.

The State of Utah Division of Water Rights requires that no entity exceeds its water right in usage in any year. Additionally, some water rights have a flow rate limit.

B. EXISTING WATER RIGHTS CAPACITY

The water rights capacity demand was calculated using the average day demand (ADD) of 255 gpd/ERU multiplied by the number of ERUs in the system and adding the outdoor use. The results of the calculations are shown below in Figure III-2 in acre-feet.

Figure III-2: Current Required Water Right (2024)

Total Required Demand	722 ac-ft
Total Available Water Rights	1,143 ac-ft
Existing Water Right Surplus	421 ac-ft

C. PROJECTED REQUIRED WATER RIGHTS CAPACITY

Projecting growth to the 10-year and 20-year planning periods and using the same method of calculating required demand reveals that the water system will continue to have a surplus of source capacity at the end of the planning window. The projected required source capacity for the 10-year and 20-year planning periods are shown in Figure III-3 and Figure III-4.

Figure III-3: Projected 10-year Required Water Right (2033)

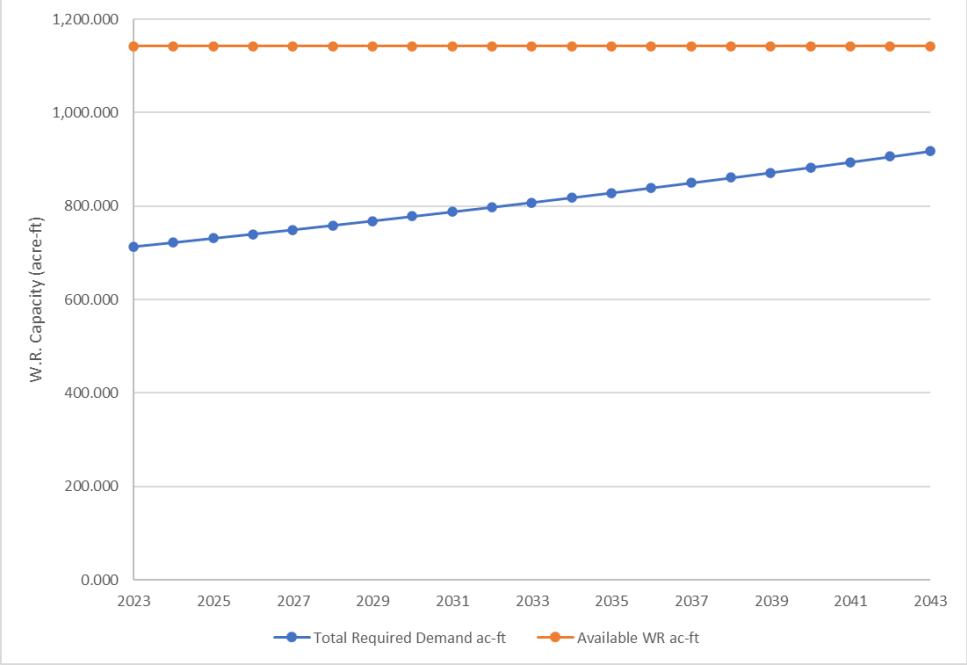
Total Required Demand	808 ac-ft
Total Available Water Rights	1,143 ac-ft
Existing Water Right Surplus	335 ac-ft

Figure III-4: Projected 20-year Required Water Right (2043)

Total Required Demand	918 ac-ft
Total Available Water Rights	1,143 ac-ft
Existing Water Right Surplus	225 ac-ft

D. WATER RIGHT CAPACITY SUMMARY

Figure III-5: Projected Water Right Capacity



IV. WATER SOURCE CAPACITY ANALYSIS

A. EXISTING WATER SOURCE

Water for the Town of Springdale is currently obtained from multiple sources, but the majority of the water comes from the North Fork of the Virgin River via a diversion structure upstream of the Town and within Zion National Park. Other sources include springs in Zion National Park, the Hummingbird Well, and Big Spring. Previous Master Plans have stated the available flow from these sources total approximately 1,100 gpm. However, the Town currently does not have the infrastructure to utilize all the sources they have access to from their water rights. In addition, the total amount of source available is greater than what the treatment plant is able to process. Therefore, the effective source for further analysis will be the max capacity of the treatment plant which is 800 gpm.

B. EXISTING REQUIRED WATER SOURCE CAPACITY

The Utah State Code R309-510-7 states that a water system's sources need to meet "the anticipated water demands on the day of the highest water consumption which is the "Peak Day Demand". The PDD for Springdale was determined above as 405 gpd/ERU. The source capacity demand for the water system was calculated by multiplying the PDD from Section II-G by the total number of ERUs existing in the system. The results of the analysis are presented in gallons per minute. The results of this analysis are shown in Figure IV-1.

Figure IV-1: Required Source Capacity (Existing Conditions)

Total Required Source Capacity	590 gpm
Total Existing Source Available	800 gpm
Total Source Capacity Surplus	210 gpm

C. PROJECTED REQUIRED WATER SOURCE CAPACITY

Projecting growth to the 10-year and 20-year planning periods and using the same method of calculating required source capacity reveals that the water system will continue to have a surplus of source capacity at the end of the planning window. The projected required source capacity for the 10-year and 20-year planning periods are shown in Figure IV-2 and Figure IV-3.

Figure IV-2: Required Source Capacity (10-Year Planning Period)

Total Required Source Capacity	675 gpm
Total Existing Source Available	800 gpm
Total Source Capacity Surplus	125 gpm

Figure IV-3: Required Source Capacity (20-Year Planning Period)

Total Required Source Capacity	783 gpm
Total Existing Source Available	800 gpm
Total Source Capacity Surplus	17 gpm

D. RECOMMENDED WATER SOURCE CAPACITY IMPROVEMENTS

1. 0 to 5 YEAR IMPROVEMENTS

- Zion Water Lines Connection – The springs in Zion National Park are not currently connected to the Town's system so the Town does not have access to those sources. An agreement between Zion National Park and the Town to use the Park's infrastructure to connect the springs can be coordinated. The Town is currently working on extending a line from SR-9 to the end of Balanced Rock Road. It is recommended that the line be extended further from Balanced Rock to Lion Boulevard and connect to the line feeding the 500K Gallon Tank.
    - The line from the Park does not contain enough pressure to feed directly into the distribution system. This line would only be able to be used if the treatment plant was offline. This line would allow the Town to have some emergency source if there was a period that the treatment plant was not operational.

