



TOWN OF SPRINGDALE
WASTEWATER MASTER PLAN

SUNRISE ENGINEERING, INC.
September 2009

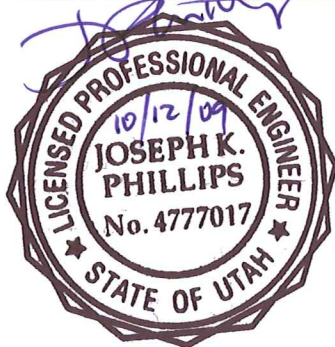
SPRINGDALE, UTAH WASTEWATER MASTER PLAN

September 2009

INCLUDES:

**TREATMENT AND COLLECTION SYSTEM ANALYSIS
RECOMMENDED SYSTEM IMPROVEMENTS
AND
WRITTEN ANALYSIS FOR USER RATE AND IMPACT FEE**

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A handwritten signature in blue ink, likely belonging to Thomas Jorgensen.

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SECTION I INTRODUCTION

A. PREFACE

The Town of Springdale (Town) contracted with Sunrise Engineering, Inc. to provide this Wastewater Master Plan (Plan) that would address the needs of the wastewater system for anticipated Town buildout. Needed collection and treatment system upgrades for anticipated buildout are of particular interest to the Town at this time so that any improvements made today will have the ability to service the Town through the anticipated buildout.

A glance at the Springdale Wastewater System (System) shows an effective collection system

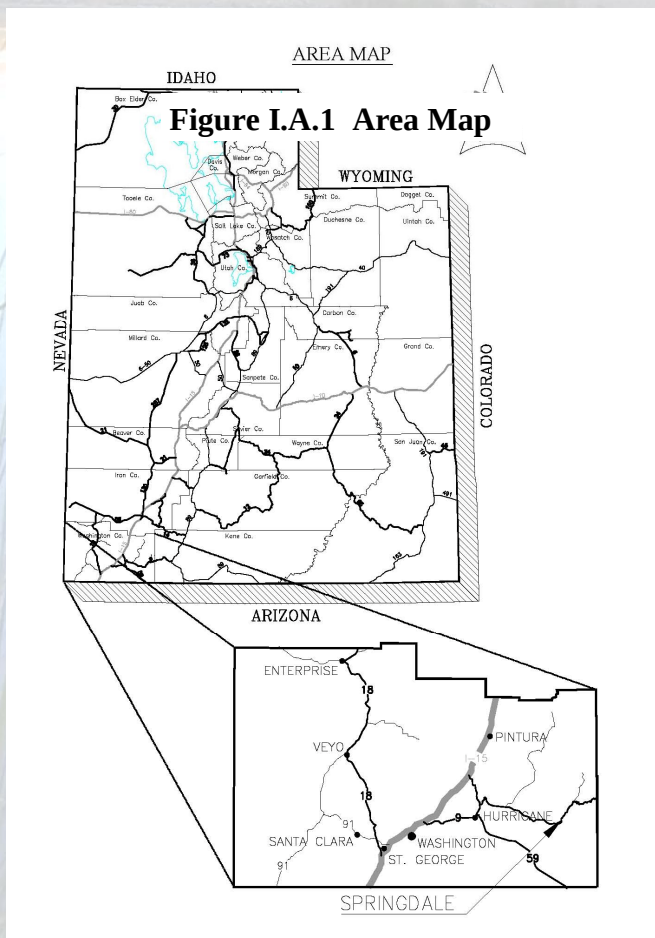
throughout the Town, running down and discharging into the wastewater treatment facility. Wastewater is currently being treated by a lagoon system before being discharged into the environment.

The existing treatment and collection systems have been in place for some time and are in need of some changes to bring the service up to current State standards. Some needed improvements have been recognized by the Town and verified by this Plan. Those recognized improvements include replacement of undersized collection lines and constructing a metering station between the Town and Rockville.

B. INTRODUCTION

This Wastewater Master Plan has been prepared for the Town of Springdale, located in Washington County, Utah, east of St. George, Utah along Highway 9 and adjacent to Zion National Park. The Town of Springdale has experienced moderate to high growth rates for a small town over the past 30 years. As in other communities, the wastewater system must be improved and enlarged to support growth and development within the Town and to comply with current State of Utah Water Quality Standards. Unlike many small towns of similar size, Springdale has experienced much of its recent growth in commercial use such as hotels and restaurants. This growth, along with the associated residential growth experienced, presents a challenge for the planning of infrastructure to accommodate existing and future growth.

The System has been analyzed under the State of Utah Department of Water Quality regulations to determine existing system conditions and needs and to determine projected system needs as the community grows to anticipated buildout. Wastewater system improvements have been recommended and a proposed financing plan has been developed as



part of the Plan.

Springdale average user rates and impact fees have also been analyzed in support of the proposed financing plan and the recommended system improvements. The recommended wastewater rates and impact fees are fair, and they will allow the Town to continue to maintain the level of service that is required of public wastewater systems for the present and over the duration of the buildout planning period.

SECTION II SYSTEM USERS ANALYSIS

A. PROJECTED GROWTH RATES

An important element in the development of a wastewater master plan is the projection of the community's population growth rate. This projection gives the planner an idea of the future demands on the wastewater system for the length of the planning period.

Projecting the number of future wastewater connections with any degree of accuracy can be a very subjective process, especially with the variety of connections serviced by the Town of Springdale. Springdale currently services connections ranging from seasonal residential to large 120+ room hotels with high discharge rates during tourist season. With this variation in mind, this Plan uses population and zoning data in line with the Town's General Plan to estimate growth in the 50 year planning period. Table II.A.1 shows the historic growth rate and provides an idea of how the community has grown based on Census counts from 1970 through 2000, and Census estimates from 2006.

Table II.A.1 Springdale Historic Population

Year	US Census Population	Annual Growth Rate	
1970	182	-	-
1980	258	1970-1980	3.6%
1990	275	1980-1990	0.6%
2000	457	1990-2000	5.2%
2006 (Est.)	550	2000-2006	3.1%

While population growth is essential to anticipating system capacity needs over a specific time period, development in the Town will eventually reach the boundaries currently defined by Zion National Park on the north, east and west, and Rockville to the south. The estimated buildout of the Town reflects the condition when development has reached these

extents defined by Zion National Park and Rockville. Town of Springdale staff have prepared anticipated buildout numbers which are used as part of this Plan. Table II.A.2 shows the anticipated buildout ERUs based upon zoning, current ERU data and known developments in the Town. While the exact number of ERUs seen by the Town may not exactly match those shown in Table II.A.2, the numbers do allow the Town to examine the anticipated maximum improvements that would be needed to service the Town to the extent that no further growth is anticipated.

