SPRINGDALE, UTAH – CULINARY WATER MASTER PLAN UPDATE

December, 2015

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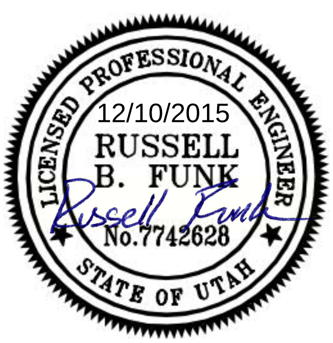

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Table of Contents

EXECUTIVE SUMMARY 1

I. INTRODUCTION 2

A. PREFACE 2
B. INTRODUCTION 2

II. SYSTEM USERS ANALYSIS 3

A. PROJECTED GROWTH RATE 3
B. LENGTH OF PLANNING PERIOD 3
C. EXISTING CULINARY WATER CONNECTIONS & USAGE 4
D. PROJECTED CULINARY WATER CONNECTIONS & ERUS 5

III. WATER SOURCE CAPACITY ANALYSIS 6

A. EXISTING WATER SOURCE CAPACITY 6
B. EXISTING REQUIRED WATER SOURCE CAPACITY 6
C. PROJECTED REQUIRED WATER SOURCE CAPACITY 7
D. RECOMMENDED WATER SOURCE CAPACITY IMPROVEMENTS 7

IV. WATER STORAGE CAPACITY ANALYSIS 9

A. EXISTING WATER STORAGE CAPACITY 9
B. EXISTING REQUIRED WATER STORAGE CAPACITY 9
C. PROJECTED REQUIRED WATER STORAGE CAPACITY 10
D. RECOMMENDED WATER STORAGE CAPACITY IMPROVEMENTS . 11

V. WATER TREATMENT ANALYSIS 12

A. GENERAL REQUIREMENTS 12
B. EXISTING TREATMENT FACILITIES 13
C. OPERATIONAL CHALLENGES & DEFICIENCIES 14
D. TREATMENT ALTERNATIVES 15
E. SELECTION OF PREFERRED ALTERNATIVE 17
F. RECOMMENDED WATER TREATMENT FACILITY IMPROVEMENTS .. 19

VI. WATER DISTRIBUTION SYSTEM ANALYSIS 20

A. EXISTING DISTRIBUTION SYSTEM ANALYSIS 20
B. PROJECTED DISTRIBUTION SYSTEM ANALYSIS 20

VII. CAPITAL FACILITIES PLAN 22

A. PRELIMINARY ENGINEER'S OPINION OF PROBABLE COST 22
B. PROPOSED FINANCING PLAN 22

List of Figures

Figure II-1: Springdale Historic & Projected Growth 3
Figure II-2: Average Usage Per Connection 4
Figure II-3: Projected Connections, ERUs & Population 5
Figure III-1: Existing Virgin River Intake Structure 6
Figure III-2: Existing Required Source Capacity 7
Figure III-3: Projected Required Source Capacity 7
Figure III-4: Projected Source Capacity Requirements 8
Figure IV-1: Existing Water Storage Capacity 9
Figure IV-2: North Concrete Tank 9
Figure IV-3: 1MG Concrete Tank 9
Figure IV-4: Existing Required Water Storage Capacity 10
Figure IV-5: Projected Required Water Storage Capacity 11
Figure V-1: Existing Springdale Water Treatment Facility 14
Figure V-2: Project Cost Comparison 18
Figure V-3: Operation & Maintenance Comparison 18
Figure V-4: Present Worth Comparison 18
Figure V-5: Alternatives Analysis Results 19
Figure VI-1: Existing Water Distribution Demand Requirements 20
Figure VI-2: Projected Water Distribution Demand Requirements 21
Figure VII-1: Engineer's Opinion of Probable Cost 23
Figure VII-2: Project Financing Plan 25

Appendices

Appendix A – Growth Projections and User Analysis
Appendix B – Multi-Point System Analysis
Appendix C – Water Treatment Alternatives Analysis
Appendix D – 500 GPM - Alternative Water Treatment Analysis

EXECUTIVE SUMMARY

The Town of Springdale contracted with Sunrise Engineering, Inc. to provide this update to the existing Culinary Water Master Plan. The water system has been analyzed according the State of Utah Division of Drinking Water regulations with a primary focus being evaluation of the existing culinary water treatment plant.

As part of the analysis, historic water usage data was analyzed to help determine anticipated future water demands the system may experience. Historic water usage in Springdale is approximately 160 gpd per equivalent residential unit (ERU). This is significantly less than the State average usage (185 gallons per capita per day). This historic usage was used to evaluate water source capacity, water storage capacity, and water distribution requirements. No major recommendations have been included for these portions of the culinary water system.

The analysis of the existing treatment plant found that the plant technically has sufficient capacity to meet peak day demands. However, the plant has several operational challenges and deficiencies which are of major concern. One of the primary concerns is that the current facility only includes a single train or pathway for water to be treated with no redundancy. This is a major concern because there is no way to keep the plant in operation if major components of the system need to be taken out of service for maintenance or for other reasons.

In order to comply fully with the State of Utah and EPA requirements for system redundancy and to enable the Town to supply a consistent and reliable supply of water, it is recommended that the existing plant be replaced as soon as feasibly possible. A detailed alternatives analysis was completed evaluating several viable treatment options, and recommending that the Town move forward with a package conventional water treatment plant. (Refer to Section V of the Plan for the full analysis).

The anticipated capital cost associated with the project is $3,345,650, with an additional $1,100,000 for potential options based on Town preferences.

A potential financing plan has also been created using the base costs mentioned above and assumed project financing. This financing plan results in an average monthly culinary water cost of $46.69, with a potential increase to the culinary water impact fee of $421.

I. INTRODUCTION

A. PREFACE

In January of 2015 the Town of Springdale contracted with Sunrise Engineering, Inc. to provide an update to the Culinary Water Master Plan that would address several aspects of the existing system for the 20 year planning period. Of special interest to the Town at this time is the existing culinary water treatment plant and providing sufficient water during peak operations.

The Town is located at the entrance of Zion National Park, and the number of commercial entities associated with their proximity to the park is relatively high for a Town of their size. With that said, the Town of Springdale experiences relatively high peak water usage during the summer months, and low usage during the winter months. The extreme nature of the tourism industry requires that the Town take into account the ability to provide enough water during these peak times. During these times of peak usage, the Town has become aware that they are bumping into the total capacity of their existing treatment plant. Therefore, the main focus of this report is to provide recommendations regarding future treatment options and alternatives for increasing the overall capacity of the treatment plant. The Town's desire is to start the planning process now, rather than when the treatment plant has reached its capacity limits.

B. 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. As with other communities, the Town must continue to improve and enlarge the existing culinary water system to support growth and development within the Town.

The culinary water system has been analyzed under the State of Utah Division of Drinking Water regulations to determine the current system status and to determine possible system upgrades as the community grows during the next 20 years. Since a recent master plan was completed in 2008, the master plan will provide updated information regarding existing and projected water demands, source capacity, and storage capacity. With these being minor portions of the report, the bulk of the report will be focusing on recommendations and alternatives regarding the treatment plant.

This master plan will include assessing the current system and consider alternatives for expansion and/or replacement. This master plan will also development a capital improvements plan that will present the estimated costs and recommended schedule for the proposed improvements to the treatment plant.

II. SYSTEM USERS ANALYSIS

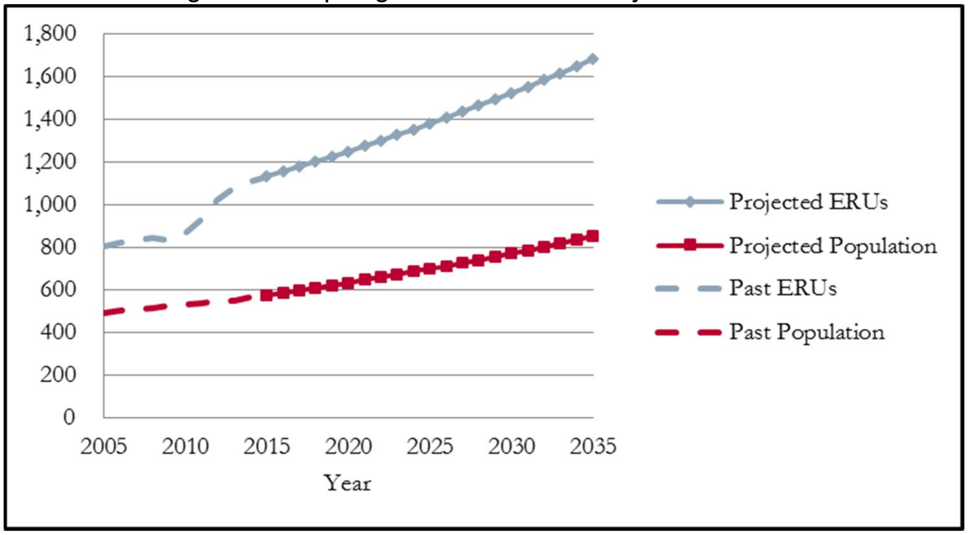
A. PROJECTED GROWTH RATE

An important element in the development of a Culinary Water Master Plan is the projection of the Town's population growth rate. This projection gives the planner an idea of the future demands on the culinary water system for the length of the planning period.

Projecting the number of future culinary water connections is a subjective process. An effective method of estimating the number of future connections is by analyzing census records.

The population figures in the service area and the percent increase each year back to the year 2005 is shown in Figure II.A-1. During this period, the population increased by an average of 1.5% per year.

Figure II-1: Springdale Historic & Projected Growth



After analyzing the historic growth data and communicating with the Town, a growth rate of 2.0% was chosen for this master plan.

While population growth is essential to anticipating water needs over a specific time period, eventually the lots in the existing subdivisions will reach maximum capacity. If the maximum number of system connections is reached earlier or later than projected, future improvements to support growth may either come earlier or later.

B. LENGTH OF PLANNING PERIOD

This Culinary Water Master Plan uses a 20-year planning period beginning in year 2015 and running through the year 2035. 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.

C. EXISTING CULINARY WATER CONNECTIONS & USAGE

The State of Utah Public Drinking Water Regulations require public water systems to meet requirements based upon usage. State rules provide a standard usage based upon the types of connections serviced in a system. Usage can also be based upon historical data if there is enough data to provide a confidence level of 90% or higher that the usage shown is representative of actual usage. Springdale has provided historic usage records which will meet the confidence requirements outlined previously. The analysis of these historic usage records will be outlined in this section.

According to data provided by Springdale, the average number of existing residential culinary connections in 2014 was 261 with another 118 commercial and 31 “other” connections. To calculate how much water is used by an average residential connection, the total amount of water used by all Springdale residential, commercial, and other customers over the course of a year was determined. Table II.C-1 below provides historic data from Springdale records from 2009 to 2014. The average daily use per residential connection was calculated to be 158 gal/day for residential, 1,017 gal/day for commercial, and 561 gal/day for other connections. In comparison to other communities of similar nature, the daily average use for Springdale appears to be much lower for residential usage. These results also match the results from the 2008 master plan, which showed the average daily residential usage was 156 gal/day. Therefore, it is recommended that any future improvements be sized using 160 gal/day per ERU. The remainder of this report will refer to this usage as historical usage and several sections will include analysis showing requirements based upon this historic usage.

Figure II-2: Average Usage Per Connection

	2009	2010	2011	2012	2013	2014	Average
Residential	(6 Months)						11 - 14
Usage (gallons)	6,882,000	12,955,000	12,800,000	13,368,000	12,763,000	13,879,000	12,107,833
Connections (ERUs)	208	208	222	243	246	261	231
Usage Per Connection (gal/year)	66,173	62,284	57,658	55,012	51,882	53,176	57,698
Daily Usage Per Connection (gal/day)	181	171	158	151	142	146	158
This master plan will use a historical daily ERU usage of				160			gpd/conn.
Commercial							
Usage (gallons)	19,541,000	33,851,000	37,735,000	38,582,000	39,440,000	41,509,000	35,109,667
Connections	92	96	104	112	117	118	107
Usage Per Connection (gal/year)	424,804	352,615	362,837	344,482	337,094	351,771	371,184
Daily Usage Per Connection (gal/day)	1,164	966	994	944	924	964	1,017
Equivalent Residential Unit - Historical	7.27	6.04	6.21	5.90	5.77	6.02	6.20
Commercial ERUs - Historical	669	580	646	661	675	711	657
Other							
Usage (gallons)	1,994,000	2,638,000	3,379,000	4,290,000	7,351,000	7,367,000	4,503,167
Connections	15	17	16	23	29	31	22
Usage Per Connection (gal/year)	265,867	155,176	211,188	186,522	253,483	237,645	204,688
Daily Usage Per Connection (gal/day)	728	425	579	511	694	651	561
Equivalent Residential Unit - Historical	4.55	2.66	3.62	3.19	4.34	4.07	3.74
Commercial ERUs - Historical	68	45	58	73	126	126	83

*Year 2009 represent 6 months of data. Therefore adjustments were used when determining averages to include that year but not skew the results.

An Equivalent Residential Unit (ERU) value allows the comparison of water use between a residential and any other type of connection. For instance, the results of the usage analysis shows that on average, a commercial connection in the Town of Springdale uses approximately 6.20 times the amount of an average residential connection. Therefore, throughout the rest of this report, each commercial connection equates to 6.20 ERUs. Likewise, each "other" connection equates to 3.74 ERUs.

D. PROJECTED CULINARY WATER CONNECTIONS & ERUs

The number of future ERUs can be calculated using the compound growth formula (shown below) and inserting the projected growth rate, the existing number of culinary water ERUs, and the number of years for which the future number of ERUs is desired. Yearly projections are shown in Table II-3.

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

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

Present ERUs were taken from data provided by the Town; the total number of ERUs as of December 2014, in the Town was 1,111. Based on the assumed growth rate of 2.0%, the total number of ERUs at the end of the planning period will be 1,680; it is recommended that Springdale size all future culinary water related infrastructure improvements for at least 1,680 ERUs.

Figure II-3: Projected Connections, ERUs & Population

Year	Est. Growth Rate	Residential Connections	Commercial Connections	Other Connections	Residential ERU's	Commercial ERU's	Other ERU's	Total ERU's	Estimated Population
2014	1.50%	261	118	31	261	732	116	1,109	561
2015	2.00%	266	120	32	266	746	118	1,131	572
2016	2.00%	272	123	32	272	761	121	1,153	584
2017	2.00%	277	125	33	277	776	123	1,176	595
2018	2.00%	283	128	34	283	792	125	1,200	607
2019	2.00%	288	130	34	288	808	128	1,224	619
2020	2.00%	294	133	35	294	824	131	1,248	632
2021	2.00%	300	136	36	300	840	133	1,273	644
2022	2.00%	306	138	36	306	857	136	1,299	657
2023	2.00%	312	141	37	312	874	139	1,325	670
2024	2.00%	318	144	38	318	892	141	1,351	684
2025	2.00%	325	147	39	325	910	144	1,378	698
2026	2.00%	331	150	39	331	928	147	1,406	711
2027	2.00%	338	153	40	338	946	150	1,434	726
2028	2.00%	344	156	41	344	965	153	1,463	740
2029	2.00%	351	159	42	351	985	156	1,492	755
2030	2.00%	358	162	43	358	1,004	159	1,522	770
2031	2.00%	365	165	43	365	1,024	162	1,552	786
2032	2.00%	373	169	44	373	1,045	166	1,583	801
2033	2.00%	380	172	45	380	1,066	169	1,615	817
2034	2.00%	388	175	46	388	1,087	172	1,647	834
2035	2.00%	396	179	47	396	1,109	176	1,680	850

III. WATER SOURCE CAPACITY ANALYSIS

A. EXISTING WATER SOURCE CAPACITY

Water for the Town of Springdale currently comes from many sources, but the majority of the water comes from the North Fork of the Virgin River. Other sources include springs in Zion National Park, the Hummingbird Well, Cemetery Well, and Big Springs. The 2008 Master Plan states that the available flow from these sources totals approximately 1,100 gpm. However, due to the limited capacity of the existing treatment plant, the existing water source capacity identified in the 2008 Master Plan is 400 gpm.

Figure III-1: Existing Virgin River Intake Structure

B. EXISTING REQUIRED WATER SOURCE CAPACITY

The State of Utah Public Drinking Water Regulations, Section 5, states that a community should have an adequate water source capacity to physically meet the anticipated peak day demand. State regulations outline that peak day demand for source capacity requirement per connection should be double the average amount of water required per connection per day. This master plan assumes that the peak day demand in the Springdale service area for source capacity is double the average requirement per ERU based on historic use. This required source capacity per ERU in the

Springdale service area is assumed to be 320 gallons per day for historical use. The historical peaks since 2009 have also been compared to this figure. The monthly averages show that during the peak times of the year, approximately 250 gallons per day are required for each ERU. Therefore, it's safe to assume that peak days during those peak months may be in and around 320 gallons per ERU. The existing required source capacity calculations are shown in Figure III-2.

Figure III-2: Existing Required Source Capacity

Existing Required Water Source Capacity Calculations
Required Indoor / Outdoor Source - Historic Usage
$1131 \text{ ERUs} \times \dfrac{320 \text{ gpd}}{\text{ERU}} \times \dfrac{1 \text{ day}}{24 \text{ hr}} \times \dfrac{1 \text{ hr}}{60 \text{ min.}} = 251 \text{ gpm}$

The existing source capacity surplus or deficit is determined by subtracting the existing required source capacity of 251 GPM from the total available source capacity of 400 GPM, which yields a surplus of 149 GPM.

C. PROJECTED REQUIRED WATER SOURCE CAPACITY

Projected required water source capacity at the end of the planning period is determined from the same information and calculations explained in Part B, except the projected number of culinary water ERUs is substituted in the calculations for the current number of ERUs. The projected required source capacity calculations are shown in Figure III-3.

Figure III-3: Projected Required Source Capacity

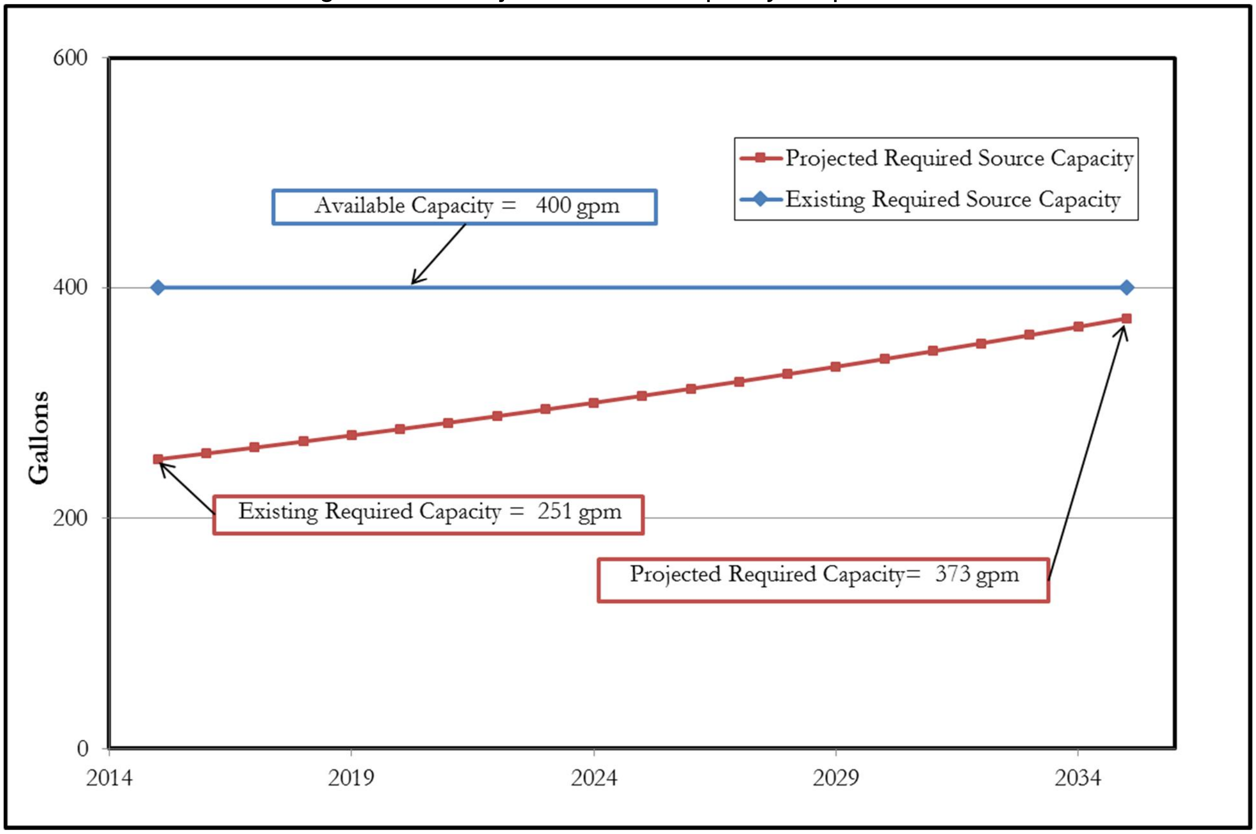
Projected Required Source Capacity Calculations
Required Indoor / Outdoor Source - Historic Usage
$1680 \text{ ERUs} \times \dfrac{320 \text{ gpd}}{\text{ERU}} \times \dfrac{1 \text{ day}}{24 \text{ hr}} \times \dfrac{1 \text{ hr}}{60 \text{ min.}} = 373 \text{ gpm}$

The projected source capacity surplus or deficit is determined by subtracting the projected required source capacity of 373 gpm from the total available source capacity of 400 gpm, which yields a projected surplus of 27 gpm at 20 year projection.

D. RECOMMENDED WATER SOURCE CAPACITY IMPROVEMENTS

As previously recommended and fulfilled by this study, treatment options should be explored and analyzed to provide feasible alternatives for upgrading the treatment plant.

Figure III-4: Projected Source Capacity Requirements



IV. WATER STORAGE CAPACITY ANALYSIS

A. EXISTING WATER STORAGE CAPACITY

The culinary water storage capacity for Springdale is identified in Table IV.A-1.

Figure IV-1: Existing Water Storage Capacity

Existing Storage Capacity:		
Anasazi Steel Tank	200,000	gal.
North Concrete Tank	500,000	gal.
1 Million Gallon Tank	1,000,000	gal.
Total Existing Storage Capacity	1,700,000	gal.