2. 6 to 10 YEAR IMPROVEMENTS

- Big Spring Well Pump Replacement – Current well pump is aging and is not working at peak efficiency. The Town has access to more of their water rights than they are currently drawing from the pump. Replacing the pump will increase the amount of water the Town is able to get from Big Spring.
- Direct Line from Pump Station to Ponds – Currently, the pump station from the Virgin River diversion pumps water that is used both for the treatment plant for culinary use and the irrigation system. The water is either directed straight into the irrigation system or is sent to the raw water ponds to be treated for the culinary water system. When the irrigation system is being used, the raw water ponds cannot be filled and as a result the treatment plant cannot supply the system with water. This improvement would allow operators to send water directly to the raw water ponds without first going into the irrigation system.

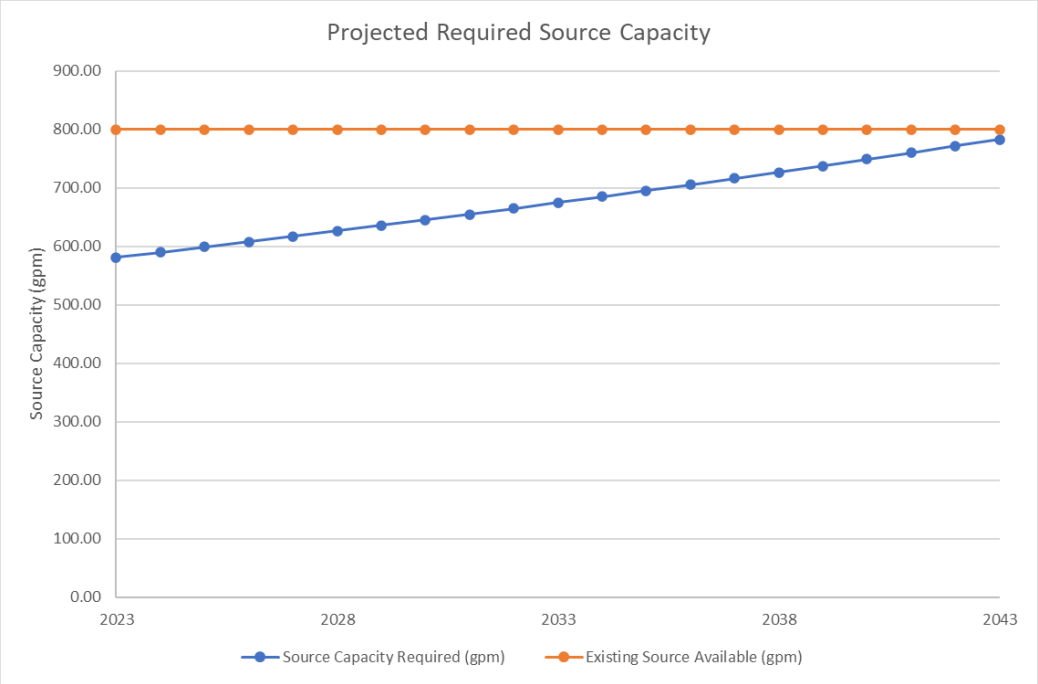
3. 11 to 20 YEAR IMPROVEMENTS

- This plan does not include any source improvements in the 10-to-20-year planning window.

Master plan updates over the next 5-20 years should evaluate conservation impacts, culinary and irrigation use patterns, and land use. These will each have an impact on future water source requirements, particularly with regard to treatment plant capacity.

E. SOURCE CAPACITY SUMMARY

Figure IV-5: Projected Source Capacity with Existing Conditions



V. WATER STORAGE CAPACITY ANALYSIS

Water storage capacity requirements are found in the State of Utah Public Drinking Water Regulations, R309-510. These regulations require storage for the community's culinary water system to meet one full day's average use requirement for all connections in the community in addition to fire flows for a minimum of three hours and emergency storage as deemed necessary.

A. EXISTING WATER STORAGE CAPACITY

There are currently three existing water storage tanks serving the Town of Springdale. The Anasazi Steel Tank is located at the southern end of Town within the Anasazi development area. The 500K Gallon Tank is located near Lion Blvd. This tank receives water directly from the treatment plant. Water from the 500K Gallon Tank is then pumped up to the 1 Million Gallon Tank which is located at a more elevated location about 0.6 miles to the northwest.

Figure V-1: Storage Capacity Summary

Existing Storage Capacity (Gallons)	
Anasazi Steel Tank	200,000.00
500K Gallon Tank	500,000.00
1 Million Gallon Tank	1,000,000.00
Total Existing Storage Capacity	1,700,000.00

B. EXISTING REQUIRED WATER STORAGE CAPACITY

As shown in Section II-F, the ADD was determined to be 255 gpd/ERU. Additionally, fire flow requirements are generally set by the local Fire Authority or are based on building size and type of construction. This plan uses the minimum fire flow storage set in the DDW's Minimum Sizing Standard for Springdale of 3,500 gpm for 3 hours. Also included in required storage is emergency storage. For planning purposes, this master plan will use an amount of 25% of the total required storage as the emergency storage. The emergency storage is on top of the storage required for an average day and fire flow.

The required storage capacity was calculated by multiplying the ADD by the total number of ERU's currently existing in the system, and then adding the fire flow volume and emergency storage. When compared with the system's total storage capacity summarized above, the calculation shows that the Town has surplus storage capacity under current conditions. The results of this analysis are shown in Figure V-2.

Figure V-2: Required Storage Capacity (Existing Conditions)

Total Required Storage Capacity	1,456,200 gal
Total Existing Storage Available	1,700,000 gal
Existing Storage Capacity Surplus	243,800 gal

C. PROJECTED REQUIRED WATER STORAGE CAPACITY

The projected culinary water storage capacity required at the end of the planning period is determined from the same factors explained in Section B above, but the projected number of ERU's is inserted into the calculations instead of the number of existing ERU's. The results of the analysis are shown below in Figure V-3 and Figure V-4.

Figure V-3: Required Storage Capacity (10-Year Planning Window)

Total Required Storage Capacity	1,552,000 gal
Total Existing Storage Available	1,700,000 gal
Projected Storage Capacity Surplus	148,000 gal

Figure V-4: Required Storage Capacity (20-Year Planning Window)

Total Required Storage Capacity	1,674,800 gal
Total Existing Storage Available	1,700,000 gal
Projected Storage Capacity Surplus	25,200 gal

D. RECOMMENDED WATER STORAGE IMPROVEMENTS

1. 0 to 5 YEAR IMPROVEMENTS

- This plan does not include any storage improvements in the 0-to-5-year planning window.