Table II.A.2 Estimated Buildout

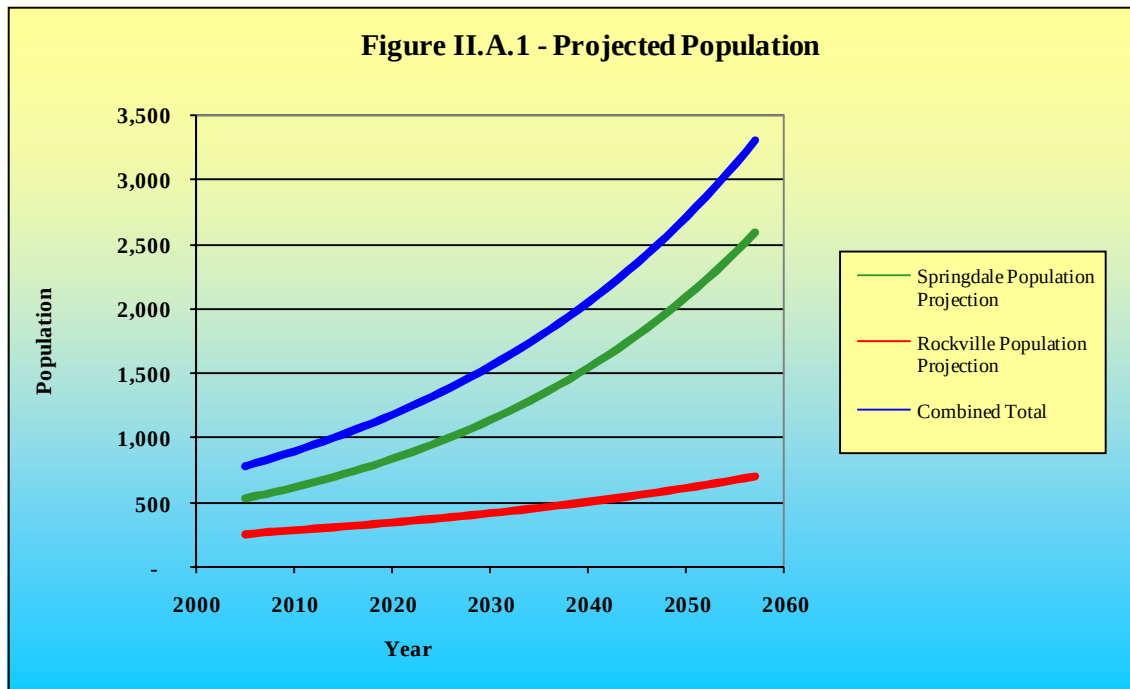
Residential ERUs	1,022	ERUs
Commercial ERUs	998	ERUs
Other ERUs	100	ERUs
Total	2,120	ERUs

In order to accurately project the wastewater flows in the collection and treatment systems, it's necessary to have a population projection for the Town of Rockville as well. Table II.A.3 shows the historic growth rate and provides an idea of how Rockville has grown based on Census counts from 1980 through 2000, and Census estimates from 2006.

Table II.A.3 Rockville Historic Population

Year	US Census Population	Annual Growth Rate	
1980	156	1970-1980	-
1990	182	1980-1990	1.6%
2000	247	1990-2000	3.1%
2006 (Est.)	262	2000-2006	1.0%

Using a 2.0% growth rate for the Town of Rockville, which is the growth rate from 1980 to 2006, the estimated population of Rockville in 50 years is approximately 705 people. This figure will be the anticipated population of Rockville at the time Springdale reaches its buildout population.



The Town of Springdale is expected to experience commercial growth that could vary greatly from the growth anticipated by a simple growth rate. Commercial growth is also expected to have a greater overall impact on the demands on the wastewater system over the planning period. Recommended improvements are based upon buildout Equivalent Residential Units (ERUs), explained later in this section, which may be achieved sooner or later than the timing anticipated by this Plan. If the number of ERUs projected changes on a small scale, then future improvements to support growth may also be affected on a small scale and could be addressed in updates to this Plan. Large scale changes such as annexation of large parcels outside the existing Town boundaries are not expected, but could be addressed in an updated master plan. It is recommended that the Town update the master plan periodically (every 5 years) to ensure that information, rates, and fees are appropriately reflected and assessed.

B. LENGTH OF PLANNING PERIOD

The Utah Administrative Code states that new sewers should be designed for the estimated ultimate tributary population or the 50 year planning period, whichever requires a larger capacity. It will be shown in the next section that these two planning periods will occur at approximately the same time. Therefore, this Plan will use the buildout planning period for analysis and recommended improvements. This Plan will also help to anticipate which recommended improvements should be addressed immediately and which improvements will be required as the Town grows. Ultimately, this Plan will make recommendations based on the buildout scenario and all necessary improvements that need to be made before the Town is fully developed according to current zoning. Revenue sources should be carefully evaluated each year as the Town Council sets budgets and anticipates these future system improvements.

C. WASTEWATER CONNECTIONS

1. Existing Wastewater Connections & ERUs

Table II.C.1 shows the current number of ERUs based on the culinary water system, as of 2006. These figures will be used later in this Plan to develop present densities in relation to zoning in order to provide a better estimation of flow accumulation in the existing collection system.

Table II.C.1 2006 ERUs

Residential ERUs	212	ERUs
Commercial ERUs	399	ERUs
Other ERUs	48	ERUs
Total	669	ERUs

According to the Town of Springdale Rate Table Summary data, the average number of existing wastewater connections from January of 2007 to March of 2008 was 350. The 350 connections include 212 Springdale residential connections, 54 Rockville residential connection, 79 Springdale commercial connections, 4 Rockville commercial connections, and one connection servicing Zion National Park.

The number of connections in the Town remain the same the entire year. However, the number of ERUs changes according to the variations in tourist traffic. Commercial connections generally require more culinary water than a residential customer and as a result produce more wastewater than a residential customer. An Equivalent Residential Unit (ERU) value allows the comparison of use between a residential and any other type of connection. For instance, if a commercial connection has an ERU of 2.5, it uses 2.5 times the water that an average residential connection would use, and would then typically produce an additional 2.5 times the wastewater of a residential connection.

Since the Town of Springdale's commercial

usage correlates to the number of tourists visiting Zion National Park, the ERU value ranges anywhere from around 6.35 during peak visitation in the summer to 1.26 during the offseason in the winter. This means that the total number of ERUs can vary anywhere between 312 to 715 ERUs depending on the season. See Table II.C.2 for the calculations.