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

Figure IV-2: North Concrete Tank

Figure IV-3: 1MG Concrete Tank

B. EXISTING REQUIRED WATER STORAGE CAPACITY

Water storage capacity requirements are found in the State of Utah Public Drinking Water Regulations, R309-510. These regulations require storage for a 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.

As shown in previous sections, the average water use per ERU in the area for 2009-2014 is 260 gallons per day of culinary water. Storage requirements for fire protection vary slightly from community to community. In general, fire flow requirements are set by the local Fire Chief or are based on building size and type of construction. The requirement for Springdale is 3,500 gpm for 3 hours. This is to meet the demand required by two commercial structures that were constructed before the requirement to install fire sprinklers was enforced. Also included in required storage is emergency storage as determined by the Owner and Engineer. For planning purposes, this master plan will use an amount of 25% of the total required storage from equalization and fire protection storage.

Based on the requirements for required storage capacity, the required storage capacity is calculated as shown in Figure IV-4.

Figure IV-4: Existing Required Water Storage Capacity

Existing Required Storage Capacity						
	160 gpd / ERU	X	1,131 ERUs	=	180,914	gpd
Fire Demand						
3,500 gpm	X	60 min / 1 hr	X	3 hr =	630,000	gal.
Emergency Supply						
25% of required storage					202,728	gal.
				Total Existing Required Storage	1,013,642	gal.
				Total Existing Storage Capacity	1,700,000	gal.
				Existing Storage Capacity Surplus	686,358	gal.

The existing water storage capacity surplus or deficit is determined by subtracting the existing required water storage capacity of 1,013,642 gallons from the total available water storage capacity of 1,700,000 gallons, which yields an existing surplus of 686,358 gallons.

C. PROJECTED REQUIRED WATER STORAGE CAPACITY

The projected required culinary water storage capacity at the end of the planning period is determined from the same factors explained in part B above, but the projected number of culinary water ERUs is inserted into the calculations in place of the current number of ERUs.

Figure IV-5: Projected Required Water Storage Capacity

Projected Required Storage Capacity in 2035									
	160 gpd / ERU		X	1,680 ERUs			=	268,828	gpd
Fire Flow									
3,500 gpm	X	60 min / 1 hr		X		3 hr	=	630,000	gal.
Emergency Supply									
	25% of required storage							224,707	gal.
						Total Required Storage		1,123,535	gal.
						Total Existing Storage Capacity		1,700,000	gal.
						Future Storage Capacity Surplus		576,465	gal.

The projected water storage capacity surplus or deficit is determined by subtracting the projected required water storage capacity of 1,123,535 gallons from the total available water storage capacity of 1,700,000 gallons, which yields a projected surplus of 576,465 gallons at 20 years.

D. RECOMMENDED WATER STORAGE CAPACITY IMPROVEMENTS

There are currently no recommendations regarding existing storage facilities or existing storage capacities. The existing facilities should be maintained to provide as long of a design life as possible.

V. WATER TREATMENT ANALYSIS

In the previous sections of this report, an average daily water usage value of 160 gallons per ERU was used to evaluate the system based on historic usage since 2005. Although the usage data analyzed to determine this value has been consistent, the Town of Springdale recognizes that the historic usage is significantly lower than the State average. They also recognize that usage trends can change over time, and as they are considering making costly upgrades to the treatment system, they want to ensure that any improvements constructed are done so with adequate capacity to last throughout the design life of the improvements. Therefore, they have requested that for analysis of the treatment system, a more conservative daily water usage value of 250 gallons per ERU be utilized to size and evaluate future improvements.

In addition, the Town requested that build-out projections for the community be considered. During completion of the 2008 Master Plan, the City provided the build-out estimate of 2,120 ERUs. This included 1,022 residential, 998 commercial, and 100 other ERUs.

Considering the peak day requirement (2 x average day usage) of 500 gpd per ERU, the required treatment plant capacity at build-out for Springdale can be estimated at 736 gpm.

In addition, there has been much discussion recently regarding the potential need to provide treated water to the Town of Rockville, due to challenges their system has encountered consistently meeting treatment and source capacity requirements. Rockville Pipeline Company also completed a Master Plan in 2015, which indicated a 20-year source capacity requirement of approximately 72 gpm. <u>Considering future demands for both Springdale and Rockville, the total estimated treatment capacity considered in the analysis below is 810 gpm.</u>

A. GENERAL REQUIREMENTS

The State of Utah Public Drinking Water Regulations (R309), in accordance with the National Safe Drinking Water Act, have adopted “primary” regulations for the protection of public health and “secondary” regulations related to taste and aesthetics. Applicable “primary” standards and treatment techniques must be met by all public drinking water systems. “Secondary” standards are optional standards which are meant to help water suppliers avoid consumer complaints.

These “primary” regulations require removal of numerous contaminants (as needed) in order to comply with the maximum contaminant levels (MCLs) outlined in R309-200. In addition, surface water sources must be treated to assure at least 99.9% (3-log) removal and/or inactivation of Giardia lamblia cysts, and at least 99.99% (4-log) removal and/or inactivation of viruses.

In the early 2000’s, the EPA also created the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) targeting removal of Cryptosporidium and other pathogenic microorganisms in drinking water. Current regulations require a 2 to 3-log removal (or inactivation), depending on source water quality and treatment methods.

In addition, continuous disinfection is recommended for all water sources and is required to be provided and monitored for all surface water sources or ground water surfaces under the direct influence of surface waters. Minimum disinfection levels are set by contact time (CT) values which are defined in R309-110.

Providing the required levels of disinfection can also be problematic. This is because disinfectants themselves can react with naturally occurring materials in the water, forming disinfection byproducts (DPBs), which may also cause health risks. Consequently, the EPA has established MCLs for disinfection byproducts which must also be complied with. This can be especially challenging for surface water systems with high amounts of organic material.

B. EXISTING TREATMENT FACILITIES

At present, the Town of Springdale operates a conventional water treatment facility to treat available water sources used by the Town. Water is pumped from the North Fork of the Virgin River into 2 large holding/settling basins located above the main treatment facility. These basins include one open air HDPE lined earthen pond, and one open air concrete tank operated in series. The combined capacity of the basins is approximately 2 million gallons. Work has recently been performed on the HDPE lined holding pond to fix the existing liner and remove settled material.

Following initial settling, the water is then sent into the primary treatment facility, as pictured in Figure V-1. The water first receives a dose of Aluminum Sulfate (Alum) to act as a coagulant before being directed to a Contraflow® Solids Contact Clarifier. This type of clarifier combines mixing, flocculation, and sedimentation in one basin. The water enters the basin in the center cone, which contains a well-established volume of previously formed precipitates. This helps to accelerate the chemical reactions of the incoming water to create large heavy particles which will quickly settle to the bottom of the clarifier. As water exits the cone, the clarified water rises and exits the clarifier over the weirs located near the water surface, while the solids settle to the bottom of the basin, where they are collected and removed.

After passing through the clarification process, the water is filtered using a gravity granular media filtration system. Springdale's treatment facility includes 4 separate filters which include layers of sand and anthracite. The filters are piped to operate in parallel. Water is directed to the top of the filters, where the forces of gravity are used to force the water down through the granular media. Through various processes, the media filters out and captures solids, floc, and some pathogens. The filtered water is collected at the bottom of the filters and is directed to the next stage of treatment.

The final treatment stage occurs as the water is disinfected by means of chlorine gas and is directed to the clear well. The volume of the clear well along with the outgoing pipeline provides the required chlorine contact time to ensure that any remaining pathogens have been inactivated before the water is consumed by customers. The treated water is then pumped to the North Concrete Tank for distribution.

Figure V-1: Existing Springdale Water Treatment Facility

C. OPERATIONAL CHALLENGES & DEFICIENCIES

There are numerous operational challenges and deficiencies associated with the existing treatment plant. One of the primary concerns is that the current facility only includes a single train or pathway for water to be treated with no redundancy. This is a major concern because there is no way to keep the plant in operation if major components of the system need to be taken out of service for maintenance or for other reasons.

Section R309-525-5 of the Utah Administrative Code states that "Ordinarily, a minimum of two units of each for flocculation, sedimentation and filtration must be provided." This section also states that "when other sources are available to the system, this requirement may be relaxed." Springdale's existing treatment plant does not meet the requirement for two treatment trains. In addition, there are currently no other sources which can be immediately utilized, which further justifies the need for multiple treatment trains.

Another related challenge is due to the highly variable quality of water coming from the Virgin River and the difficulty of the plant in dealing with these inconsistencies. Incoming turbidity from the settling basins can range anywhere from 0.7 NTU to around 20 NTU. Turbidity directly from the Virgin River can range from around 100 NTU to above 1,000 NTU. The Town will generally shut down the supply of water to the settling basins when runoff is high to avoid filling their pipelines and basins with sediment. This can result in high fluctuations of flow through the treatment system or shutting the system down for periods of time. The technology associated with the Contraflow® clarifier depends on fairly consistent flow patterns because the system is dependent upon maintaining a steady sludge blanket in the basin. The Alum dosage needs to be carefully adjusted depending on temperature and flow, and major variations can upset the system and result in a loss of the sludge blanket. After an upset or a shutdown, the system can take several days to re-establish the sludge blanket and to again deliver water of acceptable quality to the filters.

The media filters also include some deficiencies that should be addressed. It is understood that the filter system does not include a standard filter to waste cycle after a backwash. This can result in short periods of time when the maximum turbidity limits are exceeded. It addition, it is understood that the backwash does not include an adequate re-stratifying process after a backwash to return the sand and anthracite back to the desired layers. The backwash system also discharges backwash water into a small open basin in the center of the floor below the filters. Due to the configuration of the piping and the undersized basin, the plant floor is flooded each time a backwash is run. This contributes to rusting and wear on the filters and other equipment.

Another problem is the aging components making up the treatment plant, and the difficulty in maintaining these components due to the need to keep the plant online as much as possible. Based on information provided by the Town, the plant was originally constructed in the 1980's. However, due to lack of training and unfamiliarity with the system, the Town did not start fully utilizing the plant for approximately 10 years. The plant has now been in operation for more than 20 years and has numerous components (including pumps, meters, monitors, etc.) that need to be replaced. The clarifier and sand filters are also showing oxidation damage and corrosion and need to be sand blasted and recoated soon if their service lives are to be extended.

Town staff indicated that several times during the past few years, the treatment plant has shut down during the period of highest water usage (summer/tourism season). This has been caused by turbidity spikes, or by equipment failure. It generally takes around 3 days to get the system up and going again. While the system is down, the water in the storage tanks acts as a buffer to meet the demand until the system is back up again. After the plant is back on line, it can take a week or more to return the tanks to the full level, while keeping up with peak season demands. If the plant would have shut down again during these periods for any reason, the Town likely would not have been able to supply enough water to keep up with demands.

D. TREATMENT ALTERNATIVES

In order to comply with the current Division of Drinking Water requirements and to provide a more dependable source of treated water, consideration should be given to upgrading or replacing the existing treatment plant. Numerous options are available which would alleviate the existing treatment concerns. The following alternatives have been considered:

- Upgrade Existing Treatment Plant
  Upgrading the existing plant would require, at minimum, the addition of another treatment train. This would include new flocculation and settling facilities. It should be reiterated that the existing solids contact clarifier is not ideal for the challenges associated with treating

surface water from the Virgin River, so continued operational challenges would be expected. In addition, the service life of the existing equipment is reaching the end of its design life. Consequently, if only one new train was installed initially, replacement of the other train would still be needed in the coming years.

It is also expected that layout of the treatment components for a new train, while keeping the existing treatment equipment in place and operating, would be difficult and would result in additional layout challenges when the existing equipment is ultimately replaced. Also, while it could technically be possible to re-use portions of the existing building and install new equipment inside, associated construction would be very expensive, and would seriously limit the options for new equipment and technology. Although performing a structural analysis for the existing building is outside of the scope of this study, it is assumed that the treatment plant and building do not conform to current structural and seismic standards. Because of these reasons, upgrading the existing plant is not believed to be in the best interest of the Town and is not recommended.

- <u>New Conventional Treatment Plant</u>

  A new conventional water treatment plant would include facilities for mixing, flocculation, sedimentation, filtration, and disinfection. At least 2 trains would be provided. The basins for these process are sized according to the required capacity of the plant. Some of these basins can be constructed indoors or outside, although gravity filters are generally constructed inside of a treatment building. Additional treatment building space is required for chlorination facilities, pumping equipment, compressors, office space for controls, and restroom facilities. An underground clear well would be required to provide the necessary CT time before the water was pumped to the tanks.

  For a conventional plant sized to meet Springdale's anticipated demands (approximately 810 gpm), it is assumed that a package plant would be the most economical. This type of system would include all of the treatment steps included in a standard conventional treatment plant, but in compact pre-manufactured basins. Since it is assumed that the package plant equipment would be located indoors, this alternative would require minimal exterior work and improvements, but would require a larger building footprint than other alternatives.

  Waste from the plant would include backwash water from the filter units and settled sludge from the sedimentation basins. The treatment plant location provides access to the sanitary sewer and all waste could be discharged directly to the sewer, or it could be recirculated to the open air settling basins. If high discharge rates to the sewer collection system are a concern, a sludge holding basin could also be constructed allowing plant waste to be slowly discharged to the sewer between backwashes.

  Preliminary sizing and pricing data for a packaged conventional system was obtained from a manufacturer as part of this plan and has been included in Appendix C.

- <u>New Membrane Treatment Plant</u>

  Membrane plants include hollow fibers bundled together in a pressure vessel. The fibers contain small pores or holes sized to filter out contaminants as water is forced through the hollow fibers using a pressure differential. Membrane systems generally consist of pre-configured skids including filter units and controls, but can also be custom built systems with separated components. As with other alternatives, multiple trains or skids would be needed. Prior basins for mixing and flocculation are not typically required, although it is necessary (for all options) that the existing settling basins remain in service to help provide an expected range of turbidity. Space required for membrane skids is assumed to be similar to, or slightly less than, that of a conventional package treatment plant with minimal exterior improvements. The building would also include chlorination facilities, pumping equipment, compressors, office space for controls, and restroom facilities. Because of the high removal credit for Cryptosporidium and Giardia associated with membrane treatment, it is assumed that required CT time would be minimal and could likely be provided in the pipeline supplying treated water to the tank, thus eliminating the need for a large clear well or contact chamber. However, access to filtrate water (from the storage tanks, or a separate holding basin) would be required for backwashes.

In order to help control DBPs, many membrane treatment plants are required to utilize pre-filter chemicals (such as aluminum sulfate) to reduce TOCs and other materials that can contribute to the creation of Haloacetic Acids, Trihalomethanes, and other DBPs. A pilot study would be required to determine for certain if this would be required for Springdale, but it is assumed that pre-treatment with Alum would be required. This would likely require a small basin to facilitate flash mixing of alum into the water prior to the membranes.

Frequent brief backwash cycles are required to flush out contaminants filtered out by the membranes and to keep the membranes from being plugged up. In addition, chemical enhanced backwashes are also needed to keep membranes clean. Waste from regular backwashes could be recirculated back to the open air settling ponds or discharged to the sewer. Waste from chemical backwashes (after being neutralized) can also be discharged directly to the sanitary sewer.

Preliminary sizing and pricing data for a membrane treatment skid system was obtained from a manufacturer as part of this plan and has been included in Appendix C.

E. SELECTION OF PREFERRED ALTERNATIVE

This section will present the method of selecting the preferred treatment alternative. The following criteria were selected to help determine the most cost effective means of meeting the applicable regulations and system demands.

The best ranking alternative in each category was given a score of 2 points. The other alternative was given a pro-rated score based on how it compared with the other alternative.

- <u>Project Cost</u>
  The overall project cost is one of the most important criteria being considered. An Engineer's Opinion of Probable Cost (EOPC) has been created for each alternative and has been included in Appendix C. Engineering and other incidental costs have been excluded from these estimates, but will be provided for the recommended alternative. The following table shows a comparison of the project cost for each alternative.

Figure V-2: Project Cost Comparison

Collection Alternatives	Project Cost	Points
Conventional Water Treatment Plant	$ 2,767,150	2.00
Membrane Water Treatment Plant	$ 2,911,750	1.90

- Operation & Maintenance
  Another important criteria to consider is the comparison of annual Operation and Maintenance (O&M) costs for each alternative. Annual O&M was estimated using anticipated costs for equipment, supplies, and electricity for each alternative and are included in Appendix C. Manpower and personnel costs were not included since it is assumed that these costs will be equivalent for each alternative. The following table shows a comparison of the O&M costs for each alternative.

Figure V-3: Operation & Maintenance Comparison

2016 Base Annual O&M	$ 556,187	Base
Collection Alternatives	**Additional O&M**	**Points**
Conventional Water Treatment Plant	$ 68,657	2.00
Membrane Water Treatment Plant	$ 80,584	1.65

- Present Worth
  Another method of comparing the alternatives is by using a Present Worth (PW) engineering analysis. This approach converts future costs and revenues into today's equivalent dollars. The method of performing a PW analysis is as follows:

  PW = Current Cost – Annual O&M(today's dollars) + Salvage Value(today's dollars)

  The PW calculations have been included in Appendix C. Because the alternatives were analyzed as service alternatives (the cost and O&M as disbursements only), the values are negative. The calculations were based on a 20 year salvage value. The smaller negative value represents the better alternative based on the analysis. The following table shows a comparison of the present worth for each alternative.

Figure V-4: Present Worth Comparison

Collection Alternatives	PW	Points
Conventional Water Treatment Plant	$ (3,329,915)	2.00
Membrane Water Treatment Plant	$ (3,679,229)	1.79

In order to determine the preferred alternative, each option was assigned a point ranking for each of the criteria previously mentioned. The criteria scores for each alternative were totaled to provide an overall score. The highest score represents the best alternative based on the analysis performed. The following table summarizes the results of the selection process. As can be seen, the preferred treatment alternative is a new Conventional Water Treatment Plant.

Figure V-5: Alternatives Analysis Results

Selection Criteria	Weight	Treatment System Alternatives			
		Conventional Water Treatment Plant		Membrane Water Treatment Plant	
		Points	Score	Points	Score
Project Cost	1	2.00	**2.00**	1.90	**1.90**
Operation & Maintenance	1	2.00	**2.00**	1.65	**1.65**
Present Worth	1	2.00	**2.00**	1.79	**1.79**
TOTALS			6.00		5.34

F. RECOMMENDED WATER TREATMENT FACILITY IMPROVEMENTS

Although the existing plant is working and is currently capable of generating water of adequate quality and quantity to meet the requirements of the Division Drinking Water and the Safe Drinking Water Act, the lack of redundancy in the system is cause for major concern. As mentioned, there are numerous scenarios (turbidity spikes, equipment failures, line breaks, required O&M, etc.) that could cause or require a shutdown of the plant. If there were to be any extended delay or difficulty in bringing the plant back on line following any of these scenarios, the Town may not be able to supply water to keep up with demand.

It is recommended that the Town make preparations to replace the existing treatment plant with a new package conventional water treatment plant as soon as is feasibly possible.

An additional issue to be considered by the Town is how extremely high turbidity events would be handled if the upstream settling ponds were taken out of service or had to be temporarily bypassed. Both of the options evaluated assume that the settling basins would remain in service in order to provide a consistent and expected range of turbidity. If the basins did have to be bypassed, incoming turbidity levels from the river water would be well above the treatment capacity of the recommended treatment system.

Depending on the likelihood of this occurring, the Town may consider an additional pretreatment or sedimentation treatment step prior to the new plant. One option would be to incorporate a SuperSettler™ system (or equivalent) meant to reduce the incoming turbidity to a level that could be effectively treated by the recommended improvements. It is expected that including this option would result in an increase to the improvement costs of approximately $600,000.

Another consideration is that the Town occasionally receives complaints regarding the taste and odor of treated water. Although the recommended improvements would provide water of high quality meeting all required standards, these issues may still persist. As an additional option to address these types of complaints, the Town could consider adding a Granular Activated Carbon (GAC) process to the end of the treatment plant. It is expected that including this option would result in an increase to the improvement costs of approximately $500,000.

VI. WATER DISTRIBUTION SYSTEM ANALYSIS

A. EXISTING DISTRIBUTION SYSTEM ANALYSIS

The State of Utah Administrative Rules for Public Drinking Water Systems, R309-510, require distribution systems to be sized to supply peak instantaneous flows, while maintaining a minimum system pressure of 30 psi. The rule also requires that distribution systems are able to supply peak day flows plus fire flows for a minimum of 2 hours, while maintaining a minimum system pressure of 20 psi. The system also needs to provide peak day flows while maintaining a minimum system pressure of 40 psi. As a general guideline, it is recommended that the system be able to provide a minimum static pressure of 50 psi at every point in the distribution system.

The indoor peak instantaneous demand equation is found in the State of Utah Public Administrative Rules for Drinking Water Systems, R309-510. As stated previously, peak day flows are equal to twice the average day flows, or 320 gpm. Fire flow demands are 1,000 gpm in most areas to meet the requirements of R309-105-9, but are 3,500 gpm in two areas to cover fire flow demands for two commercial structures that were built before the requirement for fire sprinklers. The required distribution system demands are calculated below in Figure VI-1.

Figure VI-1: Existing Water Distribution Demand Requirements

Indoor Peak Instantaneous Demand:							
Q=	10.8 X N^.64			N= Number of ERU's			
Q=	10.8 X	1,131	^.64		=	972	gpm
Current Indoor Peak Instantaneous Demand					=	**972**	**gpm**
Peak Day Demand & Fire Flow							
All ERUs							
1,131 ERUs X	320 gpd X / ERU		1 day / 24 hr	1 hr / 60 min.	=	251	gpm
Fire Flow (Standard)					=	1,000	gpm
Fire Flow (Non Sprinklered Commercial)					=	3,500	gpm
Current Peak Day Demand + Fire Flow (Standard)					=	**1,251**	**gpm**
Current Peak Day Demand + Fire Flow (Non Sprinklered Commercial)					=	**3,751**	**gpm**

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 ERUs are inserted into the calculations. The projected peak instantaneous demand and peak day demand plus fire flow have been calculated in Figure VI-2.