2. 6 to 10 YEAR IMPROVEMENTS

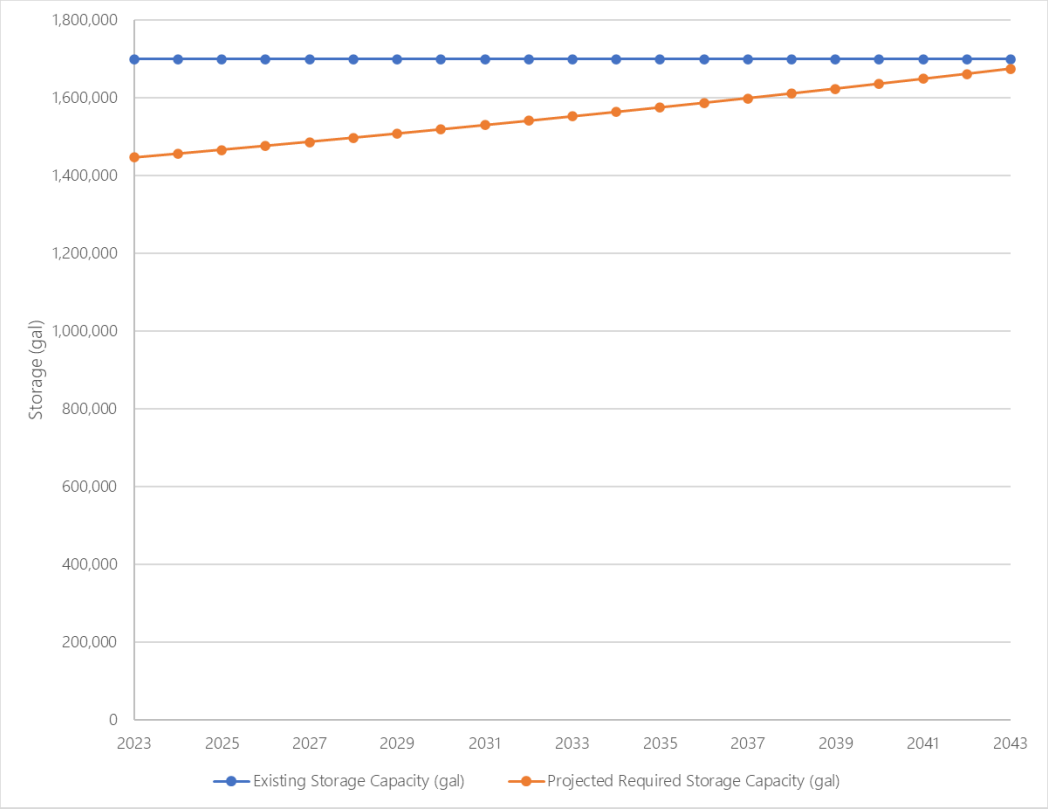
- Raw Water Pond Improvements – The two raw water ponds north of the treatment facility are uncovered. Enclosing these ponds with a cover will reduce evaporation and improve safety by removing direct access into the ponds. The north raw water pond collects sediment and needs to be dredged often. Lining this pond with concrete will make it easier to clean and dredge the pond in the future. The ponds also have difficulty draining so draining improvements such as a pond outlet, piping, and valves should be constructed.

3. 11 to 20 YEAR IMPROVEMENTS

- This plan does not include any storage improvements in the 11-to-20-year planning window.

E. STORAGE CAPACITY SUMMARY

Figure V-5: Projected Storage Capacity with Existing Conditions



VI. WATER DISTRIBUTION SYSTEM ANALYSIS

The State of Utah Public Water Regulations, R309-105-9, states three pressure conditions which must be met to demonstrate adequate service capacity of a system. These conditions are:

- At least 40 psi must be retained as residual pressure in the distribution system under a Peak Day Demand (PDD).
- At least 30 psi must be retained as residual pressure in the distribution system under Peak Instantaneous Demand (PID).
- At least 20 psi must be retained as residual pressure in the distribution system under PDD plus fire flow conditions.

In addition to the above pressure requirements distribution piping should be sized such that the velocities in the pipe during a PID scenario do not exceed 5 feet per second.

A. EXISTING DISTRIBUTION SYSTEM ANALYSIS

The existing PDD and PID were calculated in Section II. These flows are shown below:

- PDD – 573 gpm
- PID – 1,416 gpm

Fire flow demands are 1,000 gpm per R309-105-9 for most of the system, but two areas require a fire flow demand of 3,500 because there are structures that were built before fire sprinklers were required for commercial structures.

The above values for fire flow, PDD, and PID were used in a hydraulic model to check if the system can meet the necessary conditions outlined in the R309-105-9. Infowater by Inovyze was the software used to model the system.

B. PROJECTED DISTRIBUTION SYSTEM ANALYSIS

The projected distribution system analysis is performed using the same assumptions as in the existing system analysis, except that the projected number of connections for the 20-year planning window is inserted into the calculations. The results of this calculation for both PDD and PID are shown below:

- PDD – 775 gpm
- PID – 1,719 gpm

The same water model that was used to examine the existing distribution system was used to analyze the scenarios of the projected system at the end of the 20-year window.

C. MODEL RESULTS

After running the model under different scenarios, it was found that the system in its current condition has the capacity to deliver 40 psi under PDD, 30 psi under PID, and 20 psi under PDD with fire flow conditions. The model also showed that pipes do exceed a velocity of 5 feet per second during PID conditions. This remained the same for the 20-year period.

D. RECOMMENDED DISTRIBUTION SYSTEM IMPROVEMENTS

1. 0 to 5 YEAR IMPROVEMENTS

- Flow Meter Vault from Storage Tanks – To find the peak day demand required by the State, the amount of water exiting the storage tanks needs to be able to be tracked. Adding a flow meter to track the water outflow from the 500K tank and the 1M tank will allow easier collection of data for the Town.

2. 5 to 10 YEAR IMPROVEMENTS

- This plan does not include any distribution improvements in the 5-to-10-year planning window.

3. 10 to 20 YEAR IMPROVEMENTS

- This plan does not include any distribution improvements in the 10-to-20-year planning window.