Table II.C.2 ERU Configuration for Peak and Off Peak Seasons

January				
Avg. Charge Res.	Avg. Gal. Usage	Avg. Charge Comm.	Avg. Gal. Usage	ERU/ Comm. Conn.
\$ 34.72	12,402	\$ 47.17	15,652	1.26
	Avg. Num. Res. Conn.	Avg. Num. Comm. Conn.	ERU/ Comm. Conn.	Total ERUs
	212	+ 79	X 1.26	= 312

July				
Avg. Charge Res.	Avg. Gal. Usage	Avg. Charge Comm.	Avg. Gal. Usage	ERU/ Comm. Conn.
\$ 51.47	16,775	\$ 394.92	106,450	6.35
	Avg. Num. Res. Conn.	Avg. Num. Comm. Conn.	ERU/ Comm. Conn.	Total ERUs
	212	+ 79	X 6.35	= 715

Given the total volume of wastewater flow into the treatment lagoons and this information above, the monthly average of flow per ERU can be more accurately represented. This in turn allows a more accurate depiction of the total volume of wastewater subsequently treated in the future and at buildout.

2. Projected Wastewater Connections and ERUs

This Plan will use the buildout figures prepared by the Town as the total number of ERUs at the end of the planning period. These figures prepared by the Town can be found below in Table II.C.3.

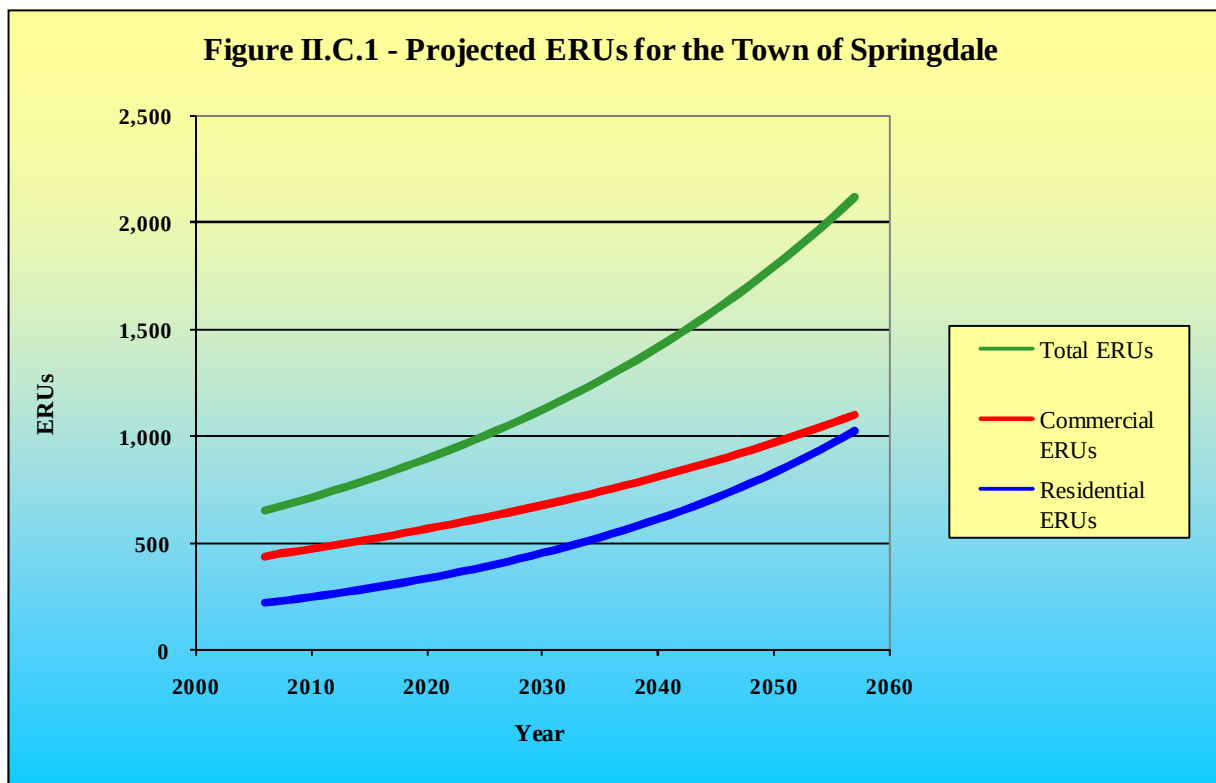
Table II.C.3 Estimated Buildout

Residential ERUs	1,022	ERUs
Commercial ERUs	998	ERUs
Other ERUs	100	ERUs
Total	2,120	ERUs

550 people / 217 residential ERUs = 2.53 people/ERU

This figure is then multiplied by the estimated number of residential ERUs at buildout, 1,022, to give us an approximate population at buildout, which is 2,586 people. Using a growth rate of 3.10%, the Town of Springdale will reach this population in the year 2057, which shows us that the 50 year planning period and the point at which buildout will likely occur is at approximately the same time for all intents and purposes.

It is recommended that the Town of Springdale size all future wastewater related infrastructure



As shown, the total number of wastewater ERUs projected at buildout is 2,120. Dividing the population in 2006 by the number of residential ERUs in 2006 provides us with an estimated 2.53 people per residential ERU as demonstrated by the following calculation.

improvements within the Town for at least 2,120 ERUs, or after applying the value of 2.53 people per ERU an equivalent population of 5,364 people. It should be noted that these figures do not take into account the wastewater flows from the Town of Rockville or Zion

National Park. Wastewater flows from these sources will be taken into account for all relevant design calculations in this Plan.

It will be assumed throughout this Plan that the design population size of Rockville in 50 years is 705 people after applying the annual average growth rate of 2.0%. It will also be assumed that Zion National Park visitation will increase by around 25% in 50 years. Current average daily flows during peak season are 105,000 gallons per day. It will be estimated that if visitation increases by 25%, future flows will be 131,250 gallons per day. In order to obtain an equivalent population it is assumed that the number of gallons of wastewater for the average person is 100 gallons. Taking the total number of gallons a day produced by the Park and dividing it by 100 gpcd generates an equivalent population of 1,313 people during peak season.

Combining these figures results in a theoretical population at buildout of 7,382 people, summarized in Table II.C.4.