Figure VI-2: Projected Water Distribution Demand Requirements

Indoor Peak Instantaneous Demand:								
Q=	10.8 X N^.64			N= Number of ERU's				
Q=	10.8 X	1,680	^.64			=	1,252	gpm
	Projected Peak Instantaneous Demand					=	**1,252**	**gpm**
Peak Day Demand & Fire Flow								
All ERUs								
1,680	ERUs X	320	gpd X	1 day	1 hr	=	373	gpm
			ERU	24 hr	60 min.			
	Fire Flow (Standard)					=	1,000	gpm
	Fire Flow (Non Sprinklered Commercial)					=	3,500	gpm
Projected Peak Day Demand + Fire Flow (Standard)						=	**1,373**	**gpm**
Projected Peak Day Demand + Fire Flow (Non Sprinklered Commercial)						**=**	**3,873**	**gpm**

It is recommended that the distribution system be modeling using these calculated demands to ensure that the required pressures and flows are able to be provided.

VII. CAPITAL FACILITIES PLAN

As previously mentioned, it is recommended that the Town make preparations to replace the existing treatment plant with a new package conventional water treatment plant as soon as is feasibly possible. This project will address the concerns associated with the lack of redundancy with the existing treatment plant.

A. PRELIMINARY ENGINEER'S OPINION OF PROBABLE COST

A table showing the opinion of probable cost for the recommended water improvements projects is provided in Figure VII-1.

Included in the Opinion of Probable Cost for the proposed improvements are anticipated construction costs, a contingency budget, and a budget for other normal project costs such as survey, administration, engineering, legal services, fiscal costs, etc.

B. PROPOSED FINANCING PLAN

Figure VII-2 outlines a possible financing plan for the recommended improvements. It should be noted that this is a sample and other funding sources or options may be considered. The total estimated cost for the project is $3,345,650. It is assumed that funding assistance for the project would be provided by the Utah Drinking Water Board (DDW), with $145,650 of up front self-participation by Springdale. The self-participation would need to come from the Town's available cash. The amount assumed to be funded by DDW is $3,200,000 of which 50% is assumed grant and 50% is assumed loan. The financing plan assumes that the loan has an interest rate of 1% and payback term of 25 years. The financing plan also considers the expected first year expenses including salaries, utilities, legal and professional fees, as well as the existing debt service.

An increase to the Town's culinary water impact fee of $421 has been assumed to cover the cost of surplus capacity which would be built into the treatment plant. This estimate is based on the cost of the project and the assumed financing plan. It takes into account the amount of interest to be paid on the loan and subtracts out the assumed amount of grant funding, which is not impact fee eligible. To determine the percent of the eligible costs that would be attributable to new growth, the number of existing ERUs (1,131) was divided by the estimated number of build-out ERUs (2,120), which indicates that 53.3% of the future ERUs to be served are existing. This corresponds in the project being 46.7% impact fee eligible. The total eligible amount of $915,254 was divided by the 989 future ERUs to estimate an impact fee increase of $431.

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

Project:	Package Conventional Water Treatment Plant	Project No:	
	810 gpm plant	Date:	6-Nov-15
Owner:	Town of Springdale	By:	RBF

ITEM NO.	DESCRIPTION	QTY	UNITS	UNIT COST	AMOUNT
1	Mobilization	1	LS	$ 87,000	$ 87,000
2	Pilot Study	1	LS	$ 50,000	$ 50,000
Treatment Plant Building Construction (3,450 SF)					
3	Earthwork - Excavation	1	LS	$ 20,000	$ 20,000
4	Earthwork - Structural Fill / Compaction	1	LS	$ 17,250	$ 17,250
5	Footings/Foundation/Floor	1	LS	$ 110,400	$ 110,400
6	Package Conventional System	1	LS	$ 754,000	$ 754,000
7	Install Package Treatment System	1	LS	$ 85,000	$ 85,000
8	Masonry Building	1	LS	$ 172,500	$ 172,500
9	Plumbing & Accessories	1	LS	$ 30,000	$ 30,000
10	Mechanical Piping (Valves, Supports, Marking)	1	LS	$ 165,000	$ 165,000
11	Misc. Furnishings (Rails, Grating, Furnishings)	1	LS	$ 45,000	$ 45,000
12	Electrical Systems	1	LS	$ 260,000	$ 260,000
13	Mechanical Systems	1	LS	$ 55,000	$ 55,000
14	Air Piping System & Compressor	1	LS	$ 30,000	$ 30,000
15	SCADA & Controls	1	LS	$ 100,000	$ 100,000
16	Chlorine Contact Time Chamber	1	LS	$ 40,000	$ 40,000
17	On-Site Sodium Hypochlorite Generation System	1	LS	$ 75,000	$ 75,000
18					
19		Subtotal			$ 1,959,150
Site Work					
20	Demolition of Existing Filter Building	1	LS	$ 30,000	$ 30,000
21	Demolition of Existing Clarifier	1	LS	$ 15,000	$ 15,000
22	Flow Control Vault	1	LS	$ 75,000	$ 75,000
23	Misc Piping and Site Work	1	LS	$ 50,000	$ 50,000
24	Landscaping	1	LS	$ 20,000	$ 20,000
25	Asphalt	500	SY	$ 40	$ 20,000
26		Subtotal			$ 210,000
27					
28	Construction Subtotal				$ 2,306,150
29	Contingency	20	%		$ 461,000
30	TOTAL CONSTRUCTION COST				$ 2,767,150
31					

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

Project: Package Conventional Water Treatment Plant
810 gpm plant
Owner: Town of Springdale

Project No:
Date: 6-Nov-15
By: RBF

ITEM NO.	DESCRIPTION	QTY	UNITS	UNIT COST	AMOUNT
Incidentals					
32	Funding & Administrative Services	0.5%	L.S.		$ 16,000
33	Civil Engineering Design	6.3%	L.S.		$ 211,000
34	Engineering Construction Admin / Observation	6.0%	Hourly		$ 200,000
35	Water Conservation Plan		Est.		$ -
36	Operation and Maintanence Manual		Est.		$ -
37	SWPPP (Storm Water Pollution Protection Plan)		Est.		$ 3,500
38	Environmental Assistance (Not EA or ER)		Est.		$ 15,000
39	Geotechnical Engineering				
40	Geotechnical Report / Subsurface Investigation		Est.		$ 5,000
41	Electrical Engineering				$ -
42	Electrical Engineering Design		Est.		$ 40,000
43	SCADA Design		Est.		$ -
44	Survey and Mapping				
45	Design Survey		Est.		$ 3,000
46	Construction Staking		Est.		$ 2,500
47	Property Surveys		Est.		$ 2,500
48	Land & RoW Acquisition		Est.		$ -
49	Land & RoW Research & Documents		Est.		$ -
50	Water Source Incidentals				
51	Water Rights Research & Applications		Est.		$ -
52	Legal and Fiscal				
53	Legal & Financial Consultants		Est.		$ 40,000
54	Loan Origination Fee		Est.		$ 30,000
55	Interim Financing Costs		Est.		$ -
56	Miscellaneous				
57	Miscellaneous Engineering Services		Est.		$ 10,000
58					
59	TOTAL PROJECT COST				$ 3,345,650

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.

FIGURE VII-2

TOWN OF SPRINGDALE FY 2016 PROPOSED FINANCING PLAN				
TOTAL PROJECT COST			**$**	**3,345,650**
FY 2016 EXPENSES				
Proposed Funding:	**Rate**	**Term in Yrs.**		**Principal**
Self Participation			$	145,650
DWB Grant			$	1,600,000
DWB Loan	1.00%	25	$	1,600,000
TOTAL PROJECT FUNDING:				**$3,345,650**
PROJECTED EXPENSES: (First Year of New Debt Service Payment)				
Personnel Services			$	215,140
Utilities			$	43,601
Repair & Maintenance			$	56,206
Other Supplies & Expenses			$	60,084
Insurance Expense			$	13,001
Depreciation Expense			$	168,155
*Estimated O&M Increases for New Treatment Plant			$	34,500
Subtotal Expenses:			**$**	**590,687**
EXISTING DEBT SERVICE				
2004 Water Revenue			**$**	**81,000**
2009 Water Revenue			**$**	**62,000**
2012 Water Revenue			**$**	**5,000**
Loan Payment Reserves (Payment/10)			**$**	**7,750**
Subtotal Existing Annual Debt Service:				**$155,750**
NEW DEBT SERVICE				
2016 Loan Payment				$72,700.00
Loan Reserve (Payment/10)			$	7,270
Subtotal New Annual Debt Service:				**$79,970**
Renewal and Replacement Fund (5% of Annual Expenses)			$	29,500
GRAND TOTAL EXPENSES:				**$855,907**
ANNUAL INCOME				
Projected Yearly Impact Fees (Existing - $6,060)	New ERUs	23	$	139,380
Estimated Yearly Impact Fees (Treatment - $431)	New ERUs	23	$	9,913
Transient Room Tax Revenues			$	60,000
Total Number of ERUs (FY 2016)				1,154
Average Monthly Water User Rate/ERU Required				**$46.69**
TOTAL ANNUAL INCOME:				**$855,907**
Average Monthly Irrigation Water User Rate/ERU				**$2.15**
Total Average Monthly Water Cost/ERU				**$48.84**

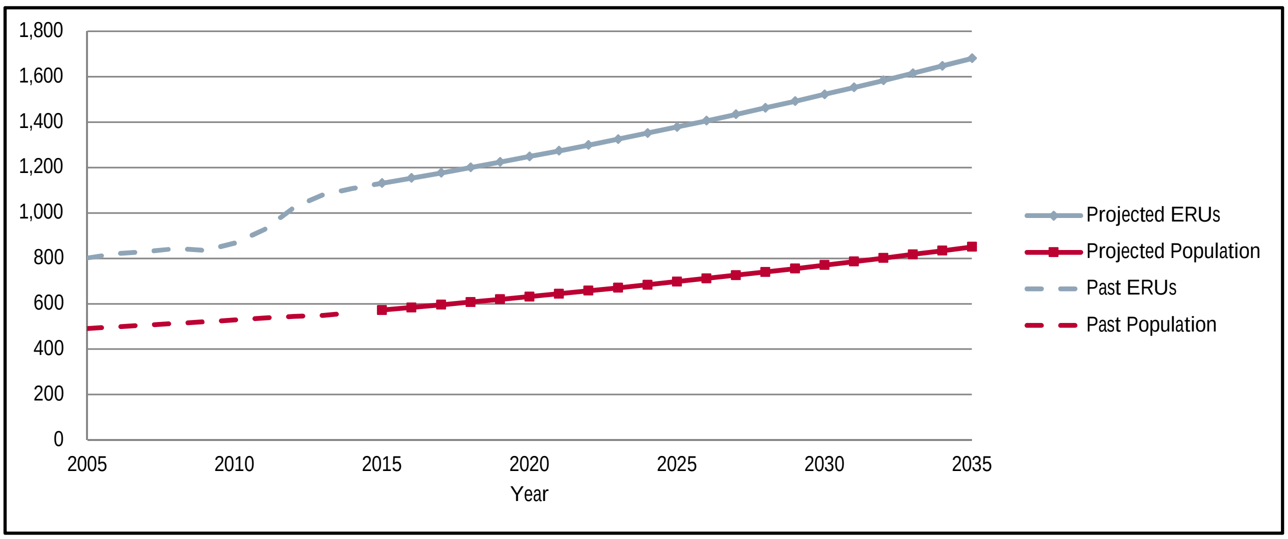
*This number represents h*alf of calculated O&M for new treatment plant. This assumes the other half is associated with operation of the existing plant and would not be an increase to the annual expenses.*

APPENDIX A

GROWTH PROJECTIONS & USER ANALYSIS

Culinary Water Connections (At End of Each Year)

Year	Est. Growth Rate	Residential Connections	Commercial Connections	Other Connections	Residential ERU's	Commercial ERU's	Other ERU's	Total ERU's	Estimated Population
2005	1.50%	210	93	4	210	577	15	802	491
2006	1.50%	217	95	4	217	589	15	821	498
2007	1.50%	222	95	5	222	589	19	830	506
2008	1.50%	225	96	6	225	595	22	843	513
2009	1.50%	208	92	15	208	570	56	835	521
2010	1.50%	208	96	17	208	595	64	867	529
2011	1.50%	222	104	16	222	645	60	927	537
2012	1.50%	243	112	23	243	694	86	1,023	545
2013	1.50%	246	117	29	246	725	108	1,080	548
2014	1.50%	261	118	31	261	732	116	1,109	561
2015	2.00%	266	120	32	266	746	118	1,131	572
2016	2.00%	272	123	32	272	761	121	1,153	584
2017	2.00%	277	125	33	277	776	123	1,176	595
2018	2.00%	283	128	34	283	792	125	1,200	607
2019	2.00%	288	130	34	288	808	128	1,224	619
2020	2.00%	294	133	35	294	824	131	1,248	632
2021	2.00%	300	136	36	300	840	133	1,273	644
2022	2.00%	306	138	36	306	857	136	1,299	657
2023	2.00%	312	141	37	312	874	139	1,325	670
2024	2.00%	318	144	38	318	892	141	1,351	684
2025	2.00%	325	147	39	325	910	144	1,378	698
2026	2.00%	331	150	39	331	928	147	1,406	711
2027	2.00%	338	153	40	338	946	150	1,434	726
2028	2.00%	344	156	41	344	965	153	1,463	740
2029	2.00%	351	159	42	351	985	156	1,492	755
2030	2.00%	358	162	43	358	1,004	159	1,522	770
2031	2.00%	365	165	43	365	1,024	162	1,552	786
2032	2.00%	373	169	44	373	1,045	166	1,583	801
2033	2.00%	380	172	45	380	1,066	169	1,615	817
2034	2.00%	388	175	46	388	1,087	172	1,647	834
2035	2.00%	396	179	47	396	1,109	176	1,680	850



Water Usage Data

Month & Year	Water Usage Data				Connection Data		
	Residential	Commercial	Other	Total	Residential	Commercial	Other
Jul-09	1,492,390	4,430,680	744,590	6,667,660	208	88	15
Aug-09	1,284,990	4,432,030	687,010	6,404,030	208	90	14
Sep-09	1,258,850	3,817,290	125,330	5,201,470	210	90	13
Oct-09	1,203,680	3,767,830	233,040	5,204,550	210	94	16
Nov-09	751,220	1,541,350	136,140	2,428,710	206	93	18
Dec-09	891,290	1,551,840	68,200	2,511,330	206	94	16
Jan-10	704,320	946,960	39,780	1,691,060	203	90	14
Feb-10	663,440	999,030	44,020	1,706,490	201	91	14
Mar-10	808,109	1,927,500	328,180	3,063,789	211	95	16
Apr-10	1,026,500	3,158,820	209,260	4,394,580	213	94	18
May-10	1,052,630	3,337,640	169,250	4,559,520	209	98	19
Jun-10	1,583,860	4,332,560	334,440	6,250,860	214	98	15
Jul-10	1,513,790	4,248,060	705,610	6,467,460	210	97	21
Aug-10	1,385,550	4,551,830	220,310	6,157,690	208	97	20
Sep-10	1,246,980	3,747,930	175,670	5,170,580	209	97	19
Oct-10	971,310	3,469,710	296,750	4,737,770	208	100	19
Nov-10	1,209,700	2,176,060	71,470	3,457,230	206	100	19
Dec-10	788,830	954,670	42,920	1,786,420	204	98	12
Jan-11	791,860	1,324,140	31,500	2,147,500	202	99	14
Feb-11	809,200	1,361,780	61,040	2,232,020	199	100	14
Mar-11	780,781	2,069,480	95,170	2,945,431	208	104	15
Apr-11	870,670	3,359,370	142,540	4,372,580	208	102	15
May-11	1,134,200	4,390,570	128,840	5,653,610	213	104	15
Jun-11	1,203,120	3,995,450	146,870	5,345,440	212	103	15
Jul-11	1,494,390	4,338,120	511,520	6,344,030	209	104	15
Aug-11	1,694,500	5,037,160	638,640	7,370,300	244	105	18
Sep-11	1,227,570	4,298,280	687,040	6,212,890	241	106	18
Oct-11	1,043,040	3,589,890	845,750	5,478,680	242	107	19
Nov-11	1,007,350	2,666,460	50,170	3,723,980	242	108	18
Dec-11	743,720	1,304,020	39,750	2,087,490	241	109	18
Jan-12	910,850	1,540,120	52,110	2,503,080	245	110	19
Feb-12	719,450	1,287,190	74,570	2,081,210	241	111	19
Mar-12	870,790	2,093,590	1,015,980	3,980,360	241	112	20
Apr-12	1,267,400	3,992,950	51,160	5,311,510	240	112	21
May-12	1,308,850	3,891,460	203,670	5,403,980	242	112	22
Jun-12	1,681,770	4,954,600	883,170	7,519,540	242	112	23
Jul-12	1,477,280	4,657,320	421,950	6,556,550	242	112	26
Aug-12	1,287,000	4,463,730	564,110	6,314,840	244	112	25
Sep-12	1,112,570	3,840,390	214,230	5,167,190	243	112	25
Oct-12	1,194,830	4,053,050	710,430	5,958,310	243	112	26
Nov-12	888,340	2,727,800	57,840	3,673,980	244	112	25
Dec-12	649,170	1,080,230	40,750	1,770,150	244	112	26
Jan-13	957,400	1,383,850	85,662	2,426,912	245	112	26
Feb-13	670,240	1,131,000	275,000	2,076,240	245	114	29
Mar-13	848,240	2,318,780	410,260	3,577,280	245	114	29
Apr-13	1,089,550	3,837,690	445,680	5,372,920	243	115	28
May-13	1,214,780	4,227,210	619,830	6,061,820	245	118	32
Jun-13	1,291,490	4,619,360	1,000,000	6,910,850	245	118	30
Jul-13	1,634,040	5,898,190	963,800	8,496,030	244	118	31
Aug-13	1,234,790	4,332,710	1,141,240	6,708,740	248	118	31
Sep-13	1,139,990	4,652,710	895,200	6,687,900	247	120	29
Oct-13	1,104,380	3,452,620	643,240	5,200,240	250	118	27
Nov-13	765,250	2,054,310	462,870	3,282,430	250	118	27
Dec-13	812,900	1,531,440	408,300	2,752,640	250	118	28
Jan-14	851,670	1,572,410	513,270	2,937,350	248	118	35
Feb-14	676,380	1,471,510	407,940	2,555,830	257	118	33
Mar-14	1,018,910	2,556,290	462,000	4,037,200	258	118	32
Apr-14	1,279,570	4,319,800	682,650	6,282,020	259	118	33
May-14	1,320,740	4,019,720	534,220	5,874,680	261	118	29
Jun-14	1,660,500	5,308,570	868,660	7,837,730	260	118	31
Jul-14	1,427,350	5,157,280	801,840	7,386,470	258	118	31
Aug-14	1,242,850	4,326,500	581,570	6,150,920	258	118	29
Sep-14	1,367,930	4,907,670	688,470	6,964,070	258	119	29
Oct-14	1,136,810	4,063,530	727,180	5,927,520	263	118	29
Nov-14	726,190	1,723,770	410,830	2,860,790	272	118	28
Dec-14	1,169,950	2,082,140	688,310	3,940,400	275	118	28
Total	**39,396,950**	**108,886,420**	**10,291,460**	**158,574,830**			

Year	Yearly Usage in 1,000 Gallons				Average Yearly Connections		
2009	6,882	19,541	1,994	28,418	208	92	15
2010	12,955	33,851	2,638	49,443	208	96	17
2011	12,800	37,735	3,379	53,914	222	104	16
2012	13,368	38,582	4,290	56,241	243	112	23
2013	12,763	39,440	7,351	59,554	246	117	29
2014	13,879	41,509	7,367	62,755	261	118	31

Year	Monthly Averages by Year				Winter Averages (Dec, Jan, & Feb)		
2009 Avg	1,147,000	3,256,833	332,333	4,736	753	1,166	51
2010 Avg	1,079,583	2,820,917	219,833	4,120	797	1,214	45
2011 Avg	1,066,667	3,144,583	281,583	4,493	791	1,377	55
2012 Avg	1,114,000	3,215,167	357,500	4,687	825	1,611	257
2013 Avg	1,063,583	3,286,667	612,583	4,963	780	1,525	443
2014 Avg	1,156,583	3,459,083	613,917	5,230	1,170	2,082	688

Year	Average Usage Per Connection			
	Residential		Commercial	
	Monthly	Daily	Monthly	Daily
2009	5,514	181	35,400	1,164
2010	5,190	171	29,385	966
2011	4,805	158	30,236	994
2012	4,584	151	28,707	944
2013	4,324	142	28,091	924
2014	4,431	146	29,314	964

Table II.C-1: Average Usage Per Connection

	2009	2010	2011	2012	2013	2014	Average
Residential	(6 Months)						11 - 14
Usage (gallons)	6,882,000	12,955,000	12,800,000	13,368,000	12,763,000	13,879,000	12,107,833
Connections (ERUs)	208	208	222	243	246	261	231
Usage Per Connection (gal/year)	66,173	62,284	57,658	55,012	51,882	53,176	57,698
Daily Usage Per Connection (gal/day)	181	171	158	151	142	146	158
This master plan will use a historical daily ERU usage of				160			gpd/conn.
Commercial							
Usage (gallons)	19,541,000	33,851,000	37,735,000	38,582,000	39,440,000	41,509,000	35,109,667
Connections	92	96	104	112	117	118	107
Usage Per Connection (gal/year)	424,804	352,615	362,837	344,482	337,094	351,771	371,184
Daily Usage Per Connection (gal/day)	1,164	966	994	944	924	964	1,017
Equivalent Residential Unit - Historical	7.27	6.04	6.21	5.90	5.77	6.02	6.20
Commercial ERUs - Historical	669	580	646	661	675	711	657
Other							
Usage (gallons)	1,994,000	2,638,000	3,379,000	4,290,000	7,351,000	7,367,000	4,503,167
Connections	15	17	16	23	29	31	22
Usage Per Connection (gal/year)	265,867	155,176	211,188	186,522	253,483	237,645	204,688
Daily Usage Per Connection (gal/day)	728	425	579	511	694	651	561
Equivalent Residential Unit - Historical	4.55	2.66	3.62	3.19	4.34	4.07	3.74
Commercial ERUs - Historical	68	45	58	73	126	126	83

*Year 2009 represent 6 months of data. Therefore adjustments were used when determining averages to include that year but not skew the results.

APPENDIX B

MULTI-POINT SYSTEM ANALYSIS

Water Source Capacity

A.