VII. SUMMARY OF RECOMMENDED IMPROVEMENTS

A. PRIORITY OF IMPROVEMENTS

Figure VII-1 shows a summary of the proposed improvements from Section VI with the estimated cost for the project in today's dollars, the estimated year the improvements will be installed and the estimated cost of the project accounting for inflation. This plan uses an assumed inflation rate of 3%.

Figure VII-1: Summary of Recommended Improvements

Project	Est. Year of Installation	Cost Estimate (Todays $)	Estimated Costs with Inflation
0 to 5 Year Improvements			
Zion Water Lines Connection	2025	$ 312,700.00	$ 331,700.00
Flow Meter Vault from Storage Tanks	2027	$ 246,900.00	$ 277,900.00
Subtotal		$ 559,600.00	$ 609,600.00
6 to 10 Year Improvements			
Big Springs Well Pump Replacement	2029	$ 171,200.00	$ 204,400.00
Raw Water Pond Improvements	2030	$ 705,300.00	$ 867,400.00
Direct Line from Pump Station to Ponds	2032	$ 1,712,620.00	$ 2,234,600.00
Subtotal		$ 2,589,120.00	$ 3,306,400.00
Grand Total		**$ 3,148,720.00**	**$ 3,916,000.00**

An Engineers Opinion of Probable Cost can be found for each project in Appendix C. Included in the Opinion of Probable Cost for the proposed projects are anticipated construction costs, a contingency budget, legal services, fiscal costs, permitting, environmental, rights-of-way, etc.

VIII. POSSIBLE FINANCING OPTIONS

This master plan provides a possible funding scenario for each project to show what a possible bond payment would be if the Town needed to finance any of the recommended improvement projects. Culinary water projects typically can receive funding from Utah's Division of Drinking Water (DDW), the Utah Community Impact Board (CIB), or the open market. Based on communication with these funding agencies at this time, it is not anticipated that grant money is likely to be available for projects in the near future. These options assume that the funding will come as a loan. The loan is assumed to have a term of 30 years at an interest rate of 3.5%. These terms are only for planning purposes actual terms would be set during the funding application process. Using the costs from Section VII, accounting for inflation, and using the terms mentioned above results in the bond payments shown in Figure IX-3.

Figure VIII-1: Summary of Possible Bond Payments

Project	Estimated Cost with Inflation	Annual Bond Payment	Est. Year of First Payment
Zion Water Lines Connection	$ 312,700.00	$17,000.00	2026
Flow Meter Vault from Storage Tanks	$ 246,900.00	$13,400.00	2028
Big Springs Well Pump Replacement	$ 171,200.00	$9,300.00	2030
Raw Water Pond Improvements	$ 705,300.00	$38,300.00	2031
Direct Line from Pump Station to Ponds	$ 1,712,620.00	$93,100.00	2033

IX. LAND USE AND FUTURE WATER SERVICE POTENTIAL

The analyses in Section III-VI show that the existing water system is projected to still meet system requirements for water rights, source capacity, and storage at the end of the 20-year planning window. The water right and water source surpluses show that it is anticipated that there is water available to serve the projected growth. There is also potential to increase the water availability with future source improvement projects.

Sections III-VI analyzed the existing systems' capacity to handle the anticipated growth in the 20-year planning window. This section analyzes the number of potential future ERU's that can be added to the system under multiple scenarios using the system's existing (2024) usage and surplus. These scenarios include:

- Water that is currently available with the existing water system - As stated in the source analysis the existing treatment plant is the limiting factor within the existing system. This scenario calculates the amount of additional ERU's that could be added to the system with the treatment plant's current capacity. This surplus for this scenario is the same surplus as shown in Section IV. The peak usage for this scenario is the same usage used in Section IV.

- Water source added via all available water sources - This scenario calculates the number of additional ERU's that could be added to the system if the Town installed infrastructure that allowed the system to capture additional water from the Big Spring well and the springs in Zion National Park. Because this scenario looks at all the water potentially available to the Town, both indoor and outdoor water demand is included. The outdoor water demand in this scenario is just from the Town customers. The outdoor demand used is the actual water used by Town customers in 2022.

- Water associated with all available Town water rights & the water rights of the SCIC - This scenario calculates the amount of additional ERU's that could be added to the system if the Town installed infrastructure that allowed the system to capture all the water from Big Spring, the springs in the Park and also the water from the Virgin River that is used by the SCIC. The added surplus of this scenario is the added water from the SCIC water rights minus the existing outdoor usage of the SCIC shareholders. This scenario uses the same peak day usage as the previous scenario to calculate additional ERU potential.

For each scenario, the total number of potential ERU's was calculated based on water usage and water available surplus. These values are shown in Figure IX-1

Figure IX-1: Available Water Calculations

Scenario	Water Availability Surplus (gpm)	Peak Usage (gpd/ERU)	Potential Additional ERU's
Scenario 1 - Currently Accessible Water	210	405	747
Scenario 2 - Town Water Rights	261	459	819
Scenario 3 - Town Water Rights + SCIC	324	459	1018

To show the potential land use options for the additional ERU's calculated above the number of additional ERU's were converted into potential commercial connections, hotel rooms, and general commercial connections (non-hotel commercial). This was done using the same method to calculate ERU's from Section II-C. Figure IX-2 shows a summary of the calculations. These calculations use usage data from 2022.

Figure IX-2 ERU Calculations

Average Residential Usage per Connection (gal)			43,826
	Total Commercial	Only Hotel	General Commercial
Usage (gal)	69,846,254	52,283,775	17,562,479
# Connections (or Hotel rooms)	175	1,257	128
Usage Per Connection	399,121.4	41,594.1	137,206.9
ERUs	9.11	0.95	3.13

Taking the potential number of additional ERU's value in Figure IX-1 and dividing by the corresponding ERU value from Figure IX-2 results in the number of potential commercial connections, hotel rooms and general commercial connections. The results of this analysis for each scenario are shown in Figure IX-3.

Figure IX-3: Potential Additional ERUs by ERU Type

Scenario	Potential Additional ERU's	Equivalent Total Commercial	Equivalent Hotel Rooms	Equivalent General Commercial Connections
Scenario 1 - Currently Accessible Water	747	82	787	238
Scenario 2 - Town Water Rights	819	90	863	262
Scenario 3 - Town Water Rights + SCIC	1,018	112	1,073	325

It should be noted that the equivalent commercial connections, hotel rooms, and general commercial connections shown in Figure IX-3 are independent equivalences of the total potential additional ERU's. For example, if 787 hotel rooms were added that would represent all the potential additional ERU's in scenario 1 and no additional residential, or commercial connections would be available. Combinations of the 3 use types could also be developed.