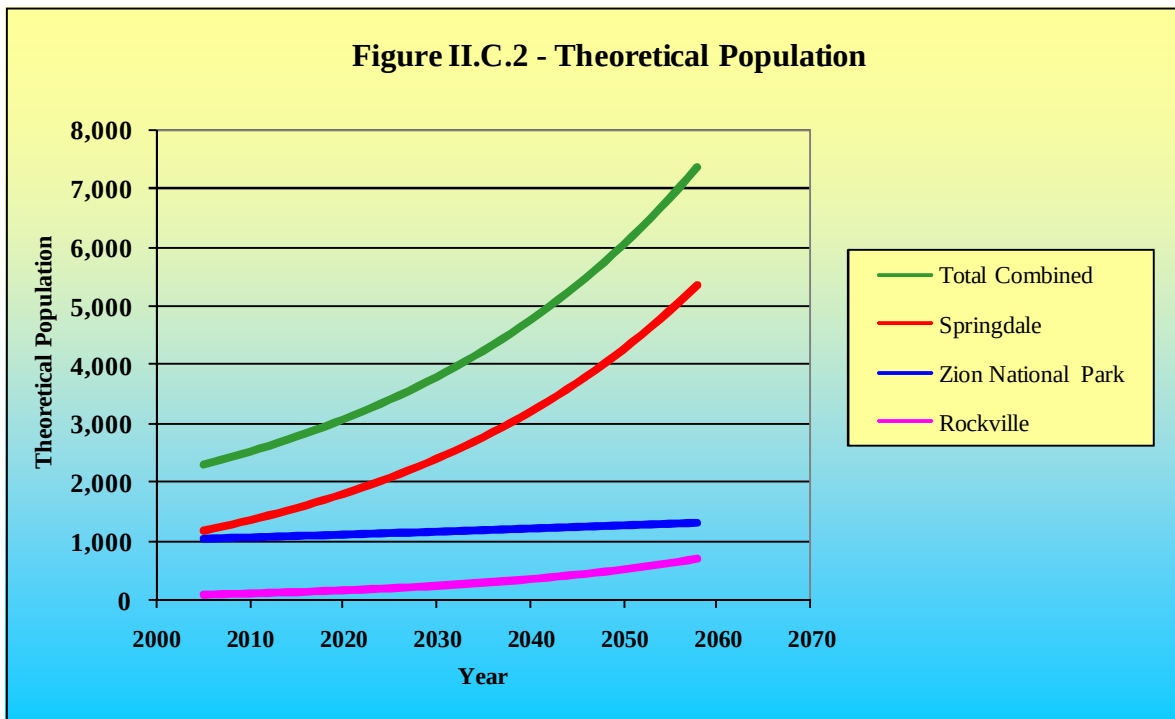
Note, this is not the actual population, but an equivalent population where all commercial ERUs and anticipated flows are converted into population figures and added to the projected actual population figures.

Table II.C.4 Theoretical Population Figures

Town of Springdale	
1,098* Com. ERUs X 2.53 people/ERU	2,778 people
1,022 Res. ERUs X 2.53 people/ERU	2,586 people
Town of Rockville	
	705 people
Zion National Park	
	1,313 people
Total	7,382 people

* This figure combines the "Commercial" and "Other" ERUs

The number of commercial connections in Table II.C.4 includes both commercial and other connections from Table II.C.3.



SECTION III SEWER SYSTEM CAPACITY

A. COLLECTION SYSTEM CAPACITY

1. Utah Administrative Code

According to the design requirements for wastewater collection, treatment and disposal systems given in R317-3 of the Utah Administrative Code, new sewer systems shall be designed on the basis of an annual average daily rate of flow. This annual average daily rate is set at 100 gallons per day (gpcd) per person. Laterals and collector pipelines shall be designed by applying a peaking factor of 4.0, and interceptors and outfall pipelines shall apply a peaking factor of 2.5.

The Utah Administrative Code also requires that no gravity sewer shall be less than eight inches in diameter, while a 6-inch diameter pipe may be permitted when the sewer is serving only one connection.

The Utah Administrative Code also requires that the pipe diameter and slope shall be selected to obtain velocities that minimize settling problems. All sewers shall be designed and constructed to obtain mean velocities of not less than 2 feet per second, when flowing full, and based on Manning's formula using an "n" value of 0.013. Table III.A.1 provides the minimum slope required per pipe diameter to acquire the minimum velocity of 2 feet per second.

Table III.A.1 Minimum Pipe Slope

D (in)	Slope (ft/ft)	V (fps)
8	0.00332	2.000
10	0.00247	2.002
12	0.00194	2.003
15	0.00144	2.003
18	0.00113	2.004
21	0.00092	2.003
24	0.00077	2.004

2. Zoning and Land Use

The design of any wastewater pipe system requires that the amount of wastewater flows entering the system are known. Wastewater flow quantities can usually be derived based on population densities existing or predicted within the wastewater collection area. Standard design practices and calculations are applied to the population numbers to predict average and peak wastewater flows that will be generated in the area and introduced into the wastewater system. This section seeks to summarize how design wastewater flows were calculated for the Town of Springdale study area.

The Town of Springdale has identified the different types of land use and zoning within the Town boundaries as follows: Foothill Residential, Valley Residential, Village Commercial, Central Commercial, Public Use, and Agricultural. Exhibit 2 identifies how these specific zoning designations lie within the study area boundaries.

Once the different zones have been identified, an ERU based density can be calculated by taking the total ERUs associated with each zone and dividing that by the total number of acres in that zone. The following equation illustrates the densities assigned to both residential and commercial zones under existing conditions. For the following calculations, the commercial and other connections have been combined.

Residential Density Existing

$$\begin{aligned} &222 \text{ Res. ERUs} / 1201 \text{ Res. Acres} \\ &= 0.18 \text{ ERUs per Acre} \end{aligned}$$

Commercial and Other Density Existing

$$\begin{aligned} &447^* \text{ Comm. ERUs} / 269 \text{ Comm. Acres} \\ &= 1.66 \text{ ERUs per Acre} \end{aligned}$$

*This figure includes both "Commercial" and "Other" ERUs

The same is done for densities at buildout.

Residential Density at Buildout

$$\begin{aligned} &1,022 \text{ Res. ERUs} / 1,201 \text{ Res. Acres} \\ &= 0.85 \text{ ERUs per Acre} \end{aligned}$$

Commercial and Other Density at Buildout

1,098* Comm. ERUs / 269 Comm. Acres

= 4.08 ERUs per Acre

*This figure includes both "Commercial" and "Other" ERUs

Applying these calculated densities to each zone results in an average total number of ERUs produced by a given area.

From this we can also deduce the resulting corresponding population density. This is accomplished by determining the average number of people per ERU. In the Town of Springdale, the total number of people per ERU is calculated by taking the entire current residential population and dividing that by the total number of residential ERUs. The following equation illustrates this calculation.

550 people / 217 ERUs = 2.53 people/ERU

*Taken from the 2006 population and ERUs figures

Using each of these figures we can now divide the Town up into any number of regions and be able to quantify the total equivalent population that the region will generate and the resulting wastewater flow. We can then divide the Town into specific areas that are controlled by the natural flow of the land and calculate the resulting rate of flow produced by each individual area. The next section will refer to these areas within the Town as collection basins.