Big Water Sources	Total Flow	
Sources	CFS	gpm
Treatment Plant	0.9	400
	0.0	
	0.0	
Source Total =	0.9	400

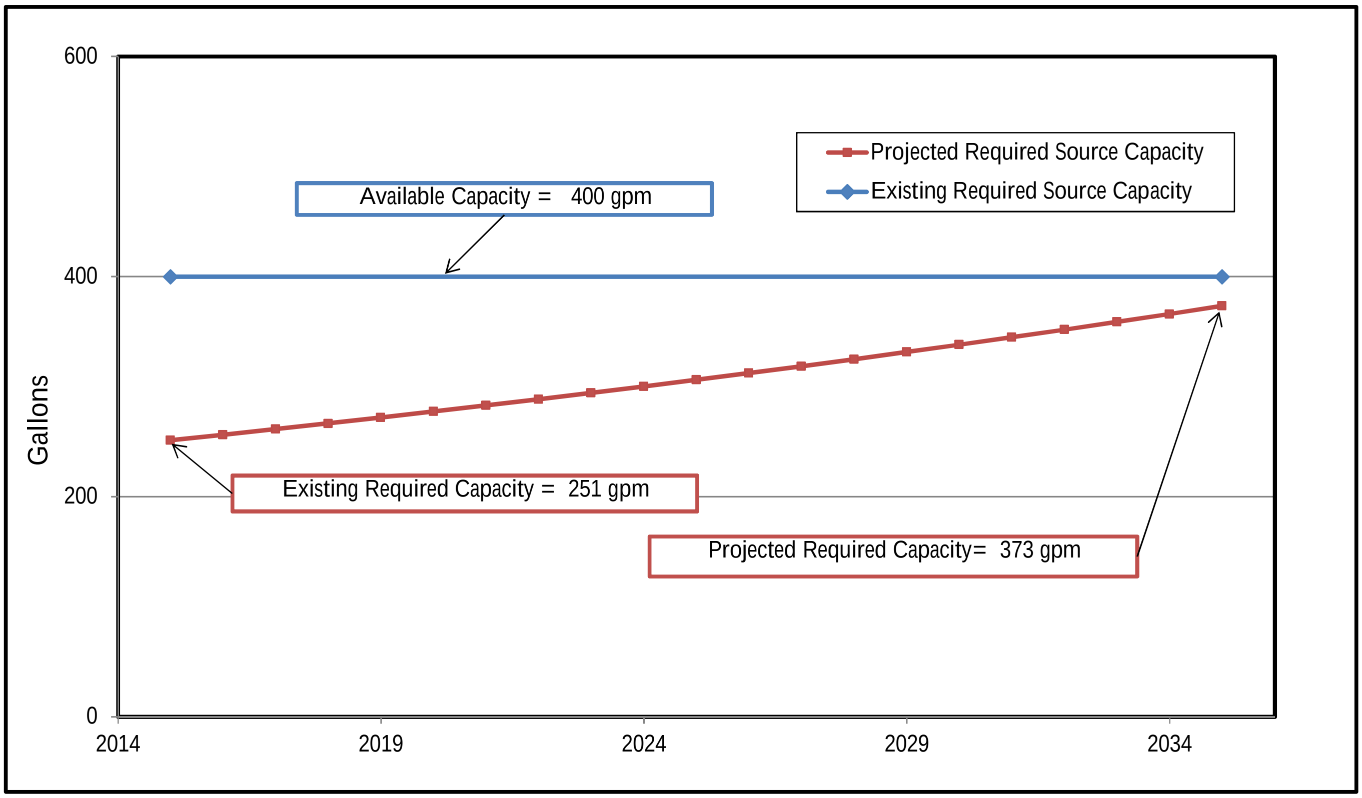
B. Current & Projected Required Source Capacity (2015-2035):

Year	Number of ERUs	Percent Reduction in Usage per ERU	Peak Day Usage (gpd/conn.)	Source Capacity (gpm)
2015	1131	0.0%	320	251
2016	1153	0.0%	320	256
2017	1176	0.0%	320	261
2018	1200	0.0%	320	267
2019	1224	0.0%	320	272
2020	1248	0.0%	320	277
2021	1273	0.0%	320	283
2022	1299	0.0%	320	289
2023	1325	0.0%	320	294
2024	1351	0.0%	320	300
2025	1378	0.0%	320	306
2026	1406	0.0%	320	312
2027	1434	0.0%	320	319
2028	1463	0.0%	320	325
2029	1492	0.0%	320	332
2030	1522	0.0%	320	338
2031	1552	0.0%	320	345
2032	1583	0.0%	320	352
2033	1615	0.0%	320	359
2034	1647	0.0%	320	366
2035	1680	0.0%	320	373

Build-Out ERUs	2120							
Rockville ERUs	207							
Total	2327	x	500	gpd	=	807.9861	gpm	REQUIRED BO Capacity

Existing Required Water Source Capacity Calculations							
Required Indoor / Outdoor Source - Historic Usage							
1131	ERUs X	320 gpd X	1 day X	1 hr	=	251	gpm
		ERU	24 hr	60 min.			
Existing Culinary System Source Capacity Surplus						149	gpm

Projected Required Source Capacity Calculations							
Required Indoor / Outdoor Source - Historic Usage							
1680	ERUs X	320 gpd X	1 day X	1 hr	=	373	gpm
		ERU	24 hr	60 min.			
Projected Culinary System Source Capacity Surplus						27	gpm



Water Storage Capacity

A.

Existing Storage Capacity:		
Anasazi Steel Tank	200,000	gal.
North Concrete Tank	500,000	gal.
1 Million Gallon Tank	1,000,000	gal.
Total Existing Storage Capacity	1,700,000	gal.

Historic Usage

B. Existing Required Storage Capacity

$$\frac{160 \text{ gpd}}{\text{ERU}} \times 1{,}131 \text{ ERUs} = 180{,}914 \text{ gpd}$$

Fire Demand

$$\frac{3{,}500 \text{ gpm} \times 60 \text{ min}}{1 \text{ hr}} \times 3 \text{ hr} = 630{,}000 \text{ gal.}$$

Emergency Supply

25% of required storage 202,728 gal.

Total Existing Required Storage	1,013,642	gal.
Total Existing Storage Capacity	1,700,000	gal.
Existing Storage Capacity Surplus	686,358	gal.

Projected Required Storage Capacity in 2035

$$\frac{160 \text{ gpd}}{\text{ERU}} \times 1{,}680 \text{ ERUs} = 268{,}828 \text{ gpd}$$

Fire Flow

$$\frac{3{,}500 \text{ gpm} \times 60 \text{ min}}{1 \text{ hr}} \times 3 \text{ hr} = 630{,}000 \text{ gal.}$$

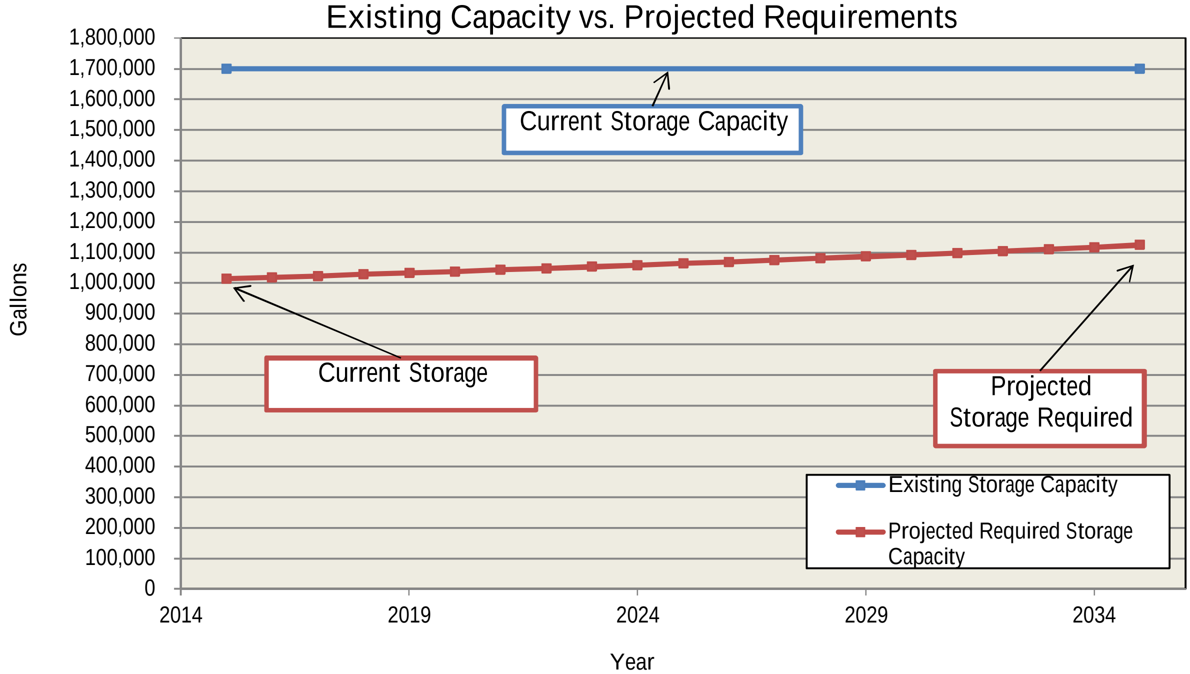
Emergency Supply

25% of required storage 224,707 gal.

Total Required Storage	1,123,535	gal.
Total Existing Storage Capacity	1,700,000	gal.
Future Storage Capacity Surplus	576,465	gal.

Storage Capacity Analysis						
Year	**Number of ERUs**	**Storage Required**	**Fire Flow Stg Rqd**	**Emergency Supply**	**Existing Stg Capacity**	**Total Stg Rqd**
2015	1131	180,914	630,000	202,728	1,700,000	1,013,642
2016	1,153	184,532	630,000	203,633	1,700,000	1,018,165
2017	1,176	188,223	630,000	204,556	1,700,000	1,022,778
2018	1,200	191,987	630,000	205,497	1,700,000	1,027,484
2019	1,224	195,827	630,000	206,457	1,700,000	1,032,284
2020	1,248	199,743	630,000	207,436	1,700,000	1,037,179
2021	1,273	203,738	630,000	208,435	1,700,000	1,042,173
2022	1,299	207,813	630,000	209,453	1,700,000	1,047,266
2023	1,325	211,969	630,000	210,492	1,700,000	1,052,462
2024	1,351	216,209	630,000	211,552	1,700,000	1,057,761
2025	1,378	220,533	630,000	212,633	1,700,000	1,063,166
2026	1,406	224,943	630,000	213,736	1,700,000	1,068,679
2027	1,434	229,442	630,000	214,861	1,700,000	1,074,303
2028	1,463	234,031	630,000	216,008	1,700,000	1,080,039
2029	1,492	238,712	630,000	217,178	1,700,000	1,085,890
2030	1,522	243,486	630,000	218,372	1,700,000	1,091,858
2031	1,552	248,356	630,000	219,589	1,700,000	1,097,945
2032	1,583	253,323	630,000	220,831	1,700,000	1,104,154
2033	1,615	258,389	630,000	222,097	1,700,000	1,110,487
2034	1,647	263,557	630,000	223,389	1,700,000	1,116,946
2035	1680	268,828	630,000	224,707	1,700,000	1,123,535

Figure V.E-1: Storage Capacity
Existing Capacity vs. Projected Requirements



Water Distribution

Historic Usage

A. Total Current ERUs = 1,131

Existing Distribution Requirement (Historical Usage):

Indoor Peak Instantaneous Demand:

Q=	10.8 X N^.64			N= Number of ERU's			
Q=	10.8 X	1,131	^.64		=	972	gpm
Current Indoor Peak Instantaneous Demand					**=**	**972**	**gpm**

Peak Day Demand & Fire Flow

All ERUs

1,131	ERUs X	320 gpd X		1 day		1 hr	=	251	gpm
			ERU	24	hr	60 min.			
	Fire Flow (Standard)						=	1,000	gpm
	Fire Flow (Non Sprinklered Commercial)						=	3,500	gpm
Current Peak Day Demand + Fire Flow (Standard)							**=**	**1,251**	**gpm**
Current Peak Day Demand + Fire Flow (Non Sprinklered Commercial)							**=**	**3,751**	**gpm**

B. Total Projected ERUs 20 Years = 1,680

Distribution Requirement for projected 20 year growth (Historic Usage):

Indoor Peak Instantaneous Demand:

Q=	10.8 X N^.64			N= Number of ERU's			
Q=	10.8 X	1,680	^.64		=	1,252	gpm
Projected Peak Instantaneous Demand					**=**	**1,252**	**gpm**

Peak Day Demand & Fire Flow

All ERUs

1,680	ERUs X	320 gpd X		1 day		1 hr	=	373	gpm
			ERU	24	hr	60 min.			
	Fire Flow (Standard)						=	1,000	gpm
	Fire Flow (Non Sprinklered Commercial)						=	3,500	gpm
Projected Peak Day Demand + Fire Flow (Standard)							**=**	**1,373**	**gpm**
Projected Peak Day Demand + Fire Flow (Non Sprinklered Commercial)							**=**	**3,873**	**gpm**

Assume : 0.00 Irrigated Acre / ERU
Zone 4 : 0 GPM / Irrigated Acre
Factor : 1 X Zone 3 Outdoor Use Factor Due to Limited Watering Hours

		Peak Instantaneous Demand	Historic		Peak Day + Fire		
Year	**No. ERU's**	**Indoor (gpm)**	**Outdoor (gpm)**	**Total (gpm)**	**Peak Day (gpm)**	**Fire (gpm)**	**Total (gpm)**
2015	1131	972	n/a	972	251	1,373	1,625
2016	1153	984	n/a	984	256	1,373	1,630
2017	1176	997	n/a	997	261	1,373	1,635
2018	1200	1,009	n/a	1,009	267	1,373	1,640
2019	1224	1,022	n/a	1,022	272	1,373	1,645
2020	1248	1,035	n/a	1,035	277	1,373	1,651
2021	1273	1,049	n/a	1,049	283	1,373	1,656
2022	1299	1,062	n/a	1,062	289	1,373	1,662
2023	1325	1,075	n/a	1,075	294	1,373	1,668
2024	1351	1,089	n/a	1,089	300	1,373	1,674
2025	1378	1,103	n/a	1,103	306	1,373	1,680
2026	1406	1,117	n/a	1,117	312	1,373	1,686
2027	1434	1,131	n/a	1,131	319	1,373	1,692
2028	1463	1,146	n/a	1,146	325	1,373	1,698
2029	1492	1,160	n/a	1,160	332	1,373	1,705
2030	1522	1,175	n/a	1,175	338	1,373	1,712
2031	1552	1,190	n/a	1,190	345	1,373	1,718
2032	1583	1,205	n/a	1,205	352	1,373	1,725
2033	1615	1,221	n/a	1,221	359	1,373	1,732
2034	1647	1,236	n/a	1,236	366	1,373	1,739
2035	1680	1252	n/a	1252	373	1,373	1,747

APPENDIX C

WATER TREATMENT ALTERNATIVES ANALYSIS

OPERATIONS MAINTENANCE CALCULATIONS

Base O&M Costs		
Operating Expenses	**Actual 2014 Operating Expenses**	**Projected 2016 Operating Expenses**
Personnel Services	$ 202,790	$ 215,140
Utilities	$ 41,098	$ 43,601
Repair & Maintenance	$ 52,980	$ 56,206
Other Supplies & Expenses	$ 56,635	$ 60,084
Insurance Expense	$ 12,255	$ 13,001
Depreciation	$ 158,502	$ 168,155
	TOTAL	***$556,187***

Operation and Maintenance Increases by Project Alternative

Power Cost ($KW-Hr) = $ 0.085

Conventional Water Treatment Plant	Total Cost	Life (Yr)	HP	KW	Hr/Yr	KW-Hr/Yr	$/Yr
Coagulant Dosing Skid (Replacement Pump)	$2,500	10					$250
Coagulant Chemical Purchase	$22,500	1					$22,500
Sludge Pump (Replacement Pump)	$2,500	20					$125
Electric Power for Sludge Pump		1	5	4	2,920	10,892	$926
Air Compressor (Replacement)	$2,000	10					$200
Electric Power for Air Compressor		1	1.5	1	2,920	3,267	$278
Media Replacement	$15,000	10					$1,500
Actuated Valves (Replacement Actuators)	$6,000	10					$600
Chlorine Dosing Skid (Replacement Pump)	$2,500	10					$250
Electric Power for NaOCl System		1	2.0	1	6,570	9,802	$833
Salt Purchase for NaOCl System	$1,200	1					$1,200
Distribution Pump (Replacement Pump)	$15,000	20					$750
Electric Power for Distribution Pump		1	75	56	6,570	367,592	$31,245
SCADA Maintenance	$6,000	1					$6,000
Sandblast and Re-coat Basins	$30,000	15					$2,000
							$68,657

Membrane Water Treatment Plant	Total Cost	Life (Yr)	HP	KW	Hr/Yr	KW-Hr/Yr	$/Yr
Screening Equipment (Replacement Motor, Etc)	$2,500	10					$250
Microfiltration Skid (Replacement Membranes)	$80,000	10					$8,000
Electric Power for Microfiltration Skid		1	5	4	8,760	32,675	$2,777
Sludge Pump (Replacement Pump)	$2,500	20					$125
Electric Power for Sludge Pump		1	5	4	2,920	10,892	$926
Air Compressor (Replacement)	$2,000	10					$200
Electric Power for Air Compressor		1	1.5	1	2,920	3,267	$278
Citric Acid Pump Skid (Replacement Pump)	$2,500	10					$250
Citric Acid Chemical Purchase	$1,200	1					$1,200
Caustic Pump Skid (Replacement Pump)	$2,500	10					$250
Caustic Chemical Purchase	$2,400	1					$2,400
Actuated Valves (Replacement Actuators)	$6,000	10					$600
Chlorine Dosing Skid (Replacement Pump)	$2,500	10					$250
Electric Power for NaOCl System		1	2.0	1	6,570	9,802	$833
Salt Purchase for NaOCl System	$1,500	1					$1,500
Distribution Pump (Replacement Pump)	$15,000	20					$750
Electric Power for Distribution Pump		1	75	56	6,570	367,592	$31,245
Alum Pump Skid (Replacement Pump)	$2,500	10			6,570		$250
Alum Chemical Purchase	$22,500	1					22500
SCADA Maintenance	$6,000	1					$6,000
							$80,584

SUNRISE ENGINEERING, INC.

CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

Project: Package Conventional Water Treatment Plant
810 gpm plant
Owner: Town of Springdale

Project No:
Date: 19-Oct-15
By: RBF

ITEM NO.	DESCRIPTION		QTY	UNITS	UNIT COST	AMOUNT
1	Mobilization		1	LS	$ 87,000	$ 87,000
2	Pilot Study		1	LS	$ 50,000	$ 50,000
Treatment Plant Building Construction (3,450 SF)						
3	Earthwork - Excavation		1	LS	$ 20,000	$ 20,000
4	Earthwork - Structural Fill / Compaction		1	LS	$ 17,250	$ 17,250
5	Footings/Foundation/Floor		1	LS	$ 110,400	$ 110,400
6	Package Conventional System		1	LS	$ 754,000	$ 754,000
7	Install Package Treatment System		1	LS	$ 85,000	$ 85,000
8	Masonry Building		1	LS	$ 172,500.00	$ 172,500
9	Plumbing & Accessories		1	LS	$ 30,000	$ 30,000
10	Mechanical Piping (Valves, Supports, Marking)		1	LS	$ 165,000	$ 165,000
11	Misc. Furnishings (Rails, Grating, Furnishings)		1	LS	$ 45,000	$ 45,000
12	Electrical Systems		1	LS	$ 260,000	$ 260,000
13	Mechanical Systems		1	LS	$ 55,000	$ 55,000
14	Air Piping System & Compressor		1	LS	$ 30,000	$ 30,000
15	SCADA & Controls		1	LS	$ 100,000	$ 100,000
16	Chlorine Contact Time Chamber		1	LS	$ 40,000	$ 40,000
17	On-Site Sodium Hypochlorite Generation System		1	LS	$ 75,000	$ 75,000
18						
19		**Subtotal**				**$ 1,959,150**
Site Work						
20	Demolition of Existing Filter Building		1	LS	$ 30,000	$ 30,000
21	Demolition of Existing Clarifier		1	LS	$ 15,000	$ 15,000
22	Flow Control Vault		1	LS	$ 75,000	$ 75,000
23	Misc Piping and Site Work		1	LS	$ 50,000	$ 50,000
24	Landscaping		1	LS	$ 20,000	$ 20,000
25	Asphalt		500	SY	$ 40	$ 20,000
26		**Subtotal**				**$ 210,000**
27		**Construction Subtotal**				**$ 2,306,150**
28	Contingency		20	%		$ 461,000
29	**Total Construction Cost**	**Subtotal**				**$ 2,767,150**

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, INC.

CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

Project: Membrane Water Treatment Plant
810 gpm plant
Owner: Town of Springdale

Project No:
Date: 19-Oct-15
By: RBF

ITEM NO.	DESCRIPTION		QTY	UNITS	UNIT COST		AMOUNT	
1	Mobilization		1	LS	$	91,000	$	91,000
2	Pilot Study		1	LS	$	50,000	$	50,000
Treatment Plant Building Construction (2,400 SF)								
3	Earthwork - Excavation		1	LS	$	17,500	$	17,500
3	Earthwork - Structural Fill / Compaction		1	LS	$	12,000	$	12,000
4	Footings/Foundation/Floor		1	LS	$	72,000	$	72,000
5	Membrane Equipment Skids		1	LS	$	1,022,000	$	1,022,000
5	Install Membrane Equipment		1	LS	$	85,000	$	85,000
6	Masonry Building		1	LS	$	120,000.00	$	120,000
7	Plumbing & Accessories		1	LS	$	27,250	$	27,250
8	Mechanical Piping (Valves, Supports, Marking)		1	LS	$	160,000	$	160,000
9	Misc. Furnishings (Rails, Grating, Furnishings)		1	LS	$	40,000	$	40,000
10	Electrical Systems		1	LS	$	260,000	$	260,000
11	Mechanical Systems		1	LS	$	50,000	$	50,000
12	SCADA & Controls		1	LS	$	100,000	$	100,000
13	Clear Well		1	LS	$	10,000	$	10,000
14	On-Site Sodium Hypochlorite Generation System		1	LS	$	75,000	$	75,000
15	Alum Dosing Pumps & Flash Mix Basin		1	LS	$	25,000	$	25,000
16		**Subtotal**					**$**	**2,075,750**
Site Work								
17	Demolition of Existing Filter Building		1	LS	$	30,000	$	30,000
18	Demolition of Existing Clarifier		1	LS	$	15,000	$	15,000
19	Flow Control Vault		1	LS	$	75,000	$	75,000
20	Misc Piping and Site Work		1	LS	$	50,000	$	50,000
21	Landscaping		1	LS	$	20,000	$	20,000
22	Asphalt		500	SY	$	40	$	20,000
23		**Subtotal**					**$**	**210,000**
24		**Construction Subtotal**					**$**	**2,426,750**
25	Contingency		20	%			$	485,000
26	**Total Construction Cost**	**Subtotal**					**$**	**2,911,750**

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.