This section calculates the potential number of ERU's available based on different scenarios of water availability. Scenarios 2 and 3 would require additional studies and infrastructure improvements to determine a more accurate number of connections that each source would add.

Growth rates and buildout were not taken into account for these calculations. It is possible that there are more additional ERUs shown in these calculations than what is available to be built with the Town's current land use policies and zoning densities.

The Peak usage demand used for these calculations is based on the State's minimum sizing standards for Springdale. As mentioned in the Conservation section of the report, as conservation continues to happen in the town, water per connection will decrease and it is possible that the sizing requirement decreases over time. If the sizing requirement for planning decreases, the number of available ERU's could potentially increase.

As land use and zoning policies and water usage change over time these calculations will need to be updated. It is recommended that these calculations be revised every 3 to 5 years.

APPENDIX A
Growth Rate Analysis

Calendar Year	Residential ERUs	Commercial ERUs	Institutional ERUs	Total ERUs
2022	358	1,594	85	2,036
2023	367	1,614	85	2,066
2024	377	1,635	86	2,098
2025	387	1,656	87	2,130
2026	397	1,677	88	2,162
2027	407	1,698	89	2,194
2028	418	1,720	90	2,228
2029	429	1,742	91	2,262
2030	440	1,764	92	2,296
2031	451	1,787	93	2,331
2032	463	1,810	94	2,367
2033	475	1,833	95	2,403
2034	487	1,856	96	2,439
2035	500	1,880	97	2,477
2036	513	1,904	98	2,515
2037	526	1,928	99	2,553
2038	540	1,953	100	2,593
2039	554	1,978	101	2,633
2040	568	2,003	102	2,673
2041	583	2,029	103	2,715
2042	598	2,055	104	2,757
2043	613	2,081	105	2,799

APPENDIX B
Water Use Analysis

Historical Usage

Calendar Year	Total Usage (Thousand gallons)	Number of Connections	Usage per Conn. (gpd/conn)	Number of ERUs	Usage Per ERU (gpd/ERU)
2018	81,495	443	504	1,627	137
2019	102,311	480	584	1,808	155
2020	80,300	483	455	1,415	156
2021	90,867	524	475	1,765	141
2022	89,240	552	443	2,036	120
5-Year Avg:	88,843	496	492	1,730	141

Water Rights Calculations

Existing Required Water Rights Calculations								255	gpd/conn.
Required Indoor Demand									
2,098	ERUs X	255	gpd	X	365	day	X	1 Acft.	= 599 Ac-Ft
		ERU			1	yr		325,829 gal	
Required Outdoor Demand									
		40,000,000	gal					1 Acft.	= 123 Ac-Ft
								325,829 gal	
				Existing Culinary System Water Right					= 1143 Ac-Ft
Existing Culinary System Water Right Surplus									421 Ac-Ft

Calendar Year	No. ERU's	Usage (gpd)	Required Demand (gpm)	Required Demand (indoor) ac-ft	Required Demand (outdoor) ac-ft	Total Required Demand ac-ft	Available WR ac-ft	Surplus ac-ft
2022	2,036	255.00	360.6	582	122.8	704.378	1142.81	438
2023	2,067	255.00	366.0	590	122.8	713.103	1142.81	430
2024	2,098	255.00	371.5	599	122.8	721.958	1142.81	421
2025	2,129	255.00	377.1	608	122.8	730.946	1142.81	412
2026	2,161	255.00	382.7	617	122.8	740.069	1142.81	403
2027	2,194	255.00	388.5	627	122.8	749.329	1142.81	393
2028	2,227	255.00	394.3	636	122.8	758.727	1142.81	384
2029	2,260	255.00	400.2	646	122.8	768.267	1142.81	375
2030	2,294	255.00	406.2	655	122.8	777.949	1142.81	365
2031	2,328	255.00	412.3	665	122.8	787.777	1142.81	355
2032	2,363	255.00	418.5	675	122.8	797.753	1142.81	345
2033	2,399	255.00	424.7	685	122.8	807.878	1142.81	335
2034	2,435	255.00	431.1	695	122.8	818.154	1142.81	325
2035	2,471	255.00	437.6	706	122.8	828.585	1142.81	314
2036	2,508	255.00	444.2	716	122.8	839.173	1142.81	304
2037	2,546	255.00	450.8	727	122.8	849.919	1142.81	293
2038	2,584	255.00	457.6	738	122.8	860.827	1142.81	282
2039	2,623	255.00	464.4	749	122.8	871.898	1142.81	271
2040	2,662	255.00	471.4	760	122.8	883.135	1142.81	260
2041	2,702	255.00	478.5	772	122.8	894.540	1142.81	248
2042	2,743	255.00	485.7	783	122.8	906.117	1142.81	237
2043	2,784	255.00	492.9	795	122.8	917.868	1142.81	225

Storage Capacity Calculations

Storage Capacity Analysis										
Year	Number of ERU	Percent Reduction In Usage Per ERU	Avg. Usage (gpd/ERU)	Storage Required (gal)	Fire Flow Stg Rqd	Emergency Supply (25%)	Existing Stg Capacity	Total Stg Rqd	Storage Capacity Surplus/Deficit (gal)	Projected Storage Capacity
2022	2036	0.0%	255.0	519,239	630,000	287,310	1,700,000	1,436,549	263,451	1,700,000
2023	2077	0.5%	253.7	526,976	630,000	289,244	1,700,000	1,446,220	253,780	1,700,000
2024	2118	0.5%	252.5	534,815	630,000	291,204	1,700,000	1,456,018	243,982	1,700,000
2025	2161	0.5%	251.2	542,756	630,000	293,189	1,700,000	1,465,945	234,055	1,700,000
2026	2204	0.5%	249.9	550,801	630,000	295,200	1,700,000	1,476,001	223,999	1,700,000
2027	2248	0.5%	248.6	558,950	630,000	297,238	1,700,000	1,486,188	213,812	1,700,000
2028	2293	0.5%	247.4	567,206	630,000	299,301	1,700,000	1,496,507	203,493	1,700,000
2029	2339	0.5%	246.1	575,567	630,000	301,392	1,700,000	1,506,959	193,041	1,700,000
2030	2386	0.5%	244.8	584,037	630,000	303,509	1,700,000	1,517,546	182,454	1,700,000
2031	2433	0.5%	243.5	592,615	630,000	305,654	1,700,000	1,528,269	171,731	1,700,000
2032	2482	0.5%	242.3	601,302	630,000	307,826	1,700,000	1,539,128	160,872	1,700,000
2033	2532	0.5%	241.0	610,100	630,000	310,025	1,700,000	1,550,126	149,874	1,700,000
2034	2582	0.5%	239.7	619,010	630,000	312,252	1,700,000	1,561,262	138,738	1,700,000
2035	2634	0.5%	238.4	628,032	630,000	314,508	1,700,000	1,572,540	127,460	1,700,000
2036	2687	0.5%	237.2	637,167	630,000	316,792	1,700,000	1,583,958	116,042	1,700,000
2037	2741	0.5%	235.9	646,416	630,000	319,104	1,700,000	1,595,520	104,480	1,700,000
2038	2795	0.5%	234.6	655,780	630,000	321,445	1,700,000	1,607,225	92,775	1,700,000
2039	2851	0.5%	233.3	665,260	630,000	323,815	1,700,000	1,619,076	80,924	1,700,000
2040	2908	0.5%	232.1	674,858	630,000	326,214	1,700,000	1,631,072	68,928	1,700,000
2041	2966	0.5%	230.8	684,573	630,000	328,643	1,700,000	1,643,216	56,784	1,700,000
2042	3026	0.5%	229.5	694,406	630,000	331,102	1,700,000	1,655,508	44,492	1,700,000
2043	3086	0.5%	228.2	704,359	630,000	333,590	1,700,000	1,667,949	32,051	1,700,000