3. Drainage Basins

Each collection basin is an area defined by topographic or other features that govern or influence how wastewater is most efficiently routed away from an area. In most cases, collection basins are determined by considering how a gravity sewer system could be constructed and which direction the proposed pipes must be aligned to maintain downhill slopes to the receiving treatment facility. In

many cases, the end of a collection basin is a junction with a regional trunk line. In summary, the collection basin is a tributary area from which wastewater flows are concentrated to a single point as it enters the main trunk line.

Using digital surface contours, aerial photographs, and a program developed at Brigham Young University called WMS, the Town of Springdale study area was divided into 13 individual collection basins. Exhibit 1 illustrates the division of the study area into wastewater collection basins and specifies each with a numerical identifier.

In order to determine the total flow generated by each of the wastewater collection basins we must first apply the ERU densities calculated earlier in this section. This is done by determining the total number of acres of each zone that are located within each collection basin. Then the density of ERUs from each zone is multiplied by each zone's total acreage resulting in the total number of ERUs produced by each zone within each collection basin. Then, by multiplying the total number of ERUs by the average number of people per ERU, we can figure the total equivalent population generated by each zone within each collection basin. By assigning an average peak flow per capita, the total flow from that basin can be calculated. The same process is done for all 13 collection basins within the Town of Springdale under both existing and future conditions.

This method is important in determining the required capacity of the wastewater main trunk line as it accumulates flow from each collection basin down to the treatment facility.

Appendix B contains the spreadsheet printouts showing the total flow resulting from each of the 13 collection basins, under both existing and buildout conditions. Also shown in the printouts are the total number of acres of each zone within each collection basin and the

resulting equivalent population in each zone and collection basin.

Table III.A.2 illustrates the entire process for Drainage Basin 4.

Table III.A.2 - Drainage Basin 4

Total Area (acres)	91.54
Total Area of Zone "Residential" (acres)	82.35
Total Area of Zone "Commercial" (acres)	9.19
Residential ERU Density (ERU/acre)	.19
Commercial ERU Density (ERU/acre)	1.69
Total ERU from Residential Zone	15.71
Total ERU from Commercial Zone	15.54
Total ERU in Drainage Basin 4	31.25
Number of People per ERU	2.53
Total Equivalent Population in Drainage Basin 4	79.05
Flow per Person with Peaking Factor of 2.5 (gal/person/day)	250
Total Flow Produced by Drainage Basin 4 (gal/day)	19,763

4. Rockville and Zion National Park

The flows produced by Rockville and Zion National Park were analyzed using a different method since finite flows along the main trunk line produced from these locations are not within the scope of this Plan.

The existing and future flows produced by Rockville were configured in the following manner. Currently, there are approximately 54 residential connections and 4 commercial connections in Rockville. Based on the connection fee rates, each commercial connection is equivalent to 1.68 ERUs, resulting in a total of 61 combined ERUs for the Town of Rockville. Applying Springdale's people per ERU amount of 2.53, it was assumed that 154 people are on the current system, out of the total population of 262 people. It was also

assumed that in 50 years, the Town of Rockville would have reached a total population of 705, based on a population projection rate as previously determined in Section II. That projection rate assumes that the vast majority, if not all of Rockville, will be hooked up to the collection system within the next 50 years.

705 residents x 250 gal/person/day = 176,250 gal/day

It was also assumed that Zion National Park contributes 105,000 gallons per day to the current system as an average day figure. The future flow will be based on a 25% increase from today's figures resulting in 131,250 gallons per day.

The flows from Zion National Park will enter into the collection system at the most upstream node in the current collection system, while Rockville's flows will enter the collection system closer to the treatment facility. Both of these sources were given a peaking factor of 2.5, the same as was given to the Town of Springdale.

5. Pipe Sizing Spreadsheet

The total theoretical flow generated by the Town of Springdale, Rockville, and Zion National Park according to the assumptions described in the previous subsections was compared to the actual daily flow into the wastewater lagoons during peak days of the year to determine if the theoretical flows coincide with actual recorded flow data. For 2008, the peak flow occurred during the second weekend in August at approximately 0.32 million gallons per day, while theoretical peak flows for that year were determined to be 0.77 million gallons per day. From this it can be seen that the assumptions in the previous subsections accurately represent flows according to a 2.5 peaking factor.

After determining existing and future

wastewater flows generated by each collection basin, the Town of Rockville, and Zion National Park, a spreadsheet was set up to compute the required pipe sizes within the network. The determined wastewater flows from each basin, Rockville and Zion National Park were applied to the network at the appropriate nodes and the spreadsheet was run. The printed results of the spreadsheet are provided in Appendix B. It should be noted that the design of the conceptual wastewater system was completed at a master planning level only; detailed design completed during an improvements project may require an adjustment in installed pipe sizes.

Design criteria entered into the pipe design spreadsheet assumed that the pipe system will flow at full capacity, the Manning's roughness was set at 0.013, the minimum velocity was set at 2.0 fps, and the maximum flow velocity was set at 15.0 fps. The manhole elevations and pipeline segment lengths were taken from the Town's GIS information, from which the pipe inverts were estimated to be on average 8 feet below ground elevation, but were adjusted at several nodes to ensure that minimum velocities and slopes were maintained.

6. Conclusions

It was determined that the existing capacity of the main trunk line in the collection system is sufficient for peak flows produced by the Town of Springdale, Rockville, and Zion National Park under existing conditions. It has been concluded that pipe slopes, capacities and velocities are all in compliance with current State standards.

Conversely, the projected buildout peak flows produced by the Town of Springdale, Rockville and Zion National Park will exceed the present capacity of certain segments of the main trunk. These segments and recommended improvements will be addressed in Section IV.

The other sewer lines, excluding the main trunk line, were evaluated for required pipe size

diameters mandated by the State. It was found that a single section does not meet the minimum diameter size; please refer to Section IV and Exhibit 3 for additional information regarding recommended improvements.

B. LAGOON TREATMENT SYSTEM CAPACITY

According to the design requirements for treatment and disposal systems given in R317-3 of the Utah Administrative Code, new sewer systems shall be designed on the basis of an annual average daily rate of flow of 100 gallons per day per person (gpcd). This number includes an allowance for infiltration / inflow from ground water.

The current Springdale treatment facility includes 2 large sewer ponds, while one of these ponds, the aeration pond, is divided into two approximately equal sized ponds by a floating baffle wall. The sewer ponds have an estimated average surface area of 1,025,400 SF, and are estimated to be 9 ft deep. The volume of the aeration cells total at 29.7 million gallons, and the storage cell totals at 24.3 million gallons.