SALVAGE VALUES AND PRESENT WORTH CALCULATIONS

Salvage Values - Conventional Water Treatment Plant

Item	**Life (years)**	**Cost ($)**	**Cost/Year**	**20 Yr Salvage**
Mobilization, Demolition, Landscape	0	$ 202,000	$ -	$ -
Buildings, Structures, Etc	50	$ 905,150	$ 18,103	$ 543,090
Water Lines, Manholes, Vaults	40	$ 165,000	$ 4,125	$ 82,500
Equipment, Pumps, Controls, Etc	25	$ 1,014,000	$ 40,560	$ 202,800
Parking Lot / Hardscape	20	$ 20,000	$ 1,000	$ -
			20 Yr Salvage Value =	$ 828,390

N =		20
i =		3%
P/A =		14.8775
P/F =		0.5537
Cost	$	2,767,150
O&M	$	68,657
Salvage	$	828,390
PW =	**$**	**(3,329,915)**

Salvage Values - Membrane Water Treatment Plant

Item	**Life (years)**	**Cost ($)**	**Cost/Year**	**20 Yr Salvage**
Mobilization, Demolition, Landscape	0	$ 206,000	$ -	$ -
Buildings, Structures, Etc	50	$ 758,750	$ 15,175.00	$ 455,250
Water Lines, Manholes, Vaults	40	$ 135,000	$ 3,375	$ 67,500
Equipment, Pumps, Controls, Etc	25	$ 1,282,000	$ 51,280	$ 256,400
Parking Lot / Hardscape	20	$ 20,000	$ 1,000	$ -
			20 Yr Salvage Value =	$ 779,150

Cost	$	2,911,750
O&M	$	80,584
Salvage	$	779,150
PW =	**$**	**(3,679,229)**

Springdale WTP

Engineer

Sunrise Engineering

Represented by

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Goble Sampson Associates

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Furnished by

Gerry Baker

gbaker@westech-inc.com

Greg Payne

gpayne@westech-inc.com

WesTech

1530291
Monday, October 12, 2015

ITEM: "A" - Trident® Packaged Treatment System

We are proposing a Trident Packaged Treatment System model **1½ TR-420A** for this project. This system is designed as follows:

Design Flow Rate to System:	810 gpm
Design Flow Rate per Tank:	410 gpm
Number of Tanks:	3*
Tank Length:	27' - 10"
Tank Width:	8' - 11"
Tank Height:	8' - 5"
Filter Loading at max flow:	5.8 gpm/ft^2
Clarifier Loading at max flow:	2.9 gpm/ft^2
Material of Construction:	Carbon Steel
Turbidity:	NTU
Color:	Cu
Other:	ppm

*Two tanks in service; one tank in standby

Technical Description:

The Trident Packaged Treatment System combines a unique upflow Adsorption Clarifier® System with a downflow mixed media filter bed for high rate water treatment. The Adsorption Clarifier system includes a buoyant media for increased capture of contaminants with ease of flushing from the system. The mixed media filter combines different sized filter materials to capture decreasing sized particles through the depth of the filter bed. This package design provides reduced footprint and lower capital costs from conventional systems. The Trident system is capable of removing turbidity, suspended solids, color, iron, manganese, odor, taste and parasites such as Giardia lamblia and Cryptosporidium. The Aquaritrol® III automatic process controller automatically adjusts chemical feed rates to changing water quality to dose the proper amount of chemicals. All materials in contact with potable water are NSF 61 approved. The system is modular for easy expansion for future needs.

Key Features and Benefits

- Reduces capital costs and footprints by using high rate, packaged treatment
- Simplifies operator interface with automatic control
- Removes the bulk of contaminants in the adsorption clarifier to increase filter run time
- Optimizes chemical dosing by the Aquaritrol III automatic process controller
- Eases future expansion with modular design

The following budget pricing includes:

Painted steel tanks with all necessary tank internals including, Adsorption Clarifier buoyant media, MULTIBLOCK® underdrain with Laser Shield™ media retainer, and mixed media filter materials. Also includes inlet flow control with adjustable setpoint, pneumatically operated butterfly valves, two chemical feed packages (normally alum and polyelectrolyte), the Aquaritrol® III automatic process control PLC program, effluent turbidimeter, two air blowers, and PLC control system, freight to the jobsite, and startup.

Trident Web Page

Pricing

Proposal Name: Springdale WTP
Proposal Number: 1530291

1. Bidder's Contact Information

Company Name	WesTech Engineering, Inc.
Contact Name	Gerry Baker
Phone	801.265.1000
Email	gbaker@westech-inc.com
Address: Number/Street	3665 S West Temple
Address: City, State, Zip	Salt Lake City, UT 84115

2. Pricing

Currency	US Dollars
"A" Trident® Packaged Treatment System	$655,000
Field Service	
Daily Rate	$960.00

Prices do not include field service unless noted, but it is available at the daily rate plus expenses. The customer will be charged for a minimum of three days for time at the jobsite. Travel will be billed at the daily rate. Any canceled charges due to the customer's request will be added to the invoice. The greater of visa procurement time or a two week notice is required prior to trip departure date.

Taxes (sales, use, VAT, IVA, IGV, duties, fees, import, etc.)	Not Included

3. Payment Terms

Submittal Approval	15%
Release for Fabrication	35%
Net 30 days from Shipment	50%

4. Schedule

Submittals, after PO receipt	6 to 8 weeks
Ready to Ship, after Submittal approval	18 to 20 weeks

Terms & Conditions: This proposal, including all terms and conditions contained herein, shall become part of any resulting contract or purchase order. Changes to any terms and conditions, including but not limited to submittal and shipment days, payment terms, and escalation clause shall be negotiated at order placement, otherwise the proposal terms and conditions contained herein shall apply.

Paint: If your equipment has paint included in the price, please take note to the following. Primer paints are designed to provide only a minimal protection from the time of application (usually for a period not to exceed 30 days). Therefore, it is imperative that the finish coat be applied within 30 days of shipment on all shop primed surfaces. Without the protection of the final coatings, primer degradation may occur after this period, which in turn may require renewed surface preparation and coating. If it is impractical or impossible to coat primed surfaces within the suggested time frame, WesTech strongly recommends the supply of bare metal, with surface preparation and coating performed in the field. All field surface preparation, field paint, touch-up, and repair to shop painted surfaces are not by WesTech.

Springdale WTP

Engineer

Sunrise Engineering

Furnished by

Libbie Linton

llinton@westech-inc.com

Greg Payne

gpayne@westech-inc.com

Represented by

Mike Charnholm

Goble Sampson Associates

Salt Lake City, Utah

(801) 268-8790

mcharnholm@goblesampson.com

WESTECH

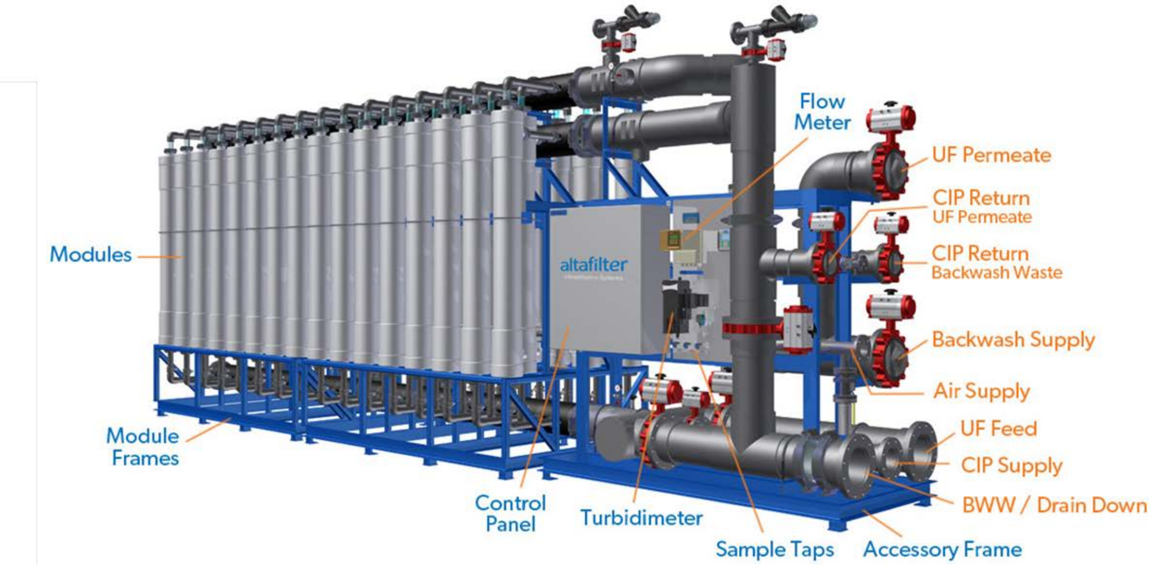
1530291
Wednesday, October 07, 2015

Item A – Ultrafiltration System

General Scope of Supply		
Description	**Unit**	**Dimension/Capacity**
Application	-	Municipal Drinking Water
WesTech System Model	-	UFB74A
Net Treated Flow Rate	gpm	800
Gross Influent Flow Rate	gpm	848
Number of Skids	Each	3 x 50% skids
Approximate Dimensions	Per Skid	16'-1" L x 5'-4" W x 11'-3 $^{9}/_{16}$" H *Plus Shared CIP:* 5'-0 $^{5}/_{16}$" L x 8'-6 $^{6}/_{16}$" W x 7'-4 $^{7}/_{8}$" H
Number of Installed Modules	Per Skid	19 per skid, 57 total

Features & Benefits

WesTech ultrafiltration/microfiltration (UF/MF) systems are designed for ease of installation, straightforward operation, and long-term reliability. WesTech systems are provided as skid-mounted, factory-tested units to minimize field assembly. Major equipment and valving is pre-configured on the skids for efficient and error-free commissioning. System controls are fully automated, including a clean-in-place skid for automated cleaning.



Reliable High Purity Treatment

WesTech UF/MF systems will consistently produce a high purity treated water, even with variation in the feed source. This is due to a small nominal pore size of 0.01 µm in an absolute barrier configuration. The system is also equipped to perform automated daily integrity testing to ensure that there are no breaches in the membrane fibers.

Certifications and Log Removal

WesTech UF/MF systems integrate modules with NSF 61 drinking water certification, log-removal challenge testing per EPA/ETV standards through CDPH and Title 22. WesTech systems exceed requirements set forth in the Long Term 2 Enhanced Surface Water Rule, and are granted credits of 4.0 log (99.99%) removal of Cryptosporidium and Giardia, and 1.0 log (90%) reduction of virus, the highest possible certification for membrane systems.

Flexibility in Design Options and Features

WesTech membrane systems are also available with VersaFilter technology in an open-platform configuration. This means the system is designed to for interchangeability of multiple UF/MF module styles and manufacturers to offer flexibility in future module change-out. Additional design considerations include redundancy to meet project-specific needs, block and bleed valving, and varied layouts to meet footprint constraints.

WesTech Membrane Filtration Experience

WesTech has supplied low pressure membrane filtration systems for over 13 years. Our membrane filtration division has manufactured UF systems for more than 60 facilities in North America. As a company, WesTech has more than 18,000 process equipment installations throughout the world. This significant experience translates into reliable, time-tested equipment.

Complete Process Experience

In addition to UF/MF equipment, WesTech is able to offer pre- and post-treatment equipment for a complete process and consolidation of equipment sourcing and responsibility. As a company, WesTech has more pretreatment equipment experience before UF/MF membranes than any manufacturer.

WesTech

Design Information

Water Quality

Feed Water Quality

Description	Unit	Concentration
pH		7.07 – 7.4
Temperature	°C	8.5 - 26
Turbidity	NTU	<20
Total Suspended Solids	mg/L	na
Total Organic Carbon	mg/L	0.7
Iron	mg/L	<0.03
Manganese	mg/L	<0.00
Oil and Grease	mg/l	ND

*Values are assumed and should be verified.

Treated Water Quality

Description	Unit	Concentration
Turbidity	NTU	≤ 0.10 NTU 95% of the time with a maximum turbidity of 0.3 NTU
Total Suspended Solids	mg/L	≤ 0.10 mg/L 90% of the time
Silt Density Index	-	≤ 3
Giardia Removal	-	≥ 4 log (99.99%)
Cryptosporidium Removal	-	≥ 4 log (99.99%)
Virus Removal	-	≥ 1.0 log removal (90.00%)

Membrane Complete Process Design Summary

UF Design Summary		
PARAMETER	**All Skids Operating**	**One Skid Offline**
Number of Skids in System	3	3
Number of Skids in Operation	3	2
WesTech System Model	UFB74A	
Installed Modules per Skid	19	
Total Module Capacity per Skid	24	
Membrane Area per Module	775 ft²	775 ft²
Membrane Area in Operation	44,175 ft²	29,450 ft²
Design Temperature	47.3 °F	
Flux at Design Temperature	30.4 gfd	51.7 lmh
Normalized Flux (20°C) at Design Temperature	41.7 gfd	70.7 lmh
Flow Rates		
Instantaneous Flow Rate	933.7 gpm	927.1 gpm
Average Gross Flow Rate	847.8 gpm	841.2 gpm
Average Net Filtrate	**810.0 gpm**	**810.0 gpm**
Backwash Flow Rate	342.4 gpm	510.0 gpm
Approx. Net Filtrate Production per Day	1,166,400 gpd	1,166,400 gpd
Backwash Waste Volume per Day	20,187 gpd	20,124 gpd
Influent Used for Rinsing/Draining per Day	34,204 gpd	24,816 gpd
Water Recovery	95-97%	
Estimated Maintenance Clean Frequency	Daily to weekly	
Estimated Clean-In-Place Frequency	>30 days	

Brief Process Description

Influent water from the feed tank is pumped by UF feed pumps and screened to remove any debris larger than 200 micron that could damage the hollow fiber membrane. The screened raw water flows through the UF/MF modules in an outside/in flow pattern to effectively remove particulates and pathogens from the water.

The feed pump is equipped with a VFD to maintain the flow rate setpoint. A short, periodic backwashing step with reversed flow is carried out at an adjustable interval to remove the filtered materials from the membrane surface. An air scouring step is used to increase agitation. Finally, a drain or filter-to-waste step is used to remove any additional material.

An automatic clean-in-place is initiated when membrane permeability decreases to a specified value. Fully-automated maintenance cleans are performed periodically to maintain membrane permeability between CIP cleans. Sodium hypochlorite and citric acid are used for cleaning. Membrane integrity testing is conducted automatically at least once every 24 hours. The pressure decay test (PDT) is capable of detecting a single fiber break.

Scope of Supply Information

Detailed Scope of Supply

Item	Quantity	Description	Brand (or equal)
Membrane Modules	19/skid 57/system	Hollow-fiber, outside-in ultrafiltration (0.01 µm pore size)	Toray
Skid Frame	3	Powder-coated carbon steel	-
Feed Pump	1/skid	Premium Efficiency	Goulds
Backwash Pump	2	Premium Efficiency	Goulds
Prestrainer	1/skid	200 micron, automatic backwashing	Valve and Filter
Compressed Air System	1	Includes compressor, receiver, filter, and dryer	Quincy
Clean-In-Place System			
NaOCl Dosing Pump	1	For CIP and MC procedures	Prominent
Citric Acid Dosing Pump	1	For CIP and MC procedures	Prominent
CIP Tank	1	HDPE, cone-bottom	Chem-tainer
pH Sensor	1	-	GF Signet
Heater	1	-	Chromalox
Temperature Transmitter	1	-	GF Signet
Recirculation Pump	1	-	Goulds
Turbidimeter	1 feed 1/skid filtrate 4 total	Hach 1720E w/SC200 controller	Hach
Flow Meters	1/skid 3 total	Bi-directional magnetic flow meter with transmitter	Siemens
Pressure Instrumentation	-	Transmitters, switches, gauges	Wika, Ashcroft
Valves	-	Manual and automated valves	Bray
Piping	-	Schedule 80 PVC HDPE	-
Electrical Controls	1 Master Panel 2 Local Skid Control Panels	NEMA 4, 480 V 3 ph, PLC, HMI	-
Tanks	By Others	Feed, backwash	-
Chemical Dosing Pump	Not included, can be added	Alum coagulation	-

On-Site Services

WesTech Trips to the Site		
Number of Trips	-	3
Time per Trip	Days	5
Total	Days	15

Field Service

Included field service is for mechanical checkout and commissioning. Any additional trips that the customer may request can be purchased at the standard WesTech daily rates plus travel and living expenses.

Pricing

Proposal Name: Springdale WTP
Proposal Number: 1530291

1. Bidder's Contact Information

Company Name	WesTech Engineering, Inc.
Contact Name	Libbie Linton
Phone	801.265.1000
Email	llinton@westech-inc.com
Address: Number/Street	3665 S West Temple
Address: City, State, Zip	Salt Lake City, UT 84115

2. Pricing

Currency	US Dollars
"A" Ultrafiltration System	$888,300

Field Service	
Daily Rate	$960.00

Prices do not include field service unless noted, but it is available at the daily rate plus expenses. The customer will be charged for a minimum of three days for time at the jobsite. Travel will be billed at the daily rate. Any canceled charges due to the customer's request will be added to the invoice. The greater of visa procurement time or a two week notice is required prior to trip departure date.

Taxes (sales, use, VAT, IVA, IGV, duties, fees, import, etc.)	Not Included

3. Payment Terms

Submittal Approval	15%
Release for Fabrication	35%
Net 30 days from Shipment	50%

4. Schedule

Submittals, after PO receipt	6 to 8 weeks
Ready to Ship, after Submittal approval	18 to 20 weeks

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Springdale WTP

Utah

Engineer

Sunrise Engineering

Furnished by

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Represented by

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WesTech Opportunity Number: 1530291
Wednesday, October 28, 2015

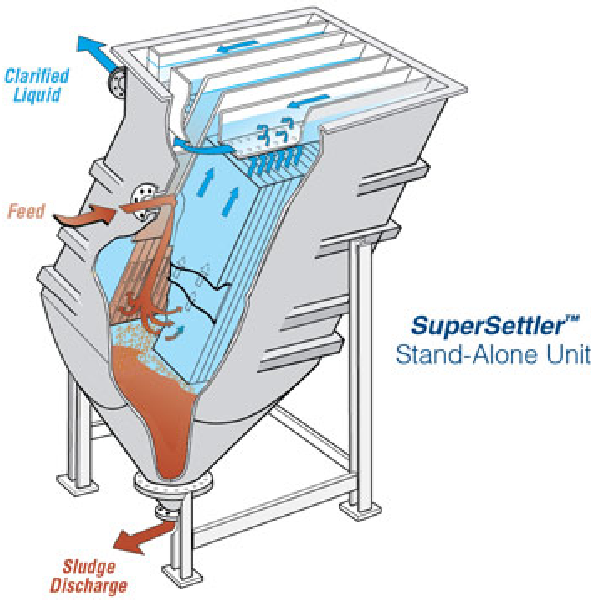
Item A : Stand Alone SuperSettler™ WesTech Model Number: PSS100

General Scope of Supply

Description	Unit	Dimension/Capacity
Number of Units	each	2
Application		River Water Pre-Treatment
Total Flow Rate	gpm	810
Flow Rate per Unit	gpm	405
Plate Surface Area	ft^2	2153
Plate Efficiency	%	100
Effective Plate Surface Area	ft^2	2153
Projected Loading Rate	gpm/ft^2	0.38
Plate Spacing	in	2
Inclined Plate Angle	deg	55
Flocculation Tank Volume	gal	3040
Approximate Shipping Weight	lbs	13000
Approximate Operating Weight	lbs	94225

Equipment Description

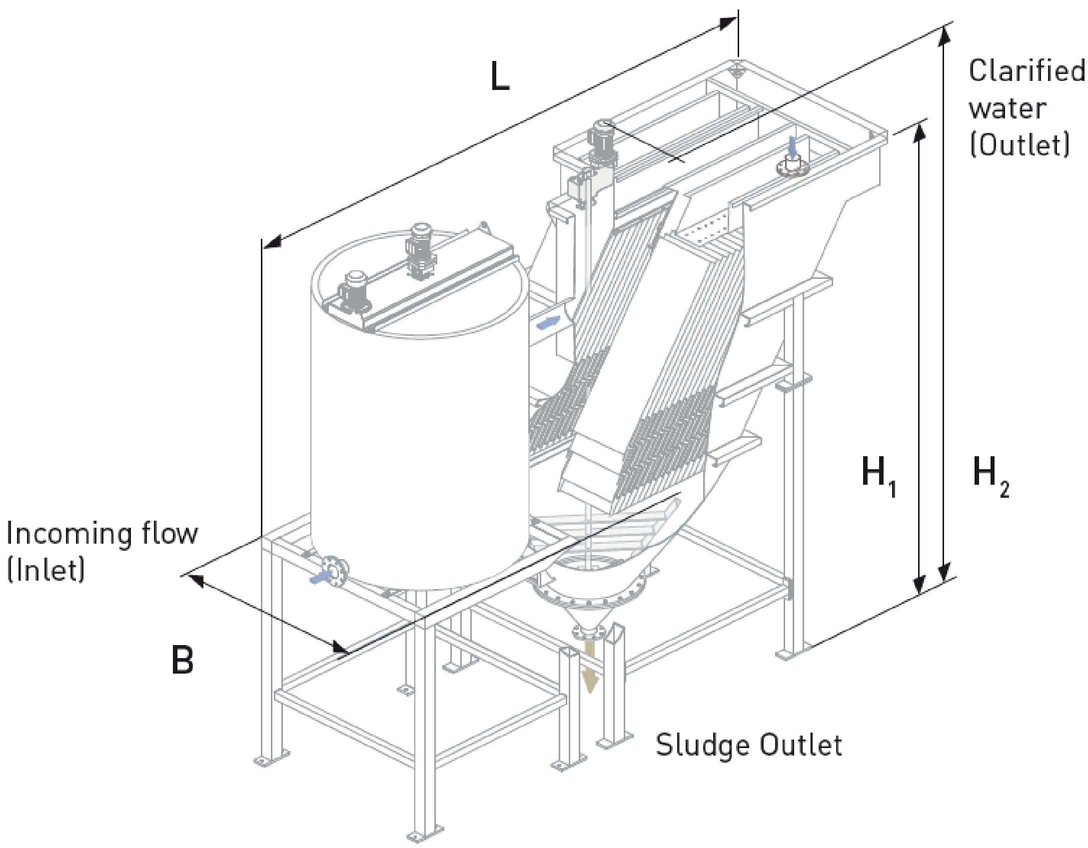
WesTech's SuperSettler Stand-alone units are designed as complete package units for smaller flow rates. The inclined plates are installed in stainless steel tanks with either a hopper or a sludge thickening bottom.