Total Required Storage Calculations

Storage Required for # of ERUs

$$2{,}098 \text{ ERUs} \times 255.0 \frac{\text{gpd}}{\text{ERU}} = 534{,}933 \text{ gal}$$

Storage Required for Fire Flow

$$3{,}500 \frac{\text{gal}}{\text{min}} \times 60 \frac{\text{min}}{\text{hour}} \times 3 \text{ hours} = 630{,}000 \text{ gal}$$

25% Emergency Storage

$(534{,}933 + 630{,}000) \times 0.25 = 291{,}233$ gal

Total Required Storage

534,933 gal + 630,000 gal + 291,233 gal = 1,456,200 gal

Source Capacity Calculations

Current & Projected Required Source Capacity						
Year	# of ERU	Percent Reduction In Usage Per ERU	Peak Day Usage (gpd/ERU)	Source Capacity Required (gpm)	Existing Source Available (gpm)	Source Capacity Surplus/Deficit (gpm)
2022	2036	0.0%	405.00	572.69	1110.00	537.31
2023	2077	0.5%	402.98	581.22	1110.00	528.78
2024	2118	0.5%	400.95	589.87	1110.00	520.13
2025	2161	0.5%	398.93	598.63	1110.00	511.37
2026	2204	0.5%	396.90	607.50	1110.00	502.50
2027	2248	0.5%	394.88	616.49	1110.00	493.51
2028	2293	0.5%	392.85	625.59	1110.00	484.41
2029	2339	0.5%	390.83	634.82	1110.00	475.18
2030	2386	0.5%	388.80	644.16	1110.00	465.84
2031	2433	0.5%	386.78	653.62	1110.00	456.38
2032	2482	0.5%	384.75	663.20	1110.00	446.80
2033	2532	0.5%	382.73	672.90	1110.00	437.10
2034	2582	0.5%	380.70	682.73	1110.00	427.27
2035	2634	0.5%	378.68	692.68	1110.00	417.32
2036	2687	0.5%	376.65	702.76	1110.00	407.24
2037	2741	0.5%	374.63	712.96	1110.00	397.04
2038	2795	0.5%	372.60	723.29	1110.00	386.71
2039	2851	0.5%	370.58	733.74	1110.00	376.26
2040	2908	0.5%	368.55	744.33	1110.00	365.67
2041	2966	0.5%	366.53	755.04	1110.00	354.96
2042	3026	0.5%	364.50	765.89	1110.00	344.11
2043	3086	0.5%	362.48	776.87	1110.00	333.13

Source Capacity Required Calculations 405.00 gpd/ERU

Source Capacity Required

$$\frac{2{,}098 \text{ ERUs} \times 405.0 \text{ gpd}}{\text{ERU}} \times \frac{\text{day}}{24 \text{ hr}} \times \frac{\text{min}}{60 \text{ hr}} = 590.0 \text{ gpm}$$

Peak Instantaneous Demand

Peak Instantaneous Demand Calculations			
Indoor Peak Instantaneous Demand			
Q=	10.8 X N^.64		N= No. of ERU
2024	Q=	1443	gpm

Water Distribution Analysis		
Calendar Year	No. ERU	PID (gpm)
2022	2036	1,416
2023	2066	1,429
2024	2098	1,443
2025	2130	1,457
2026	2162	1,471
2027	2194	1,485
2028	2228	1,500
2029	2262	1,515
2030	2296	1,529
2031	2331	1,544
2032	2367	1,559
2033	2403	1,574
2034	2439	1,589
2035	2477	1,605
2036	2515	1,621
2037	2553	1,637
2038	2593	1,653
2039	2633	1,669
2040	2673	1,685
2041	2715	1,702
2042	2757	1,719
2043	2799	1,736