Also included in this facility is a blower building used to provide the aerated lagoon cells

with dissolved oxygen. The building consists of three blower units, each equipped with a 20 HP electric motor. Also incorporated with this blower system are the floating air laterals that convey the oxygen from the blower building to the lagoons and releases the oxygen into the wastewater by means of diffuser units located at the bottom of the lagoons. Also, a UV building and re-aeration structure are included with the facility. The UV equipment is used to disinfect any effluent that is released from the facility which then passes through a re-aeration structure which entrains the effluent with dissolved oxygen by physical means before being discharged into the Virgin River.

The designed capacity of the aerated lagoon system is based on the effluent standards of BOD₅, total suspended solids (TSS), E. coli, dissolved oxygen (DO), and pH.

To achieve the effluent standards of BOD₅ according to R317-3 of the Utah Administrative Code for aerated lagoons, the minimum detention time is given as the greater of at least

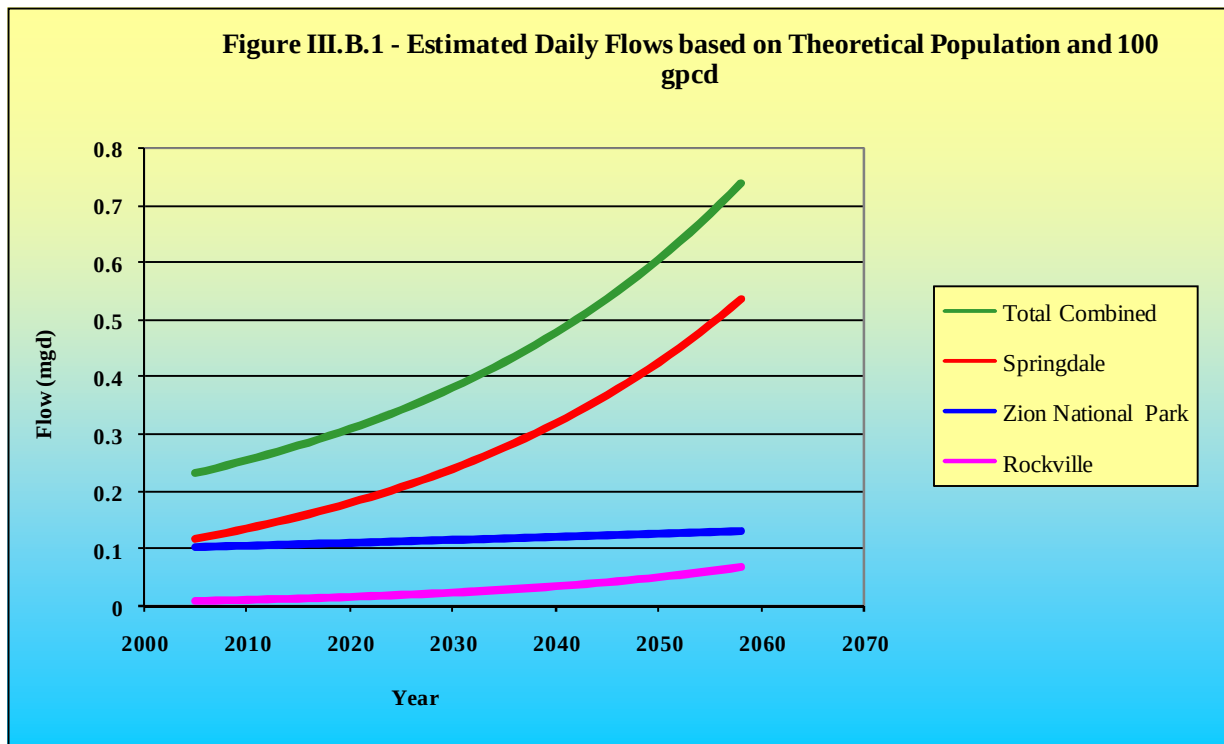
30 days or the value determined using the following formula;

$$E = (1/(1 + (2.3 \times K_1 \times t)))$$

where: t = detention time, days; E = fraction of desired BOD₅ remaining in an aerated lagoon; K₁ = reaction coefficient, aerated lagoon, base 10, which for normal domestic sewage, the K₁ value may be assumed to be 0.12 day⁻¹ at 20 degrees centigrade and 0.06 day⁻¹ at one degree centigrade which will be used in this case.

Using 45/45 effluent limits, 77.5% removal of BOD₅ is required, therefore E = 0.225 or 22.5%. Solving for “t” we obtain 25 days which is less than the minimum required 30 days. Therefore, the required detention time is 30 days.

Using the previously calculated population at buildout of 7,382 people and a per capita flow rate of 100 gallons per day results in 738,200 gallons of wastewater flowing into the treatment system on a daily basis. To obtain the



required volume of the aeration cell we then multiply the total gallons per day, 738,000 gallons, by the detention time, 30 days, which results in a total volume of 22.2 million gallons. The aeration cell has a current volume of 29.7 million gallons resulting in an excess of 7.5 million gallons in the overall required volume of the aeration lagoon cells under buildout conditions. See Appendix B for calculations regarding lagoon hydraulics.

In addition to the detention time requirements, the State regulates the required oxygen input per pound of BOD₅ applied to the treatment facility. This requirement is 2 lbs of oxygen per pound of BOD₅. The aeration equipment must also be capable of maintaining a minimum dissolved oxygen level of 2 milligrams per liter in the lagoon at all times.



It was determined from the manufacturer that the capacity of these blowers meet the required oxygen demands for the aeration lagoons. Each 20 HP blower in conjunction with the fine bubble aeration system is capable of injecting anywhere from 1,150 lbs to 1,350 lbs of oxygen per day. These calculation were done using typical oxygen transfer efficiencies for a fine bubble diffuser system. Actual efficiencies may differ from those used in this Plan, and should be taken into consideration when

planning for future equipment replacements and/or expansions. This quantity of injected oxygen is enough to treat a population range of 2,650 people to 3,025 people. The theoretical population that's currently being treated by the ponds is 2,450 people. This population figure includes converted commercial ERUs in addition to actual population numbers to obtain a theoretical population.



According to population projection estimates, using one 20 HP blower for treatment will be capable of injecting enough oxygen into the system until some time between years 2012 and 2020, at which time a second blower may need to be put into operation to keep up with the required oxygen demand. See Appendix B for calculations regarding oxygen requirements. Note that this figure is according to peak summer demand, and should be adjusted according to actual flow into the treatment lagoons. A more detailed analysis should be done in the future in order to determine the actual efficiencies of the system to acquire a more accurate projection of the treatment system capabilities and correct operational procedures of the equipment. It should also be noted that the addition of a dissolved oxygen meter would improve the ability of the wastewater operator to monitor the varying levels of oxygen in the lagoons on a continual basis. The installation of the meter would not only provide additional information for future

oxygen requirements, but would be a more convenient method for measuring the dissolved oxygen levels in the lagoons.