The SuperSettler's compact footprint is up to 1/10th the size of a conventional sedimentation basin.

Super Settler™ Dimensional Information

Description	Symbol	Unit	Dimension
Overall Length	L	Feet, inches	23'-2''
Tank Height	H_1	Feet, inches	17'-1''
Overall Height	H_2	Feet, inches	19'-6''
Width	B	Feet, inches	8'-6''



Detailed Scope of Supply		
Item	**Description**	**Material**
Plate Settler Tank	Tank, support structure and baffles	304SS
Plates	Inclined plates, Removable	304SS
Sludge Hopper	Below plate housing for sludge collection. Optional hopper scraper shown in drawing is not included with this proposal.	304SS
Launder	Two (2) effluent launders with submerged orifices	304SS Plate
Flocculation Tank	Flocculation and rapid mix tanks	304SS
Walkway	For operator access to equipment, includes aluminum grating and handrail. Walkway dimensions are 3 ft wide and span the L dimension noted above.	Steel /Aluminum
Interconnecting Piping	Piping between flocculation tank and plate settler tank	304SS
Assembly Fasteners		304SS

Drive Unit

Drive Unit		
Description	**Unit**	**Dimension/Capacity**
Rapid Mix Drive	HP	1/4
Flocculator Drive	HP	1/2

Surface Preparation and Painting

Paint	
Coating Area	**Paint Type**
Submerged Coating	Passivated Stainless
Non-Submerged	Passivated Stainless
Inspection Platform	HDG (Hot Dipped Galvanized) Steel
Drive Unit	Manufacturers standard enamel

Control Panel

Controls & Instrumentation		
Description	**Description**	**Notes**
Housing	NEMA 4X 304SS	With painted steel back panel and mounting brackets
Local Switches	H/O/A, potentiometer	
Lights	Power on, running, fault	
Emergency Stop	Yes	
Control Relays	Yes	
Timer	Sludge blowdown	
VFD	Included for flocculator mixer	With line reactor, control relays, terminal blocks, and other supporting hardware
Motor Starter	NEMA size 1	With internally reset thermal overloads

On-Site Service

WesTech Trips to the Site		
Number of Trips	**Number of Days**	**Includes**
Two (2)	Three (3)	Installation inspection, startup, and instruction of plant personnel

Clarification Comments

All connecting piping, valves and controls other than those specified in this proposal BY OTHERS.

NOTE: ANY ITEM NOT LISTED ABOVE TO BE FURNISHED BY OTHERS.

ITEMS NOT BY WESTECH

Electrical wiring, conduit or electrical equipment, piping, valves, or fittings, lubricating oil or grease, shop or field painting, field welding, erection, detail shop fabrication drawings, performance testing, bonds, unloading, storage, concrete work, field service, (except as specifically noted).

Pricing

Proposal Name: Springdale WTP
Proposal Number: 1530291

1. Bidder's Contact Information

Company Name	WesTech Engineering, Inc.
Contact Name	Greg Payne
Phone	801.265.1000
Email	gpayne@westech-inc.com
Address: Number/Street	3665 S West Temple
Address: City, State, Zip	Salt Lake City, UT 84115

2. Pricing

Currency	US Dollars
"A" Stand Alone SuperSettler™ PSS100	$450,000
Field Service	
Daily Rate	$960.00

Prices do not include field service unless noted, but it is available at the daily rate plus expenses. The customer will be charged for a minimum of three days for time at the jobsite. Travel will be billed at the daily rate. Any canceled charges due to the customer's request will be added to the invoice. The greater of visa procurement time or a two week notice is required prior to trip departure date.

Taxes (sales, use, VAT, IVA, IGV, duties, fees, import, etc.)	Not Included

3. Payment Terms

Submittal Approval	15%
Release for Fabrication	35%
Net 30 days from Shipment	50%

4. Schedule

Submittals, after PO receipt	6 to 8 weeks
Ready to Ship, after Submittal approval	16 to 20 weeks

WesTech

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Freight: Prices quoted are **F.O.B. shipping point** with freight allowed to a readily accessible location nearest to jobsite. All claims for damage or loss in shipment shall be initiated by purchaser.

Paint: If your equipment has paint included in the price, please take note to the following. Primer paints are designed to provide only a minimal protection from the time of application (usually for a period not to exceed 30 days). Therefore, it is imperative that the finish coat be applied within 30 days of shipment on all shop primed surfaces. Without the protection of the final coatings, primer degradation may occur after this period, which in turn may require renewed surface preparation and coating. If it is impractical or impossible to coat primed surfaces within the suggested time frame, WesTech strongly recommends the supply of bare metal, with surface preparation and coating performed in the field. All field surface preparation, field paint, touch-up, and repair to shop painted surfaces are not by WesTech.

APPENDIX D

500 GPM – ALTERNATIVE WATER TREATMENT ANALYSIS

I. WATER TREATMENT ANALYSIS

A. GENERAL REQUIREMENTS

The State of Utah Public Drinking Water Regulations (R309), in accordance with the National Safe Drinking Water Act, have adopted "primary" regulations for the protection of public health and "secondary" regulations related to taste and aesthetics. Applicable "primary" standards and treatment techniques must be met by all public drinking water systems. "Secondary" standards are optional standards which are meant to help water suppliers avoid consumer complaints.

These "primary" regulations require removal of numerous contaminants (as needed) in order to comply with the maximum contaminant levels (MCLs) outlined in R309-200. In addition, surface water sources must be treated to assure at least 99.9% (3-log) removal and/or inactivation of Giardia lamblia cysts, and at least 99.99% (4-log) removal and/or inactivation of viruses.

In the early 2000's, the EPA also created the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) targeting removal of Cryptosporidium and other pathogenic microorganisms in drinking water. Current regulations require a 2 to 3-log removal (or inactivation), depending on source water quality and treatment methods.

In addition, continuous disinfection is recommended for all water sources and is required to be provided and monitored for all surface water sources or ground water surfaces under the direct influence of surface waters. Minimum disinfection levels are set by contact time (CT) values which are defined in R309-110.

Providing the required levels of disinfection can also be problematic. This is because disinfectants themselves can react with naturally occurring materials in the water, forming disinfection byproducts (DPBs), which may also cause health risks. Consequently, the EPA has established MCLs for disinfection byproducts which must also be complied with. This can be especially challenging for surface water systems with high amounts of organic material.

B. EXISTING TREATMENT FACILITIES

At present, the Town of Springdale operates a conventional water treatment facility to treat available water sources used by the Town. Water is pumped from the North Fork of the Virgin River into 2 large holding/settling basins located above the main treatment facility. These basins include one open air HDPE lined earthen pond, and one open air concrete tank operated in series. The combined capacity of the basins is approximately 2 million gallons. Work has recently been performed on the HDPE lined holding pond to fix the existing liner and remove settled material.

Following initial settling, the water is then sent into the primary treatment facility, as pictured in Figure V.B-1. The water first receives a dose of Aluminum Sulfate (Alum) to act as a coagulant before being directed to a Contraflow® Solids Contact Clarifier. This type of clarifier combines mixing, flocculation, and sedimentation in one basin. The water enters the basin in the center cone, which contains a well-established volume of previously formed precipitates. This helps to accelerate the chemical reactions of the incoming water to create large heavy particles which will quickly settle to the bottom of the clarifier. As water exits the cone, the clarified water rises and exits the clarifier over the weirs located near the water surface, while the solids settle to the bottom of the basin, where they are collected and removed.

After passing through the clarification process, the water is filtered using a gravity granular media filtration system. Springdale's treatment facility includes 4 separate filters which include layers of sand and anthracite. The filters are piped to operate in parallel. Water is directed to the top of the filters, where the forces of gravity are used to force the water down through the granular media. Through various processes, the media filters out and captures solids, floc, and some pathogens. The filtered water is collected at the bottom of the filters and is directed to the next stage of treatment.

The final treatment stage occurs as the water is disinfected by means of chlorine gas and is directed to the clear well. The volume of the clear well along with the outgoing pipeline provides the required chlorine contact time to ensure that any remaining pathogens have been inactivated before the water is consumed by customers. The treated water is then pumped to the North Concrete Tank for distribution.

Figure I-1: Existing Springdale Water Treatment Facility

C. OPERATIONAL CHALLENGES & DEFICIENCIES

There are numerous operational challenges and deficiencies associated with the existing treatment plant. One of the primary concerns is that the current facility only includes a single train or pathway for water to be treated with no redundancy. This is a major concern because there is no way to keep the plant in operation if major components of the system need to be taken out of service for maintenance or for other reasons.

Section R309-525-5 of the Utah Administrative Code states that “Ordinarily, a minimum of two units of each for flocculation, sedimentation and filtration must be provided.” This section also states that “when other sources are available to the system, this requirement may be relaxed.” Springdale’s existing treatment plant does not meet the requirement for two treatment trains. In addition, there are currently no other sources which can be immediately utilized, which further justifies the need for multiple treatment trains.

Another related challenge is due to the highly variable quality of water coming from the Virgin River and the difficulty of the plant in dealing with these inconsistencies. Incoming turbidity from the settling basins can range anywhere from 0.7 NTU to around 20 NTU. Turbidity directly from the Virgin River can range from around 100 NTU to above 1,000 NTU. The Town will generally shut down the supply of water to the settling basins when runoff is high to avoid filling their pipelines and basins with sediment. This can result in high fluctuations of flow through the treatment system or shutting the system down for periods of time. The technology associated with the Contraflow® clarifier depends on fairly consistent flow patterns because the system is dependent upon maintaining a steady sludge blanket in the basin. The Alum dosage needs to be carefully adjusted depending on temperature and flow, and major variations can upset the system and result in a loss of the sludge blanket. After an upset or a shutdown, the system can take several days to re-establish the sludge blanket and to again deliver water of acceptable quality to the filters.

The media filters also include some deficiencies that should be addressed. It is understood that the filter system does not include a standard filter to waste cycle after a backwash. This can result in short periods of time when the maximum turbidity limits are exceeded. It addition, it is understood that the backwash does not include an adequate re-stratifying process after a backwash to return the sand and anthracite back to the desired layers. The backwash system also discharges backwash water into a small open basin in the center of the floor below the filters. Due to the configuration of the piping and the undersized basin, the plant floor is flooded each time a backwash is run. This contributes to rusting and wear on the filters and other equipment.

Another problem is the aging components making up the treatment plant, and the difficulty in maintaining these components due to the need to keep the plant online as much as possible. Based on information provided by the Town, the plant was originally constructed in the 1980’s. However, due to lack of training and unfamiliarity with the system, the Town did not start fully utilizing the plant for approximately 10 years. The plant has now been in operation for more than 20 years and has numerous components (including pumps, meters, monitors, etc.) that need to be replaced. The clarifier and sand filters are also showing oxidation damage and corrosion and need to be sand blasted and recoated soon if their service lives are to be extended.

Town staff indicated that several times during the past few years, the treatment plant has shut down during the period of highest water usage (summer/tourism season). This has been caused by turbidity spikes, or by equipment failure. It generally takes around 3 days to get the system up and going again. While the system is down, the water in the storage tanks acts as a buffer to meet the demand until the system is back up again. During these periods, the town has come uncomfortably close to running completely out of water. After the plant is back on line, it can take a week or more to return the tanks to the full level, while keeping up with peak season demands. If the plant would have shut down again during these periods for any reason, the Town would not have been able to supply enough water to keep up with demands.

D. TREATMENT ALTERNATIVES

In order to comply with the current Division of Drinking Water requirements and to provide a more dependable source of treated water, consideration should be given to upgrading or replacing the existing treatment plant. Numerous options are available which would alleviate the existing treatment concerns. The following alternatives have been considered:

- <u>Upgrade Existing Treatment Plant</u>
  Upgrading the existing plant would require, at minimum, the addition of another treatment train. This would include new flocculation and settling facilities. It should be reiterated that the existing solids contact clarifier is not ideal for the challenges associated with treating surface water from the Virgin River, so continued operational challenges would be expected. In addition, the service life of the existing equipment is reaching the end of its design life. Consequently, if only one new train was installed initially, replacement of the other train would still be needed in the coming years.

  It is also expected that layout of the treatment components for a new train, while keeping the existing treatment equipment in place and operating, would be difficult and would result in additional layout challenges when the existing equipment is ultimately replaced. Also, while it could technically be possible to re-use portions of the existing building and install new equipment inside, associated construction would be very expensive, and would seriously limit the options for new equipment and technology. Although performing a structural analysis for the existing building is outside of the scope of this study, it is assumed that the treatment plant and building do not conform to current structural and seismic standards. Because of these reasons, upgrading the existing plant is not believed to be in the best interest of the Town and is not recommended.

- <u>New Conventional Treatment Plant</u>
  A new conventional water treatment plant would include facilities for mixing, flocculation, sedimentation, filtration, and disinfection. At least 2 trains would be provided. The basins for these process are sized according to the required capacity of the plant. Some of these basins can be constructed indoors or outside, although gravity filters are generally constructed inside of a treatment building. Additional treatment building space is required for chlorination facilities, pumping equipment, compressors, office space for controls, and restroom facilities. An underground clear well would be required to provide the necessary CT time before the water was pumped to the tanks.

  For a conventional plant sized to meet Springdale's anticipated demands (approximately 500 gpm), it is assumed that a package plant would be the most economical. This type of system would include all of the treatment steps included in a standard conventional treatment plant, but in compact pre-manufactured basins. Since it is assumed that the package plant equipment would be located indoors, this alternative would require minimal exterior work and improvements, but would require a larger building footprint than other alternatives.

Waste from the plant would include backwash water from the filter units and settled sludge from the sedimentation basins. The treatment plant location provides access to the sanitary sewer and all waste could be discharged directly to the sewer, or it could be recirculated to the open air settling basins. If high discharge rates to the sewer collection system are a concern, a sludge holding basin could also be constructed allowing plant waste to be slowly discharged to the sewer between backwashes.

Preliminary sizing and pricing data for a packaged conventional system was obtained from a manufacturer as part of this plan and has been included as an attachment.

- New Membrane Treatment Plant
  Membrane plants include hollow fibers bundled together in a pressure vessel. The fibers contain small pores or holes sized to filter out contaminants as water is forced through the hollow fibers using a pressure differential. Membrane systems generally consist of pre-configured skids including filter units and controls, but can also be custom built systems with separated components. As with other alternatives, multiple trains or skids would be needed. Prior basins for mixing and flocculation are not typically required, although it is necessary (for all options) that the existing settling basins remain in service to help provide an expected range of turbidity. Space required for membrane skids is assumed to be similar to, or slightly less than, that of a conventional package treatment plant with minimal exterior improvements. The building would also include chlorination facilities, pumping equipment, compressors, office space for controls, and restroom facilities. Because of the high removal credit for Cryptosporidium and Giardia associated with membrane treatment, it is assumed that required CT time would be minimal and could likely be provided in the pipeline supplying treated water to the tank, thus eliminating the need for a large clear well or contact chamber. However, access to filtrate water (from the storage tanks, or a separate holding basin) would be required for backwashes.

  In order to help control DBPs, many membrane treatment plants are required to utilize pre-filter chemicals (such as aluminum sulfate) to reduce TOCs and other materials that can contribute to the creation of Haloacetic Acids, Trihalomethanes, and other DBPs. A pilot study would be required to determine for certain if this would be required for Springdale, but it is assumed that pre-treatment with Alum would be required. This would likely require a small basin to facilitate flash mixing of alum into the water prior to the membranes.

  Frequent brief backwash cycles are required to flush out contaminants filtered out by the membranes and to keep the membranes from being plugged up. In addition, chemical enhanced backwashes are also needed to keep membranes clean. Waste from regular backwashes could be recirculated back to the open air settling ponds or discharged to the sewer. Waste from chemical backwashes (after being neutralized) can also be discharged directly to the sanitary sewer.

  Preliminary sizing and pricing data for a membrane treatment skid system was obtained from a manufacturer as part of this plan and has been included as an attachment.

E. SELECTION OF PREFERRED ALTERNATIVE

This section will present the method of selecting the preferred treatment alternative. The following criteria were selected to help determine the most cost effective means of meeting the applicable regulations and system demands.

The best ranking alternative in each category was given a score of 2 points. The other alternative was given a pro-rated score based on how it compared with the other alternative.

- Project Cost

  The overall project cost is one of the most important criteria being considered. An Engineer's Opinion of Probable Cost (EOPC) has been created for each alternative and has been included as an attachment. Engineering and other incidental costs have been excluded from these estimates, but will be provided for the recommended alternative. The following table shows a comparison of the project cost for each alternative.

PROJECT COST COMPARISON		
Collection Alternatives	**Project Cost**	**Points**
Conventional Water Treatment Plant	$ 2,358,300	2.00
Membrane Water Treatment Plant	$ 2,543,300	1.84

- Operation & Maintenance

  Another important criteria to consider is the comparison of annual Operation and Maintenance (O&M) costs for each alternative. Annual O&M was estimated using anticipated costs for equipment, supplies, and electricity for each alternative and are included as an attachment. Manpower and personnel costs were not included since it is assumed that these costs will be equivalent for each alternative. The following table shows a comparison of the O&M costs for each alternative.

OPERATION & MAINTENANCE COMPARISON		
2016 Base Annual O&M	$ 556,187	Base
Collection Alternatives	**Additional O&M**	**Points**
Conventional Water Treatment Plant	$ 59,740	2.00
Membrane Water Treatment Plant	$ 68,334	1.71

- Present Worth

  Another method of comparing the alternatives is by using a Present Worth (PW) engineering analysis. This approach converts future costs and revenues into today's equivalent dollars. The method of performing a PW analysis is as follows:

  PW = Current Cost – Annual O&M(today's dollars) + Salvage Value(today's dollars)

  The PW calculations have been included as an attachment. Because the alternatives were analyzed as service alternatives (the cost and O&M as disbursements only), the values are negative. The calculations were based on a 20 year salvage value. The smaller negative value represents the better alternative based on the analysis. The following table shows a comparison of the present worth for each alternative.

PRESENT WORTH COMPARISON		
Collection Alternatives	**PW**	**Points**
Conventional Water Treatment Plant	$ (2,854,359)	2.00
Membrane Water Treatment Plant	$ (3,172,310)	1.78

In order to determine the preferred alternative, each option was assigned a point ranking for each of the criteria previously mentioned. The criteria scores for each alternative were totaled to provide an overall score. The highest score represents the best alternative based on the analysis performed. The following table summarizes the results of the selection process. As can be seen, the preferred treatment alternative is a new Conventional Water Treatment Plant.

Selection Criteria	Weight	Treatment System Alternatives			
		Conventional Water Treatment Plant		Membrane Water Treatment Plant	
		Points	Score	Points	Score
Project Cost	1	2.00	**2.00**	1.84	**1.84**
Operation & Maintenance	1	2.00	**2.00**	1.71	**1.71**
Present Worth	1	2.00	**2.00**	1.78	**1.78**
TOTALS			6.00		5.33

F. RECOMMENDED WATER TREATMENT FACILITY IMPROVEMENTS

Although the existing plant is working and is currently capable of generating water of adequate quality and quantity to meet the requirements of the Division Drinking Water and the Safe Drinking Water Act, the lack of redundancy in the system is cause for major concern. As mentioned, the system has come uncomfortably close multiple times in the past several years to running completely out of water as water operators struggled to get the plant back on line. If the plant would have shut down for any reason during the few days following the original shutdown, the Town would not have been able to keep up with demand.

It is recommended that the Town make preparations to replace the existing treatment plant with a new package conventional water treatment plant as soon as is feasibly possible.

ATTACHMENT 1

MANUFACTURER'S PRELIMINARY SIZING & PRICING PROPOSAL
CONVENTIONAL OPTION

Springdale WTP

Engineer

Sunrise Engineering

Furnished by

Greg Payne

gpayne@westech-inc.com

Represented by

Mike Charnholm

Goble Sampson Associates

Salt Lake City, Utah

(801) 268-8790

mcharnholm@goblesampson.com

WesTech

1530291

Thursday, July 30, 2015

ITEM: “A” - Trident® Packaged Treatment System

We are proposing a Trident Packaged Treatment System model **TR-420A** for this project. This system is designed as follows:

Design Flow Rate to System:	500 gpm
Design Flow Rate per Tank:	500 gpm
Number of Tanks:	2*
Tank Length:	27' - 10"
Tank Width:	8' - 11"
Tank Height:	8' - 5"
Filter Loading at max flow:	3.6 gpm/ft^2
Clarifier Loading at max flow:	7.1 gpm/ft^2
Material of Construction:	Carbon Steel
Turbidity:	NTU
Color:	Cu
Other:	ppm

*One tank in service; 100% redundancy

Technical Description:

The Trident Packaged Treatment System combines a unique upflow Adsorption Clarifier® System with a downflow mixed media filter bed for high rate water treatment. The Adsorption Clarifier system includes a buoyant media for increased capture of contaminants with ease of flushing from the system. The mixed media filter combines different sized filter materials to capture decreasing sized particles through the depth of the filter bed. This package design provides reduced footprint and lower capital costs from conventional systems. The Trident system is capable of removing turbidity, suspended solids, color, iron, manganese, odor, taste and parasites such as Giardia lamblia and Cryptosporidium. The Aquaritrol® III automatic process controller automatically adjusts chemical feed rates to changing water quality to dose the proper amount of chemicals. All materials in contact with potable water are NSF 61 approved. The system is modular for easy expansion for future needs.