APPENDIX C
Engineers Opinion of Probable Cost

SUNRISE ENGINEERING

11 North 300 West, Washington Utah 84780
Tel 435.652.8450 | **FAX** 435.652.8416

Engineer's Opinion of Probable Cost

Zion Water Lines Connection
Town of Springdale

8-Aug-23
TCD/bcw

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 11,415.00	$ 11,415.00
2	Traffic Control	1	LS	$ 10,000.00	$ 10,000.00
3	Pre-Construction DVD	1	LS	$ 1,000.00	$ 1,000.00
4	Dust Control & Watering	1	LS	$ 7,500.00	$ 7,500.00
5	Subsurface Investigation	4	HR	$ 250.00	$ 1,000.00
6	Restore Surface Improvements	1	LS	$ 2,500.00	$ 2,500.00
7	Construction Staking	1	LS	$ 7,500.00	$ 7,500.00
8	Trench Shoring and Dewatering	1	LS	$ 2,000.00	$ 2,000.00
9	Clearing, Grubbing, Excavation, and Demolition	1	LS	$ 2,500.00	$ 2,500.00
10	6" PVC (C900) Line, Fitting, Tracer Wire, Bedding, & Backfill	1,300	LF	$ 75.00	$ 97,500.00
11	6" Gate Valve Assembly	6	EA	$ 3,000.00	$ 18,000.00
12	Pavement Restoration	7,800	SF	$ 3.50	$ 27,300.00
13	Misc. Connections, Fittings, and Tie-Ins	1	LS	$ 8,000.00	$ 8,000.00
14	Reconnect Water Services	6	EA	$ 3,500.00	$ 21,000.00
15	Fire Hydrant Assembly	3	EA	$ 7,500.00	$ 22,500.00
			SUBTOTAL		**$ 239,715.00**
			CONTINGENCY	20%	**$ 47,943.00**
			CONSTRUCTION TOTAL		**$ 287,658.00**
INCIDENTALS					
1	Engineering Design	7.7%	LS	$ 27,593.78	$ 27,593.78
1	Bidding & Negotiating	2.1%	HR	$ 7,500.00	$ 7,500.00
2	Engineering Construction Services	5.4%	HR	$ 19,200.00	$ 19,200.00
3	Topographic & Property Survey	1.7%	EST	$ 6,000.00	$ 6,000.00
4	Geotechnical Report	1.1%	EST	$ 4,000.00	$ 4,000.00
38	Miscellaneous Engineering Services	1.9%	EST	$ 6,900.00	$ 6,900.00
			SUBTOTAL		$ 71,193.78
			TOTAL PROJECT COST		**$ 358,850.00**

In providing opinions of probable construction cost, the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual costs.

SUNRISE ENGINEERING

11 North 300 West, Washington Utah 84780
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Engineer's Opinion of Probable Cost

Flow Meter Vault From Storage Tanks 8-Aug-23
Town of Springdale TCD/bcw

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 6,175.00	$ 6,175.00
2	Traffic Control	1	LS	$ 3,000.00	$ 3,000.00
3	Pre-Construction DVD	1	LS	$ 1,500.00	$ 1,500.00
4	Dust Control & Watering	1	LS	$ 7,500.00	$ 7,500.00
5	Subsurface Investigation	10	HR	$ 300.00	$ 3,000.00
6	Restore Surface Improvements	1	LS	$ 15,000.00	$ 15,000.00
7	Construction Staking	1	LS	$ 6,000.00	$ 6,000.00
8	Trench Shoring and Dewatering	1	LS	$ 4,000.00	$ 4,000.00
9	Clearing, Grubbing, Excavation, and Demolition	1	LS	$ 3,500.00	$ 3,500.00
10	Misc. Fittings	1	LS	$ 9,000.00	$ 9,000.00
11	12" Gate Valve	2	EA	$ 7,000.00	$ 14,000.00
12	Concrete Vault	1	LS	$ 50,000.00	$ 50,000.00
13	Pavement Restoration	1	LS	$ 5,000.00	$ 5,000.00
14	Electrical Improvements	1	LS	$ 2,000.00	$ 2,000.00
			SUBTOTAL		**$ 129,675.00**
			CONTINGENCY	20%	**$ 25,935.00**
			CONSTRUCTION TOTAL		**$ 155,610.00**
INCIDENTALS					
1	Engineering Design	7.7%	LS	$ 16,903.26	$ 16,903.26
1	Bidding & Negotiating	3.4%	HR	$ 7,500.00	$ 7,500.00
2	Engineering Construction Services	4.8%	HR	$ 10,400.00	$ 10,400.00
3	Topographic & Property Survey	4.6%	EST	$ 10,000.00	$ 10,000.00
4	Geotechnical Report	1.8%	EST	$ 4,000.00	$ 4,000.00
5	Funding and Administrative Services	4.6%	EST	$ 10,000.00	$ 10,000.00
38	Miscellaneous Engineering Services	2.0%	EST	$ 4,300.00	$ 4,300.00
			SUBTOTAL		$ 63,103.26
			TOTAL PROJECT COST		**$ 218,710.00**

In providing opinions of probable construction cost, the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual costs.

SUNRISE ENGINEERING

11 North 300 West, Washington Utah 84780
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Engineer's Opinion of Probable Cost

Big Springs Well Pump Replacement 8-Aug-23
Town of Springdale TCD/bcw

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 7,800.00	$ 7,800.00
2	Pre-Construction DVD	1	LS	$ 1,000.00	$ 1,000.00
3	Site Restoration	1	LS	$ 2,500.00	$ 2,500.00
4	Misc. Electrical Improvements	1	LS	$ 12,000.00	$ 12,000.00
5	Install Pump for Development and Testing	1	LS	$ 60,000.00	$ 60,000.00
6	Well Development and Pumping	80	HR	$ 600.00	$ 48,000.00
7	Misc. Well and Pump Testing	1	LS	$ 10,000.00	$ 10,000.00
8	Well Head, Disinfection and Capping	1	LS	$ 7,500.00	$ 7,500.00
9	Replace Well Piping	1	LS	$ 15,000.00	$ 15,000.00
			SUBTOTAL		**$ 163,800.00**
			CONTINGENCY	20%	**$ 32,760.00**
			CONSTRUCTION TOTAL		**$ 196,560.00**
INCIDENTALS					
1	Engineering Design	7.9%	LS	$ 20,240.71	$ 20,240.71
1	Bidding & Negotiating	2.9%	HR	$ 7,500.00	$ 7,500.00
2	Engineering Construction Services	5.1%	HR	$ 13,100.00	$ 13,100.00
5	Funding and Administrative Services	2.9%	EST	$ 7,500.00	$ 7,500.00
9	Hydrogeological Study	2.9%	EST	$ 7,500.00	$ 7,500.00
38	Miscellaneous Engineering Services	2.0%	EST	$ 5,100.00	$ 5,100.00
			SUBTOTAL		$ 60,940.71
			TOTAL PROJECT COST		**$ 257,500.00**

In providing opinions of probable construction cost, the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual costs.