It is suggested for an influent structure, according to R317-3-10.5, that for a diffused aeration system that there be multiple inlets, such that the influent lines distribute the load within the mixing zone of the aeration equipment. Since the current inlet structure may be requiring maintenance, the Town should consider multiple inlets allowing a more efficient distribution of the influent.

Finally, discharging requirements are set forth as follows. All wastewaters containing pathogens or coli forming bacteria must be disinfected before being discharged to a water course. Furthermore, before being discharged into the receiving water, the final effluent must be re-aerated.

The current treatment facility is set up to disinfect with UV irradiation and re-aerate the effluent using a stepping re-aeration structure, both of which satisfy the current requirements set forth by the State. The UV assembly installed is the 3500K-PTP model which is capable of disinfecting up to 500,000 gallons per day.

In addition to meeting effluent quality standards, the lagoon system, at a minimum, shall consist of three cells of approximately equal capacity designed to facilitate both series and parallel operations. All systems shall also be designed with piping to permit isolation of any one cell without affecting the transfer and discharge capabilities of the total system. The system should also be capable of splitting the influent waste load into a minimum of two cells or all the primary cells in the system. The current configuration of the lagoon system is in compliance with these requirements, but maintenance on the recirculating pumps needs to be preformed in order to bring them back on line and operational. These pumps are used to recirculate the finished wastewater back to the

front end of the treatment system.

SECTION IV SEWER IMPROVEMENT PROJECTS

A. IMMEDIATE RECOMMENDED SEWER IMPROVEMENTS

In general, the Town of Springdale's wastewater treatment facility and collection system are satisfactory. There are no major issues preventing the wastewater system as a whole from functioning as it was intended. With that said, there are a few recommended improvements that would bring the system up to current standards according to the State of Utah Administrative Code and other improvements that will allow the Town to more accurately measure their system flows. In addition to these immediate recommendations, there are several recommendations that should be included with future improvements projects.

It is recommended that all gravity sewer pipelines currently owned and maintained by the Town be sized according to the minimum pipeline diameters required by the State of Utah. According to Section R317-3-2.A of the Utah Administrative Code, no gravity sewer shall be less than eight inches in diameter. A 6-inch diameter pipe may be permitted when the sewer is serving only one connection, or if the applicant justifies the need for such diameter on the basis of supporting documentation. In the Town of Springdale there is currently one section of sewer line that does not meet the minimum requirement. This section is located on the south end of the Town and ties several houses along Valley View Drive into the collection system servicing the Majestic View Lodge which connects to the main trunk line. This section of pipe is 4" in diameter and 740 feet long.

It is also recommended that the Town of Springdale install a metering station on the border between the Town of Springdale and

Rockville. This metering station will be able to provide the Town of Springdale with important data differentiating the flows produced by the Town and those produced by Rockville. The Town currently has two metering stations, one metering the flows coming out of Zion National Park and the other located at the lagoons. Having this third metering station will provide flow data for each entity independently.



B. FUTURE SEWER IMPROVEMENTS

1. Collection System

The majority of the current collection system was installed in the late 70's. The pipe installed was truss pipe and the anticipated life expectancy of this particular pipe ranges

anywhere from 40 to 100 years, depending on proper installation and other various factors. It is anticipated that the entire collection system that was installed during the late 70's will need to be replaced at some point in the next 15 to 30 years. A couple other problems exist with the current collection system including bellies in the line, especially on the lower portion of the pipeline, unpleasant odors being produced in certain portions, and a number of manholes are either buried or their whereabouts are unknown. These problems should be addressed as the new collection system is designed and mapped.

The analysis of the current collection system included estimated pipe invert elevations providing for a master planning level of accuracy. The results of the analysis showed that the lower portion of the main trunk line will need to be replaced with a 15" diameter section. Flows in this portion are likely to exceed capacity when the Town has a total of more than 1,250 ERU's which is anticipated to occur in 25 to 30 years. Since the current collection system might be replaced within that period of time, it is recommended that the 15" portion be upgraded as the rest of the system is replaced. Exhibit 5 shows the expected section of the main trunk line that will need to be upgraded to a 15" line to convey future wastewater flows.

2. Treatment Facility

Future improvements to the lagoons include the following recommended items. These items include both design improvements as well as the life expectancies of several components of the system.

The intake structure located in the aeration lagoon collects water from the surface. This is not a preferred practice since unwanted floating material can pass from the aeration lagoon directly into the storage cell. It is preferred that the intake structure receives water below the surface, therefore preventing floating material

from passing on to the next cell.

The aeration blowers, the blower motors, the baffle wall separating the aeration cells, and the ultraviolet radiation disinfection system will all require replacement once they've met the end of their service life. Each of the items were installed during the Wastewater Facilities Expansion Project in 1996. Each of these items and their life expectancies are provided below.



a. Blower Units

The blower units are expected to last an estimated 5-7 years assuming the units are serviced as spelled out in the manual and run for 24 hours a day. This assumption gives them a total life expectancy of 43,800 to 61,320 hours. The blowers are currently cycled between three units and run for approximately 15 hours a day. Therefore the expected life of the blowers under these conditions is approximately 24-33 years. Further investigation into their replacement should be addressed in future master plans or as the units begin to fail.

b. Blower Motors

The motors powering the blowers run the same amount of time as the blowers themselves. The average life expectancy for an AC motor ranging from 5-20 HP is around 16-20 years. It was recommended by the manufacturer that the motors should be expected to last 18 years

given proper maintenance and operational conditions.

Therefore recommended improvements and replacements would take place in approximately the year 2014.

c. Baffle Wall

The baffle wall has a life expectancy of about 20 years. According to this figure, the Town may expect to replace that around 2016. On the other hand, the Town has expressed concerns regarding the effectiveness of the baffle wall, stating that water can be seen flowing around the edges of the wall. This may be an indication that the 5x4 foot flow through window located on the southern end of the baffle wall may not be operating as effectively as it should. These flows may also be an indication that the baffle wall has reached the end of its life expectancy and that regular maintenance on the lagoons would require the replacement of the baffle wall.

d. UV Disinfection System

The UV disinfection system has several components and each has a considerably different life expectancy. The bulbs themselves last for approximately 13,000 hours.



The ballasts usually last between 5-9 years depending on the temperature and usage, while the rest of the setup can last 20 years or more depending on the amount of use. According to

these figures and suggestions from Coombs Hopkins, the supplier, the Town can expect to be replacing the ballasts every so often between now and the next few years as they reach the end of their life. Running the lights for 25 days three months out of the year, the Town can expect them to last about 7-8 years, and should expect to be replacing those as they die out. The entire setup is in good condition and could last another 10 to 20 years depending on various factors.