Key Features and Benefits

- Reduces capital costs and footprints by using high rate, packaged treatment
- Simplifies operator interface with automatic control
- Removes the bulk of contaminants in the adsorption clarifier to increase filter run time
- Optimizes chemical dosing by the Aquaritrol III automatic process controller
- Eases future expansion with modular design

The following budget pricing includes:

Painted steel tanks with all necessary tank internals including, Adsorption Clarifier buoyant media, MULTIBLOCK® underdrain with Laser Shield™ media retainer, and mixed media filter materials. Also includes inlet flow control with adjustable setpoint, pneumatically operated butterfly valves, two chemical feed packages (normally alum and polyelectrolyte), the Aquaritrol® III automatic process control PLC program, effluent turbidimeter, two air blowers, and PLC control system, freight to the jobsite, and startup.

Trident Web Page

NOTE: ANY ITEM NOT LISTED ABOVE TO BE FURNISHED BY OTHERS.

This proposal section has been reviewed for accuracy and approved for issue:
By: **Gerry Baker** Date: July 30, 2015

Pricing

Proposal Name: Springdale WTP
Proposal Number: 1530291

1. Bidder's Contact Information

Company Name	WesTech Engineering, Inc.
Contact Name	Greg Payne
Phone	801.265.1000
Email	gpayne@westech-inc.com
Address: Number/Street	3665 S West Temple
Address: City, State, Zip	Salt Lake City, UT 84115

2. Pricing

Currency	US Dollars
"A" Trident® Packaged Treatment System	$495,000

Field Service	
Daily Rate	$960.00

Prices do not include field service unless noted, but it is available at the daily rate plus expenses. The customer will be charged for a minimum of three days for time at the jobsite. Travel will be billed at the daily rate. Any canceled charges due to the customer's request will be added to the invoice. The greater of visa procurement time or a two week notice is required prior to trip departure date.

Taxes (sales, use, VAT, IVA, IGV, duties, fees, import, etc.)	Not Included

3. Payment Terms

Submittal Approval	15%
Release for Fabrication	35%
Net 30 days from Shipment	50%

4. Schedule

Submittals, after PO receipt	6 to 8 weeks
Ready to Ship, after Submittal approval	18 to 20 weeks

Terms & Conditions: This proposal, including all terms and conditions contained herein, shall become part of any resulting contract or purchase order. Changes to any terms and conditions, including but not limited to submittal and shipment days, payment terms, and escalation clause shall be negotiated at order placement, otherwise the proposal terms and conditions contained herein shall apply.

Paint: If your equipment has paint included in the price, please take note to the following. Primer paints are designed to provide only a minimal protection from the time of application (usually for a period not to exceed 30 days). Therefore, it is imperative that the finish coat be applied within 30 days of shipment on all shop primed surfaces. Without the protection of the final coatings, primer degradation may occur after this period, which in turn may require renewed surface preparation and coating. If it is impractical or impossible to coat primed surfaces within the suggested time frame, WesTech strongly recommends the supply of bare metal, with surface preparation and coating performed in the field. All field surface preparation, field paint, touch-up, and repair to shop painted surfaces are not by WesTech.

ATTACHMENT 2

MANUFACTURER’S PRELIMINARY SIZING & PRICING PROPOSAL
MEMBRANE OPTION

Springdale WTP

Engineer

Sunrise Engineering

Furnished by

Greg Payne

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Represented by

Mike Charnholm

Goble Sampson Associates

Salt Lake City, Utah

(801) 268-8790

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1530291
Monday, July 27, 2015

Item A – Ultrafiltration System

We are pleased to offer the following options for WesTech ultrafiltration equipment. Depending on preference and available footprint, WesTech can supply either a 2 x 100% UF system or a 3 x 50% system comprised of three independently operable AltaPac™ packaged UF trains. Either option will meet state redundancy requirements and is designed to achieve >95% recovery, >30 day CIPs, and meet regulatory standards for 4-log reduction of Giardia and Cryptosporidium.

General Scope of Supply

Description	Unit	Dimension/Capacity
Application	-	Municipal Drinking Water
WesTech System Model	-	UFB64A or UFB64C
Net Treated Flow Rate	gpm	500
Gross Average Feed Flow Rate	gpm	532
Number of Skids	Each	Option A-1: 2 x 100% skids Option A-2: 3 x 50% AltaPac skids
Approximate Dimensions	Per Skid	Option A-1: 16’-1” L x 5’-4” W x 11’-3$^{9}/_{16}$” H *Plus Shared CIP:* 5’-0$^{5}/_{16}$” L x 8’-6$^{6}/_{16}$” W x 7’-4$^{7}/_{8}$” H Option A-2: 16’-4” L x 4’-10” W x 11’-3$^{1}/_{16}$” H *CIP Skid Included with each skid*
Number of Installed Modules	Per Skid	Option A-1: 24 per skid, 48 total Option A-2: 12 per skid, 36 total

Features & Benefits

WesTech ultrafiltration/microfiltration (UF/MF) systems are designed for ease of installation, straightforward operation, and long-term reliability. WesTech systems are provided as skid-mounted, factory-tested units to minimize field assembly. Major equipment and valving is pre-configured on the skids for efficient and error-free commissioning. System controls are fully automated, including a clean-in-place skid for automated cleaning.

Certifications and Log Removal

WesTech UF/MF systems integrate modules with NSF 61 drinking water certification, log-removal challenge testing per EPA/ETV standards through CDPH and Title 22. WesTech systems exceed requirements set forth in the Long Term 2 Enhanced SurfaceWater Rule, and are granted credits of 4.0 log (99.99%) removal of Cryptosporidium and Giardia, and 1.0 log (90%) reduction of virus, the highest possible certification for membrane systems.

Reliable High Purity Treatment

WesTech UF/MF systems will consistently produce a high purity treated water, even with variation in the feed source. This is due to a small nominal pore size of 0.01 µm in an absolute barrier configuration. The system is also equipped to perform automated daily integrity testing to ensure that there are no breaches in the membrane fibers.

Flexibility in Design Options and Features

WesTech membrane systems are also available with VersaFilter technology in an open-platform configuration. This means the system is designed to for interchangeability of multiple UF/MF module styles and manufacturers to offer flexibility in future module change-out. Additional design considerations include redundancy to meet project-specific needs, block and bleed valving, and varied layouts to meet footprint constraints.

Compact Footprint and Simple Installation

WesTech UF systems are designed to conserve space by skid-mounting components. WesTech AltaPac™ systems also use a three-sided access to allow the system to be placed adjacent to a wall if desired. Because the packaged, skid-mounted, and factory tested design, installation activities are extremely efficient and can be completed in a little as 1 – 3 days, dramatically lowering contractor-related installation costs.

WesTech Membrane Filtration Experience

WesTech has supplied low pressure membrane filtration systems for over 13 years. Our membrane filtration division has manufactured UF systems for more than 60 facilities in North America. As a company, WesTech has more than 18,000 process equipment installations throughout the world. This significant experience translates into reliable, time-tested equipment.

Project Design Information

Water Quality

Feed Water Quality		
Description	**Unit**	**Concentration**
pH		7.07 – 7.4
Temperature	°C	8.5 - 26
Turbidity	NTU	<20
Total Suspended Solids	mg/L	na
Total Organic Carbon	mg/L	0.7
Iron	mg/L	<0.03
Manganese	mg/L	<0.00

*Values should be verified.

Treated Water Quality		
Description	**Unit**	**Concentration**
Turbidity	NTU	≤ 0.10 NTU 95% of the time with a maximum turbidity of 0.3 NTU
Total Suspended Solids	mg/L	≤ 0.10 mg/L 90% of the time
Silt Density Index	-	≤ 3
Giardia Removal*	-	≥ 4 log (99.99%)
Cryptosporidium Removal*	-	≥ 4 log (99.99%)
Virus Removal*	-	≥ 1.0 log removal (90.00%)

* Challenge-testing certification is provided by the California Department of Public Health or NSF ETV through independent evaluation. Typical removal levels exceed the certification level and are often on the order of 6-log. Additionally, UF membranes can achieve 1.5 log removals of viruses, though l certification is only recognized up to 1.0 log by CDPH for any membrane filter.

Brief Membrane Process Description

Influent water is pumped from the source into the feed tank and screened to remove any debris larger than 200 micron that could damage the hollow fiber membrane. The screened raw water flows through the UF/MF modules in an outside/in flow pattern to effectively remove particulates and pathogens.

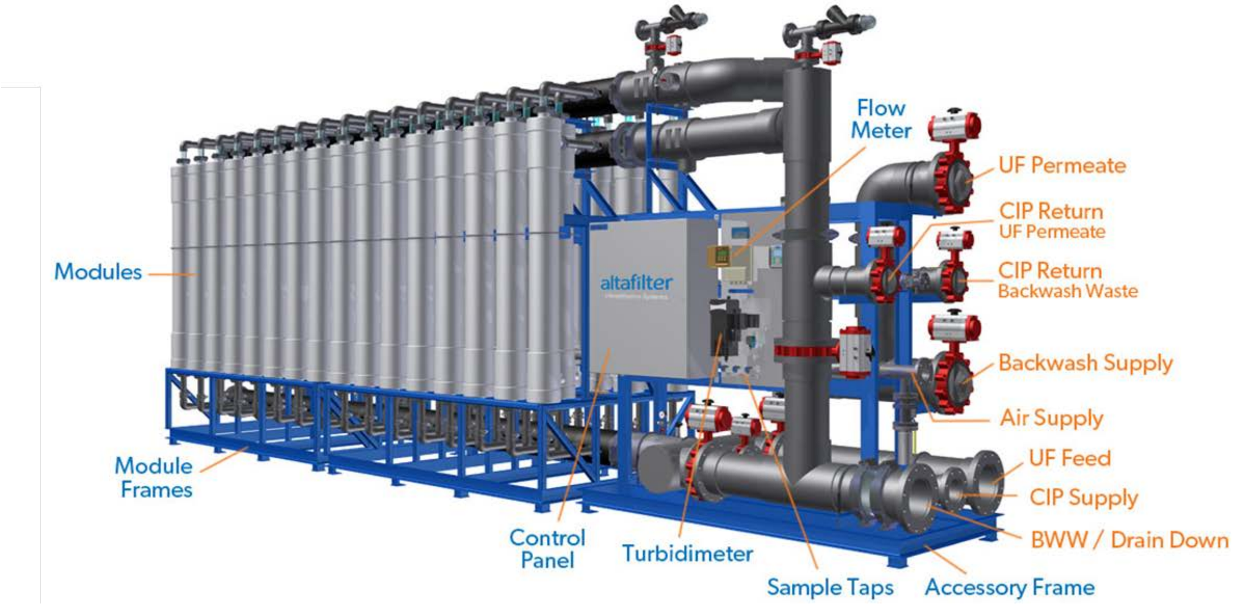
The feed pump is equipped with a VFD to maintain the flow rate setpoint. A short, periodic backwashing step with reversed flow is carried out at an adjustable interval to remove the filtered materials from the membrane surface. An air scouring step is used to increase agitation. Finally, a drain or filter-to-waste step is used to remove any additional material.

An automatic clean-in-place is initiated when membrane permeability decreases to a specified value. Fully-automated maintenance cleans are performed periodically to maintain membrane permeability between CIP cleans. Sodium hypochlorite and citric acid are used for cleaning. Membrane integrity testing is conducted automatically at least once every 24 hours. The pressure decay test (PDT) is capable of detecting a single fiber break.

Option A-1: 2 x 100% System Design

Membrane Complete Process Design Summary

UF System Design Details		
Description	**One Skid OFF (1x100% Operation)**	**All Skids ON (2x50% Operation)**
Number of Skids in System	2	2
Number of Skids in Operation	1	2
Installed Modules per Skid	24	24
Total Module Capacity per Skid	30	30
Membrane Area per Module	775 ft^2	775 ft^2
Membrane Area in Operation	18,600 ft^2	37,200 ft^2
Design Temperature	8.5 °C	8.5 °C
Flux at Design Temperature	45.06 gfd	22.89 gfd
Normalized Flux (20°C) at Design Temperature	61.67 gfd	31.33 gfd
Flow Rates		
Instantaneous Flow Rate	582 gpm	592 gpm
Average Gross Flow Rate	523 gpm	532 gpm
Average Net Filtrate	500 gpm	500 gpm
Backwash Flow Rate	640 gpm	325 gpm
Approx. Net Filtrate Production per Day	0.720 MGD	0.720 MGD
Backwash Waste Volume per Day	14,392 gpd	14,441 gpd
Influent Used for Rinsing/Draining per Day	17,957 gpd	31,404 gpd
Water Recovery	≥95.0%	≥94.0%
Estimated Maintenance Clean Frequency	Daily to Weekly	Daily to Weekly
Estimated Clean-In-Place Frequency	≥30 days	≥30 days



Scope of Supply Information

Detailed Scope of Supply			
Item	**Quantity**	**Description**	**Brand (or equal)**
Membrane Modules	24/skid 48/system	Hollow-fiber, outside-in ultrafiltration (0.01 µm pore)	Toray
Skid Frame	2	Powder-coated carbon steel	-
Feed Pump	2	Premium Efficiency	Goulds
Backwash Pump	2	Premium Efficiency	Goulds
Prestrainer	2	200 micron, automatic backwashing	Valve and Filter
Compressed Air System	1	Includes compressor, receiver, filter, and dryer	Quincy
Clean-In-Place System			
NaOCl Dosing Pump	1	For CIP and MC procedures	Prominent
Citric Acid Dosing Pump	1	For CIP and MC procedures	Prominent
CIP Tank	1	HDPE, cone-bottom	Chem-tainer
pH Sensor	1	-	GF Signet
Heater	1	-	Chromalox
Temperature Transmitter	1	-	GF Signet
Recirculation Pump	1	-	Goulds
Turbidimeter	1 feed 1/skid filtrate 3 total	Hach 1720E w/SC200 controller	Hach
Flow Meters	1/skid 2 total	Bi-directional magnetic flow meter with transmitter	Siemens
Pressure Instrumentation	-	Transmitters, switches, gauges	Wika, Ashcroft
Valves	-	Manual and automated valves	Bray
Piping	-	Schedule 80 PVC HDPE	-
Electrical Controls	1 Master Panel 2 Local Skid Control Panels	NEMA 4, 480 V 3 ph, PLC, HMI	-
Tanks	Included	Feed, backwash	-
Chemical Dosing Pump	Not included, can be provided as needed	Alum coagulation	-

Option A-2: 3 x 50% System Design with WesTech AltaPac™ skids

Membrane Complete Process Design Summary

UF Design Details

Description	One Skid OFF (2x50% Operation)	All Skids ON (3x33% Operation)
Number of Skids in System	3	3
Number of Skids in Operation	2	3
Installed Modules per Skid	12	12
Total Module Capacity per Skid	12	12
Membrane Area per Module	775 ft^2	775 ft^2
Membrane Area in Operation	18,600 ft^2	27,900 ft^2
Design Temperature	8.5 °C	8.5 °C
Flux at Design Temperature	45.06 gpm	30.29 gfd
Normalized Flux (20°C) at Design Temperature	61.67 gpm	41.45 gfd
Flow Rates		
Instantaneous Flow Rate	587 gpm	587 gpm
Average Gross Flow Rate	527 gpm	527 gpm
Average Net Filtrate	500 gpm	500 gpm
Backwash Flow Rate	215 gpm	215 gpm
Approx. Net Filtrate Production per Day	0.720 MGD	0.720 MGD
Backwash Waste Volume per Day	14,392 gpd	14,433 gpd
Influent Used for Rinsing/Draining per Day	17,957gpd	24,731 gpd
Water Recovery	≥95.0%	≥94.8%
Estimated Maintenance Clean Frequency	Daily to Weekly	Daily to Weekly
Estimated Clean-In-Place Frequency	≥30 days	≥30 days

The WesTech AltaPac™ UF system is designed as a complete, packaged treatment solution, which includes skid-mounted feed and backwash pumps, chemical cleaning equipment, and instrumentation and controls. The skid is designed for three-sided maintenance access, which allows for the system to be installed against a wall to conserve footprint. The system is also designed to collapse in height to less than 6'8" to accommodate standard doorways for installation.

WESTECH

Scope of Supply Information

Detailed Scope of Supply			
Item	**Quantity**	**Description**	**Brand (or equal)**
Membrane Modules	12/skid 36/system	Hollow-fiber, outside-in ultrafiltration (0.01 µm pore)	Toray
Skid Frame	3	Powder-coated carbon steel	-
Feed Pump/CIP Recirculation Pump	1/skid 3 total	Premium Efficiency	Goulds
Backwash Pump	1/skid 3 total	Premium Efficiency	Goulds
Prestrainer	1/skid 3 total	200 micron, automatic backwashing	Valve and Filter
Compressed Air System	1 shared	Includes compressor, receiver, filter, and dryer	Quincy
Clean-In-Place System			
NaOCl Dosing Pump	1/skid	For CIP and MC procedures	Prominent
Citric Acid Dosing Pump	1/skid	For CIP and MC procedures	Prominent
CIP Tank	1/skid	HDPE, cone-bottom	Tamco
pH Sensor	1/skid	-	GF Signet
Heater	1/skid	-	Chromalox
Temperature Transmitter	1/skid	-	GF Signet
Turbidimeter	1 feed 1/skid 4 total	Hach 1720E w/SC200 controller	Hach
Flow Meters	1/skid 3 total	Bi-directional magnetic flow meter with transmitter	Siemens
Pressure Instrumentation	-	Transmitters, switches, gauges	Wika, Ashcroft
Valves	-	Manual and automated valves	Bray
Piping	-	Schedule 80 PVC HDPE	-
Electrical Controls	1 Master Panel 3 Local Skid Control Panels	NEMA 4, 480 V 3 ph, PLC, HMI	-
Tanks	Included	Feed, backwash	-
Chemical Dosing Pump	Not included, can be provided if needed	Alum coagulation	-

On-Site Services

WesTech Trips to the Site		
Number of Trips	-	3
Time per Trip	Days	5
Total	Days	15

Field Service

Included field service is for mechanical checkout and commissioning. Any additional trips that the customer may request can be purchased at the standard WesTech daily rates plus travel and living expenses.

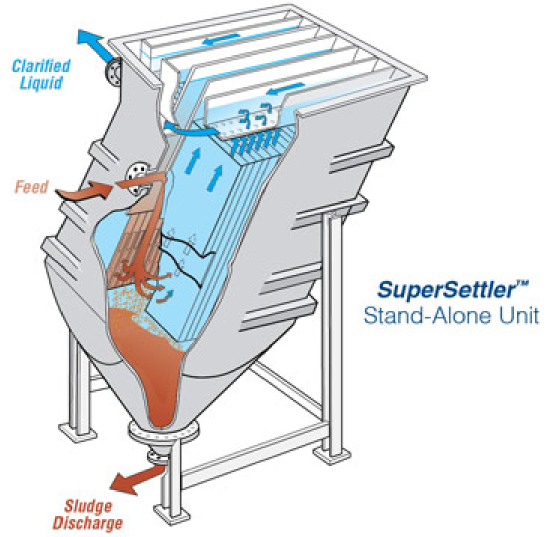
Item B: Stand Alone SuperSettler™ WesTech Model Number: PSS100

General Scope of Supply

Description	Unit	Dimension/Capacity
Number of Clarifiers	each	1
Application		River Water Pre-Treatment
Total Flow Rate	gpm	500
Flow Rate per Unit	gpm	500
Assumed Plate Surface Area	ft^2	1076
Plate Efficiency	%	Assumed 100%
Projected Loading Rate	gpm/ft^2	0.46
Pate Spacing	in	2 inch (50 mm)
Inclined Plate Angle	deg	55
Flocculation Tank Volume	gal	7600 gallon
Approximate Shipping Weight	lbs	20,000 lb
Approximate Operating Weight	lbs	160,000 lb

Equipment Description

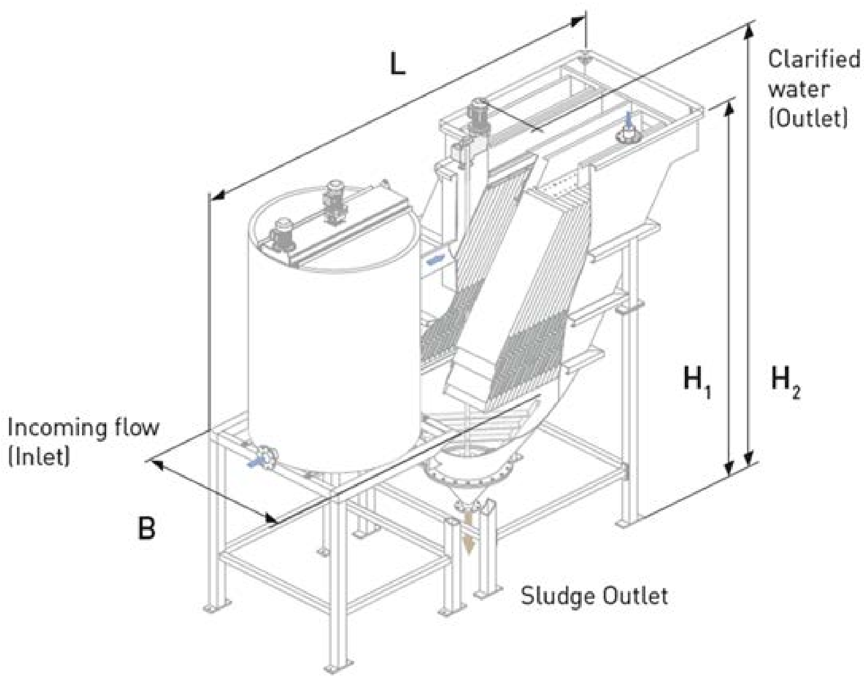
WesTech's SuperSettler Stand-alone units are designed as complete package units for smaller flow rates. The inclined plates are installed in stainless steel tanks with either a hopper or a sludge thickening bottom.



The SuperSettler's tcompact footprint is up to 1/10th the size of a conventional sedimentation basin.