SUNRISE ENGINEERING

11 North 300 West, Washington Utah 84780
Tel 435.652.8450 | **FAX** 435.652.8416

Engineer's Opinion of Probable Cost

Raw Water Pond Improvements
Town of Springdale

8-Aug-23
TCD/bcw

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 7,993.00	$ 7,993.00
2	Traffic Control	1	LS	$ 3,000.00	$ 3,000.00
3	Pre-Construction DVD	1	LS	$ 1,000.00	$ 1,000.00
4	Dust Control & Watering	1	LS	$ 2,500.00	$ 2,500.00
5	Subsurface Investigation	10	HR	$ 250.00	$ 2,500.00
6	Restore Surface Improvements	1	LS	$ 3,000.00	$ 3,000.00
7	Construction Staking	1	LS	$ 5,000.00	$ 5,000.00
8	Trench Shoring and Dewatering	1	LS	$ 1,500.00	$ 1,500.00
9	Clearing, Grubbing, Excavation, and Demolition	1	LS	$ 4,000.00	$ 4,000.00
10	18" PVC (C900) Line, Fitting, Tracer Wire, Bedding, & Backfill	150	LF	$ 135.00	$ 20,250.00
11	18" Butterfly Valve Assembly	2	EA	$ 5,500.00	$ 11,000.00
12	Concrete Liner for pond	500	CY	$ 135.00	$ 67,500.00
13	Covering for North pond	24,000	SF	$ 1.10	$ 26,400.00
14	Covering for South pond	11,100	SF	$ 1.10	$ 12,210.00
			SUBTOTAL		**$ 167,853.00**
			CONTINGENCY	20%	**$ 33,570.60**
			CONSTRUCTION TOTAL		**$ 201,423.60**
INCIDENTALS					
1	Engineering Design	7.7%	LS	$ 20,624.41	$ 20,624.41
1	Bidding & Negotiating	2.8%	HR	$ 7,500.00	$ 7,500.00
2	Engineering Construction Services	5.0%	HR	$ 13,400.00	$ 13,400.00
3	Topographic & Property Survey	1.9%	EST	$ 5,000.00	$ 5,000.00
4	Geotechnical Report	1.3%	EST	$ 3,500.00	$ 3,500.00
5	Funding and Administrative Services	2.6%	EST	$ 7,000.00	$ 7,000.00
38	Miscellaneous Engineering Services	3.7%	EST	$ 10,000.00	$ 10,000.00
			SUBTOTAL		$ 67,024.41
			TOTAL PROJECT COST		**$ 268,450.00**

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APPENDIX D
System Maps

SPRINGDALE EXISTING WATER SYSTEM

MAP LEGEND

North

0 40 80

1 In = 1,300 Feet

- PS Water Pumps
- T Water Tank
- Production Well
- Water Control Valves

- 3"
- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- Unknown

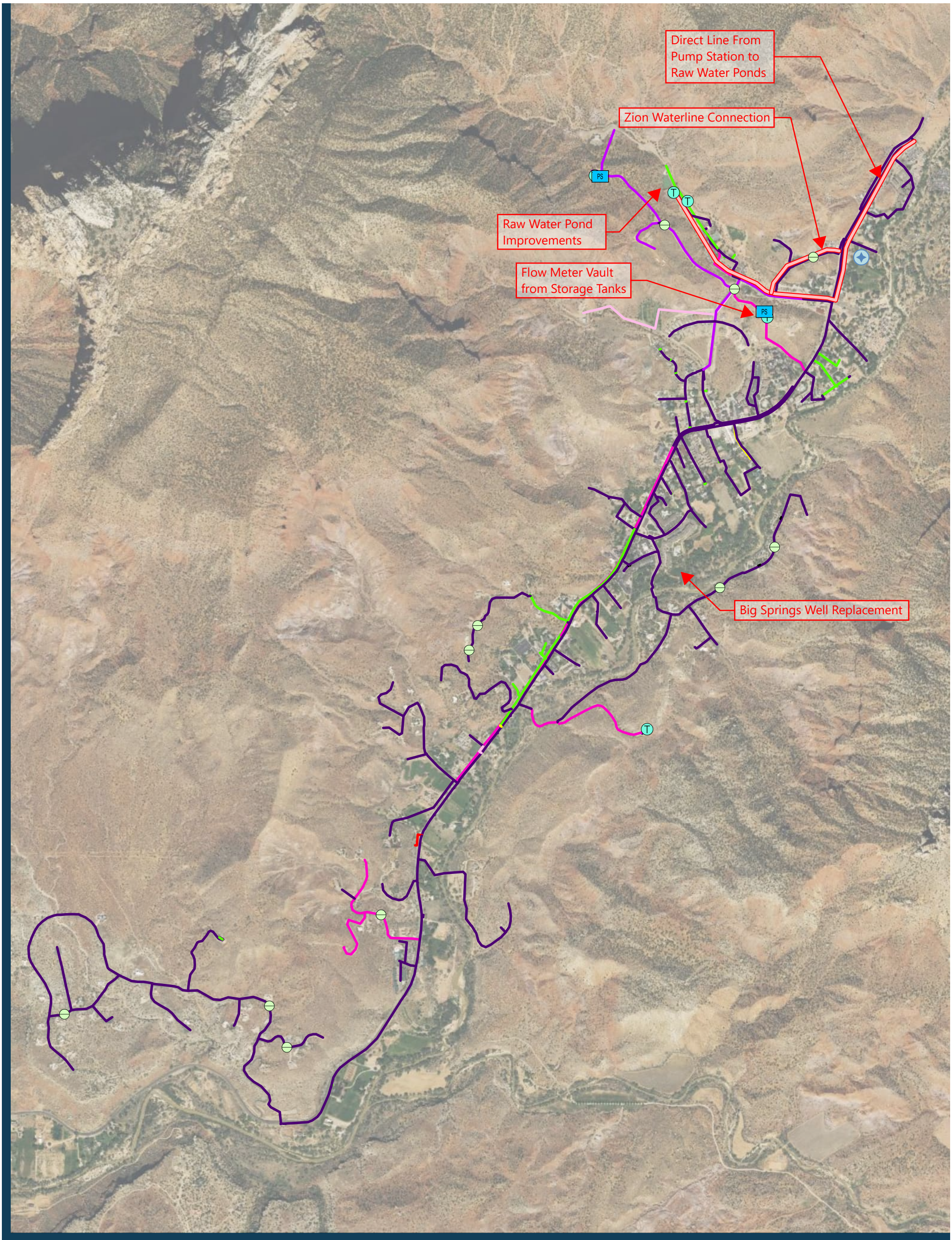
Map Date: 9/29/2023

SPRINGDALE Utah ESTD 1862

Creating solutions that work and relationships that last.

SUNRISE ENGINEERING

SPRINGDALE EXISTING WATER SYSTEM



MAP LEGEND

- PS — Water Pumps
- T — Water Tank
- Production Well
- Water Control Valves
- Recommendations

- 3"
- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- Unknown

NORTH

0 40 80

1 In = 1,300 Feet

Map Date: 9/29/2023

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