Super Settler™ Dimensional Information

Description	Symbol	Dimension	Unit
Overall Length	L	Foot	24
Tank Height	H_1	Foot	17.1
Overall Height	H_2	Foot	19.5
Width	B	Foot	8.6



Detailed Scope of Supply

Item	Description	Material
Plate Settler Tank	Includes baffles	304 stainless steel
Plates	Removable	304 stainless steel
Sludge Hopper	One (1) sludge hopper for thickening sludge	304 stainless steel
Launder	Submerged orifices	304 stainless steel
Flocculation Tank	Includes rapid mix zone	Carbon steel
Platform	Access walkway/platform	HDG steel
Interconnecting Piping	Included	Carbon Steel
Assembly Fasteners		304 stainless steel

WesTech

Drive Unit

Drive Unit		
Description	**Unit**	**Dimension/Capacity**
Rapid Mix Drive	HP	1/4
Flocculator Drive	HP	1/2

Surface Preparation and Painting

Paint	
Coating Area	**Paint Type**
Plate Settler	Passivated stainless steel
Floc Tank	Epoxy Paint
Inspection Platform	Hot dipped galvanized
Drive Unit	Manufacturer's standard enamel coating

Control Panel

Controls & Instrumentation		
Description	**Description**	**Notes**
Housing	NEMA 4X, 304 SS enclosure with wall mount foot kit and painted steel back panel	
Local Switches	HOA switch, potentiomenter	
Lights	Power on, running, fault	
Emergency Stop	Yes	
Control Relays	Yes	
VFD	VFD for flocculator mixer	
Motor Starter	NEMA 1 size	With internally reset thermal overloads

On-Site Service

WesTech Trips to the Site		
Number of Trips	**Number of Days**	**Includes**
2	3	Installation inspection, startup, instruction of plant personnel, and observation of torque testing

Clarification Comments

The Inclined Plate Settlers have been sized using information given for this application. WesTech Engineering, Inc. has a full lab to assist in bench tests to more accurately determine performance at various plate loading levels. In addition, we have an inclined plate pilot unit that would be available for actual onsite testing for this project to confirm expected performance.

Lead Times:

Submittals: 6 weeks ARO

Shipment: Available for Shipment 22 – 26 weeks after submittal approvals.

Delivery: 6 – 8 weeks estimated

Pricing

Proposal Name: Springdale WTP
Proposal Number: 1530291

1. Bidder's Contact Information

Company Name	WesTech Engineering, Inc.
Contact Name	Greg Payne
Phone	801.265.1000
Email	gpayne@westech-inc.com
Address: Number/Street	3665 S West Temple
Address: City, State, Zip	Salt Lake City, UT 84115

2. Pricing

Currency	US Dollars
A-1: 2 x 100% System Design	$722,200
A-2: 3 x 50% System Design with WesTech AltaPac skids	$682,100
B: Stand Alone SuperSettler™ PSS100	$265,000

Field Service	
Daily Rate	$960.00

Prices do not include field service unless noted, but it is available at the daily rate plus expenses. The customer will be charged for a minimum of three days for time at the jobsite. Travel will be billed at the daily rate. Any canceled charges due to the customer's request will be added to the invoice. The greater of visa procurement time or a two week notice is required prior to trip departure date.

Taxes (sales, use, VAT, IVA, IGV, duties, fees, import, etc.)	Not Included

3. Payment Terms

Submittal Approval	15%
Release for Fabrication	35%
Net 30 days from Shipment	40%

4. Schedule

Submittals, after PO receipt	6 to 8 weeks
Ready to Ship, after Submittal approval	18 to 20 weeks

Terms & Conditions: This proposal, including all terms and conditions contained herein, shall become part of any resulting contract or purchase order. Changes to any terms and conditions, including but not limited to submittal and shipment days, payment terms, and escalation clause shall be negotiated at order placement, otherwise the proposal terms and conditions contained herein shall apply.

Paint: If your equipment has paint included in the price, please take note to the following. Primer paints are designed to provide only a minimal protection from the time of application (usually for a period not to exceed 30 days). Therefore, it is imperative that the finish coat be applied within 30 days of shipment on all shop primed surfaces. Without the protection of the final coatings, primer degradation may occur after this period, which in turn may require renewed surface preparation and coating. If it is impractical or impossible to coat primed surfaces within the suggested time frame, WesTech strongly recommends the supply of bare metal, with surface preparation and coating performed in the field. All field surface preparation, field paint, touch-up, and repair to shop painted surfaces are not by WesTech.

AltaPac™ Series

AP-XII Flows from 60 to 300 gpm

The WesTech AltaPac™ AP-XII is an economical ultrafiltration treatment system that can produce up to 220 gpm on surface waters and 300 gpm on groundwaters. Complete automation, low cost, and compact design make it the perfect choice for small communities.

These fully-functional, skid-mounted systems have all pumps, valves, and ancillary components necessary for operation. A variety of optional features add even more versatility to this efficient design.

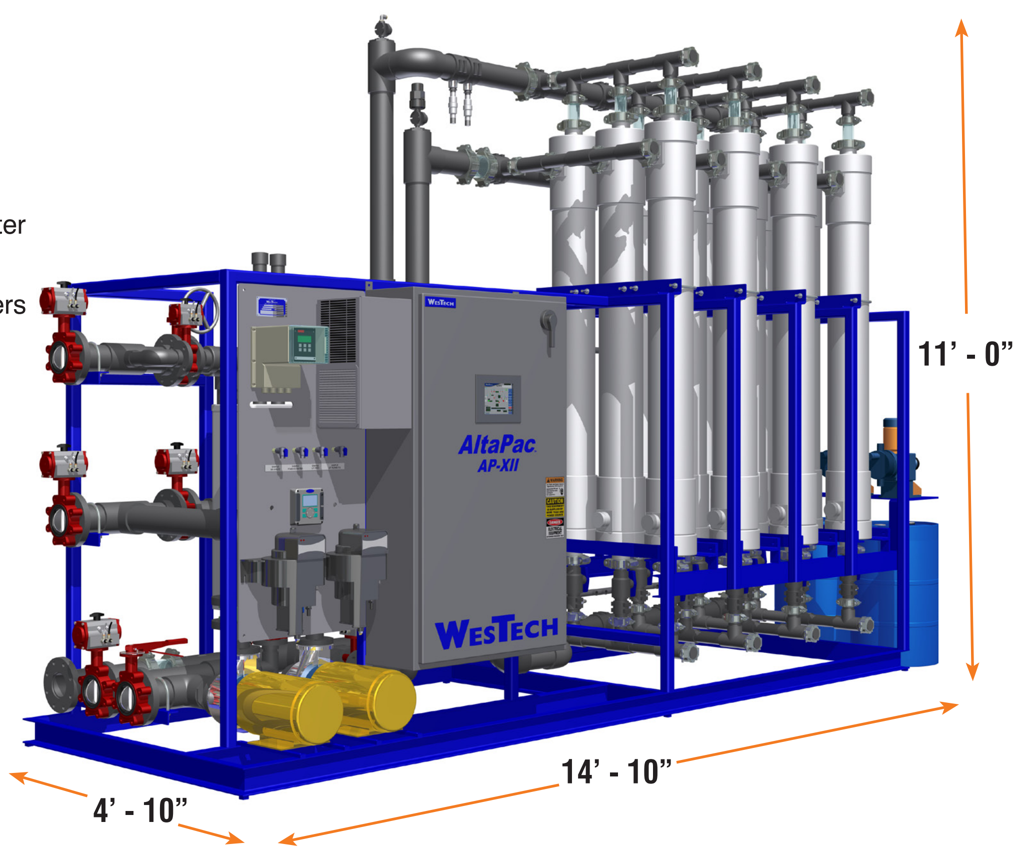
Standard Features

- ☑ Low Fouling and Durable PVDF Ultrafiltration Membranes
- ☑ Automated Clean-in-Place System
- ☑ Automated Daily Integrity Testing System
- ☑ NEMA 4/4x Electrical Enclosures
- ☑ Allen Bradley® PLC Controls
- ☑ Panel-Mounted Touch-Screen HMI with SCADA Package
- ☑ Ethernet Switch for Plant Integration
- ☑ Welded and Powder Coated Steel Skid Frame
- ☑ Sch 80 PVC Piping
- ☑ 316L Stainless Steel Feed/ Backwash Pumps
- ☑ Variable Frequency Drives
- ☑ 200 μm Pre-strainer
- ☑ Bi-directional Magnetic Flow Meter
- ☑ Valves with Pneumatic Actuators
- ☑ Pressure Gauges and Transmitters
- ☑ Compressed Air Package
- ☑ Chemical Metering Pumps

Optional Features

- ☐ Inline UF Feed and Permeate Turbidimeters
- ☐ Corrosion-Resistant HDPE/FRP Tanks
- ☐ CIP/CEBW Neutralization System
- ☐ Coagulant Feed System
- ☐ Modem for Remote Monitoring
- ☐ Service and Maintenance Plans
- ☐ Extended Warranty

UL 508A Listed
NSF/ANSI 61 Certified
CDPH Approved



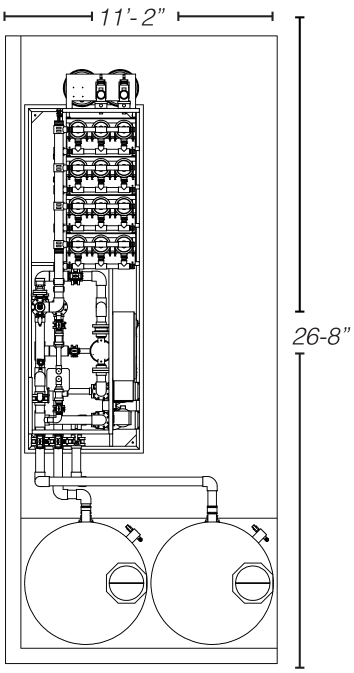
WesTech

Application Ranges:

Tertiary Wastewater: 70 - 140 gpm

Surface Water: 120 – 220 gpm

Ground Water: 160 - 300 gpm



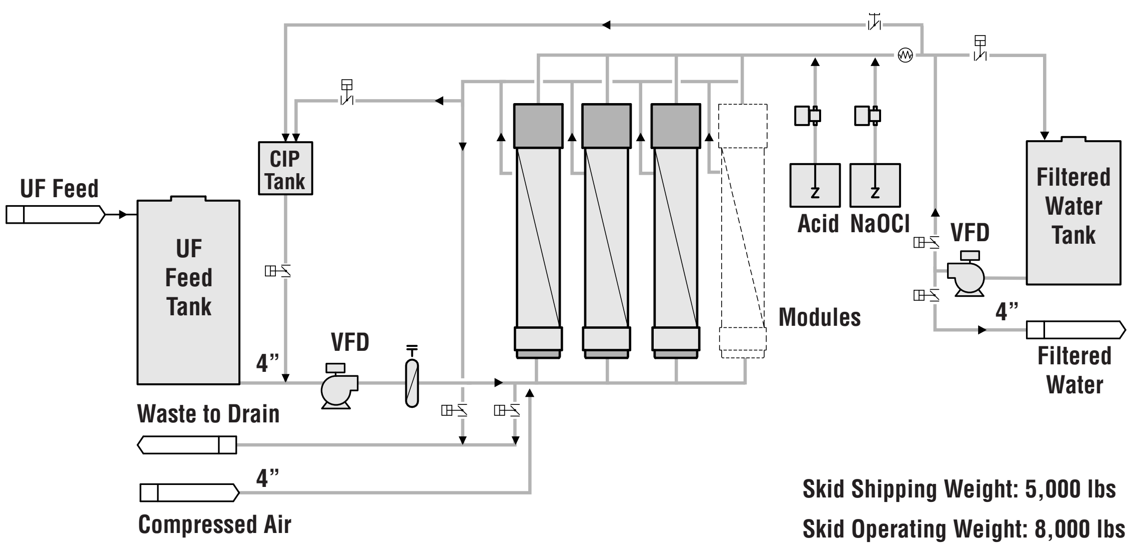
Advantages

- **Pre-assembled and tested skids** for ease of installation
- **Off-the-shelf design** for shorter shipment time
- **Long membrane life** due to durable and chemical-resistant fibers
- **Reduced footprint** by using high flux PVDF membranes and compact system design with three-sided maintenance access
- **Highly automated** for ease of operation
- **Expandable** control system with spare I/O available for ease of integration

Skid Interfacing Requirements

- ☐ 230 volt, 1 phase power, 150 amps max
- ☐ 480 volt, 3 phase power, 45 amps max
- ☐ 575 volt, 3 phase power 35 amps max
- ☑ 4" inlet / outlet / waste connections
- ☑ General alarm output
- ☑ Ethernet
- ☐ Phone line (optional)

Typical Filtered Water Quality	
Turbidity	<0.1 NTU
Giardia	99.9999% removal
Cryptosporidium	99.9999% removal
Virus	1.5 log removal
SDI	< 3



Skid Shipping Weight: 5,000 lbs

Skid Operating Weight: 8,000 lbs

Represented by:

WesTech
Process Equipment. Process Driven.

Tel: 801.265.1000
www.westech-inc.com
Salt Lake City, Utah USA

ATTACHMENT 3

ENGINEER’S OPINIONS OF PROBABLE COST

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

Project:	Package Conventional Water Treatment Plant	Project No:	
	500 gpm plant	Date:	19-Aug-15
Owner:	Town of Springdale	By:	RBF

ITEM NO.	DESCRIPTION		QTY	UNITS	UNIT COST	AMOUNT
1	Mobilization		1	LS	$ 74,000	$ 74,000
2	Pilot Study		1	LS	$ 50,000	$ 50,000
Treatment Plant Building Construction (2,400 SF)						
3	Earthwork - Excavation		1	LS	$ 17,500	$ 17,500
4	Earthwork - Structural Fill / Compaction		1	LS	$ 12,000	$ 12,000
5	Footings/Foundation/Floor		1	LS	$ 76,800	$ 76,800
6	Package Conventional System		1	LS	$ 570,000	$ 570,000
7	Install Package Treatment System		1	LS	$ 75,000	$ 75,000
8	Masonry Building		1	LS	$ 120,000.00	$ 120,000
9	Plumbing & Accessories		1	LS	$ 25,000	$ 25,000
10	Mechanical Piping (Valves, Supports, Marking)		1	LS	$ 150,000	$ 150,000
11	Misc. Furnishings (Rails, Grating, Furnishings)		1	LS	$ 40,000	$ 40,000
12	Electrical Systems		1	LS	$ 250,000	$ 250,000
13	Mechanical Systems		1	LS	$ 50,000	$ 50,000
14	Air Piping System & Compressor		1	LS	$ 30,000	$ 30,000
15	SCADA & Controls		1	LS	$ 100,000	$ 100,000
16	Chlorine Contact Time Chamber		1	LS	$ 40,000	$ 40,000
17	On-Site Sodium Hypochlorite Generation System		1	LS	$ 75,000	$ 75,000
18						
19		**Subtotal**				**$ 1,631,300**
Site Work						
20	Demolition of Existing Filter Building		1	LS	$ 30,000	$ 30,000
21	Demolition of Existing Clarifier		1	LS	$ 15,000	$ 15,000
22	Flow Control Vault		1	LS	$ 75,000	$ 75,000
23	Misc Piping and Site Work		1	LS	$ 50,000	$ 50,000
24	Landscaping		1	LS	$ 20,000	$ 20,000
25	Asphalt		500	SY	$ 40	$ 20,000
26		**Subtotal**				**$ 210,000**
27		**Construction Subtotal**				**$ 1,965,300**
28	Contingency		20	%		$ 393,000
29	**Total Construction Cost**	**Subtotal**				**$ 2,358,300**

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, INC.
CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

Project:	Membrane Water Treatment Plant	Project No:	
	500 gpm plant	Date:	19-Aug-15
Owner:	Town of Springdale	By:	RBF

ITEM NO.	DESCRIPTION		QTY	UNITS	UNIT COST	AMOUNT
1	Mobilization		1	LS	$ 80,000	$ 80,000
2	Pilot Study		1	LS	$ 50,000	$ 50,000
Treatment Plant Building Construction (2,080 SF)						
3	Earthwork - Excavation		1	LS	$ 17,500	$ 17,500
3	Earthwork - Structural Fill / Compaction		1	LS	$ 10,400	$ 10,400
4	Footings/Foundation/Floor		1	LS	$ 62,400	$ 62,400
5	Membrane Equipment Skids		1	LS	$ 785,000	$ 785,000
5	Install Membrane Equipment		1	LS	$ 75,000	$ 75,000
6	Masonry Building		1	LS	$ 104,000.00	$ 104,000
7	Plumbing & Accessories		1	LS	$ 25,000	$ 25,000
8	Mechanical Piping (Valves, Supports, Marking)		1	LS	$ 150,000	$ 150,000
9	Misc. Furnishings (Rails, Grating, Furnishings)		1	LS	$ 40,000	$ 40,000
10	Electrical Systems		1	LS	$ 250,000	$ 250,000
11	Mechanical Systems		1	LS	$ 50,000	$ 50,000
12	SCADA & Controls		1	LS	$ 100,000	$ 100,000
13	Clear Well		1	LS	$ 10,000	$ 10,000
14	On-Site Sodium Hypochlorite Generation System		1	LS	$ 75,000	$ 75,000
15	Alum Dosing Pumps & Flash Mix Basin		1	LS	$ 25,000	$ 25,000
16		**Subtotal**				**$ 1,779,300**
Site Work						
17	Demolition of Existing Filter Building		1	LS	$ 30,000	$ 30,000
18	Demolition of Existing Clarifier		1	LS	$ 15,000	$ 15,000
19	Flow Control Vault		1	LS	$ 75,000	$ 75,000
20	Misc Piping and Site Work		1	LS	$ 50,000	$ 50,000
21	Landscaping		1	LS	$ 20,000	$ 20,000
22	Asphalt		500	SY	$ 40	$ 20,000
23		**Subtotal**				**$ 210,000**
24		**Construction Subtotal**				**$ 2,119,300**
25	Contingency		20	%		$ 424,000
26	**Total Construction Cost**	**Subtotal**				**$ 2,543,300**

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.

ATTACHMENT 4

OPERATION & MAINTENANCE CALCULATIONS

OPERATIONS MAINTENANCE CALCULATIONS

Base O&M Costs		
Operating Expenses	**Actual 2014 Operating Expenses**	**Projected 2016 Operating Expenses**
Personnel Services	$ 202,790	$ 215,140
Utilities	$ 41,098	$ 43,601
Repair & Maintenance	$ 52,980	$ 56,206
Other Supplies & Expenses	$ 56,635	$ 60,084
Insurance Expense	$ 12,255	$ 13,001
Depreciation	$ 158,502	$ 168,155
	TOTAL	***$556,187***

Operation and Maintenance Increases by Project Alternative

Power Cost ($KW-Hr) = $ 0.085

Conventional Water Treatment Plant	Total Cost	Life (Yr)	HP	KW	Hr/Yr	KW-Hr/Yr	$/Yr
Coagulant Dosing Skid (Replacement Pump)	$2,500	10					$250
Coagulant Chemical Purchase	$15,000	1					$15,000
Sludge Pump (Replacement Pump)	$2,500	20					$125
Electric Power for Sludge Pump		1	5	4	2,920	10,892	$926
Air Compressor (Replacement)	$2,000	10					$200
Electric Power for Air Compressor		1	1.5	1	2,920	3,267	$278
Media Replacement	$10,000	10					$1,000
Actuated Valves (Replacement Actuators)	$6,000	10					$600
Chlorine Dosing Skid (Replacement Pump)	$2,500	10					$250
Electric Power for NaOCl System		1	2.0	1	6,570	9,802	$833
Salt Purchase for NaOCl System	$950	1					$950
Distribution Pump (Replacement Pump)	$15,000	20					$750
Electric Power for Distribution Pump		1	75	56	6,570	367,592	$31,245
SCADA Maintenance	$6,000	1					$6,000
Sandblast and Re-coat Basins	$20,000	15					$1,333
							$59,740

Membrane Water Treatment Plant	Total Cost	Life (Yr)	HP	KW	Hr/Yr	KW-Hr/Yr	$/Yr
Screening Equipment (Replacement Motor, Etc)	$2,500	10					$250
Microfiltration Skid (Replacement Membranes)	$50,000	10					$5,000
Electric Power for Microfiltration Skid		1	5	4	8,760	32,675	$2,777
Sludge Pump (Replacement Pump)	$2,500	20					$125
Electric Power for Sludge Pump		1	5	4	2,920	10,892	$926
Air Compressor (Replacement)	$2,000	10					$200
Electric Power for Air Compressor		1	1.5	1	2,920	3,267	$278
Citric Acid Pump Skid (Replacement Pump)	$2,500	10					$250
Citric Acid Chemical Purchase	$800	1					$800
Caustic Pump Skid (Replacement Pump)	$2,500	10					$250
Caustic Chemical Purchase	$1,600	1					$1,600
Actuated Valves (Replacement Actuators)	$6,000	10					$600
Chlorine Dosing Skid (Replacement Pump)	$2,500	10					$250
Electric Power for NaOCl System		1	2.0	1	6,570	9,802	$833
Salt Purchase for NaOCl System	$950	1					$950
Distribution Pump (Replacement Pump)	$15,000	20					$750
Electric Power for Distribution Pump		1	75	56	6,570	367,592	$31,245
Alum Pump Skid (Replacement Pump)	$2,500	10			6,570		$250
Alum Chemical Purchase	$15,000	1					15000
SCADA Maintenance	$6,000	1					$6,000
							$68,334

ATTACHMENT 5

PRESENT WORTH CALCULATIONS

SALVAGE VALUES AND PRESENT WORTH CALCULATIONS

Salvage Values - Conventional Water Treatment Plant				
Item	**Life (years)**	**Cost ($)**	**Cost/Year**	**20 Yr Salvage**
Mobilization, Demolition, Landscape	0	$ 189,000	$ -	$ -
Buildings, Structures, Etc	50	$ 771,300	$ 15,426	$ 462,780
Water Lines, Manholes, Vaults	40	$ 165,000	$ 4,125	$ 82,500
Equipment, Pumps, Controls, Etc	25	$ 820,000	$ 32,800	$ 164,000
Parking Lot / Hardscape	20	$ 20,000	$ 1,000	$ -
			20 Yr Salvage Value =	$ 709,280

N =		20
i =		3%
P/A =		14.8775
P/F =		0.5537
Cost	$	2,358,300
O&M	$	59,740
Salvage	$	709,280
PW =	**$**	**(2,854,359)**

Salvage Values - Membrane Water Treatment Plant				
Item	**Life (years)**	**Cost ($)**	**Cost/Year**	**20 Yr Salvage**
Mobilization, Demolition, Landscape	0	$ 195,000	$ -	$ -
Buildings, Structures, Etc	50	$ 709,300	$ 14,186.00	$ 425,580
Water Lines, Manholes, Vaults	40	$ 135,000	$ 3,375	$ 67,500
Equipment, Pumps, Controls, Etc	25	$ 1,035,000	$ 41,400	$ 207,000
Parking Lot / Hardscape	20	$ 20,000	$ 1,000	$ -
			20 Yr Salvage Value =	$ 700,080

Cost	$	2,543,300
O&M	$	68,334
Salvage	$	700,080
PW =	**$**	**(3,172,310)**