The UV disinfection system has the capability of treating 500,000 gallons a day. At buildout, this would mean that the UV system would discharge at its max capacity for between 10 and 20 days out of the month. The difference in the amount of days required for discharging results from taking into account monthly precipitation, evaporation, and seepage rates along with peaking during the summer months. By installing a second unit, the Town would be able to discharge for a fewer number of days, or not require the UV disinfection systems to run at maximum capacity.



e. Pond Dredging

Wastewater lagoons are designed so as to keep dredging of accumulated biological and non-biological material to a minimum.

Bioaugmentation and biological processes for sludge reduction can help decrease the need for dredging, but sooner or later, nearly all lagoon systems need to be dredged. Since the lagoons have been in operation for over 10 years, the

Town should schedule to test the ponds so as to anticipate the need to dredge the ponds in the future.

C. SUMMARY OF RECOMMENDATIONS

The recommended current sewer improvements project consist of constructing a metering station between the Town of Springdale and Rockville and replacing 740 feet of 4" sewer pipe with 8" sewer pipe. See Exhibit 3 for the proposed improvements. Detailed cost estimates for each project and a combined estimate can be found in Appendix C.

SECTION V USER RATE ANALYSIS

A. EXISTING USER RATES

The Town of Springdale sewer rates are set up to be measured and paid for according to the water used through the culinary water meter. For Residential and Commercial there is a monthly base rate of \$14.03, plus a volume charge of \$3.83 per 1,000 gallons of water used, as measured through the water meter, after 7,000 gallons.

The National Park Service is assessed at a proportionate share of the yearly O&M costs per their agreement, as determined by proportionate flow, to be billed as a monthly fee.

The Rockville accounts are currently set up to pay a monthly rate according to the type of connection. This rate is set up as follows:

- A. Connected Residential: Monthly rate of \$21.56.
- B. Unconnected Residential: Monthly Rate of \$14.03.
- C. Bed and Breakfast Home Occupation: Assessed at a rate of 2.5 average family residential units, or a monthly rate of \$53.91 (\$21.56 x 2.5).
- D. Other Home Occupations: Assessed a rate to be determined based on the highest use on their water meter for the months of December, January or February of the preceding year, per the Rockville Water System billing clerk.
- E. Rockville Community Center: Assessed at a rate of 2.5 average family residential units, or a monthly rate of \$53.91 (\$21.56 x 2.5).

The existing average sewer rate was determined from the billing information from 2007 provided by the Town and resulted in an average rate of \$32.14 per residential

connection. Refer to Appendix A for further information regarding billing, connections, and ERU data.

B. RECOMMENDED USER RATES

Table V.B.1 shows the method used to determine the minimum average sewer rate per ERU, which should be divided between all system customers. Annual revenues must be sufficient to cover the expenses incurred by the construction, maintenance, and administration of the sewer treatment facility and collection system. These expenses include debt service, utilities, personnel salaries and benefits, system maintenance, legal and professional fees, and other miscellaneous items.

The average sewer rate per ERU shown in Table V.B.1 is less than the existing average sewer rate per ERU determined by this Plan. It is therefore recommended that the current rate structure stay in place and that any surplus funds be deposited into the depreciation or replacement fund for future improvement projects.

It is strongly recommended that the sewer department maintain a funded depreciation or replacement fund, beyond the surplus funds from the sewer rates, to provide the money necessary for replacement and repair of the sewer treatment facility and collection system.

B. CASH FLOW

A cash flow analysis has been included in Appendix D. This cash flow analysis takes into account the projected annual expenses, revenues, and funding of future projects. An Engineer's Opinion of Probable Cost for both the New Metering Station and the In Town Sewer Line Replacements have been included in Appendix C. The cash flow analysis shows these projects being self funded the in the years 2010-2011 and 2013-2014.

TOWN OF SPRINGDALE			
Table V.B.1—FY 2009 PROPOSED FINANCING PLAN			
TOTAL PROJECT COST			\$ 138,200
FY 2009 EXPENSES			
Proposed Funding:	Rate	Term in Yrs.	Principal
Self Participation			\$138,200
DWB Grant			
DWB Loan			
TOTAL PROJECT FUNDING:			\$138,200
EXPENSES: (First Year of New Debt Serv. Pmt.)			
Salaries, wages and benefits			\$61,358
Office expenses and travel			\$2,227
Repairs and maintenance			\$33,835
Utilities			\$10,440
Legal and professional fees			\$21,825
Contract services			\$1,629
Insurance			\$6,061
Miscellaneous			\$8,817
Depreciation (in place of Renewal and Replacement Fund)			\$72,619
Subtotal Expenses:			\$218,811
EXISTING DEBT SERVICE			
Sewer Revenue Bonds, Series 1995	0%		\$0
Loan Reserve (Payment /10)			
Subtotal Existing Annual Debt Service:			\$0
NEW DEBT SERVICE (NOT IMPACT FEE ELIGIBLE)			
New Loan(s)	100.0%		\$0
Loan Reserve (Payment/10)			\$0
Subtotal New Annual Debt Service:			\$0
Renewal and Replacement Fund			\$0
GRAND TOTAL EXPENSES:			\$218,811
ANNUAL INCOME**			
Projected Yearly Impact Fees Received			\$0
Income from Zion National Park (2007 data)			\$38,000
Total Number Of <u>ERU's</u> *			601
Average Monthly Water User Rate/ERU			\$25.07
TOTAL ANNUAL INCOME:			\$218,811

*The number of ERU's is an average taken over the course of a year. The total number of ERU's also includes those from the town of Rockville.

** Miscellaneous and Interest Income/Bond Discount revenues have not been included in this analysis but have been included in the cash flow analysis.

SECTION VI HOOK-UP FEE ANALYSIS

A. HOOK– UP FEE COST ESTIMATE

A wastewater hookup fee means a reasonable fee, not in excess of the approximate average costs to the Town, for services provided for and directly attributable to the connection to the sewer system.

Currently, the Town provides services consisting of inspection time, setting up of sewer accounts, etc. for connecting private entities to the sewer system. The Town requires that any construction necessary to make the connection to the sewer system be the responsibility of the owner. Currently, the Town is not charging a hook-up fee for any connections to the sewer system, but it is recommended that the Town charge a hook-up fee in the future to cover the costs necessary to make a sewer connection, such as the inspection of the physical connection to the Town's collection system, the setting up of the sewer accounts, etc.

This connection fee should be based on the average amount of time required for any necessary inspections of the construction of the connection and the amount of time necessary to create the new sewer accounts, as well as any other time attributable to the new connection. This time should then be multiplied by the associated hourly cost of each Town employee responsible for the tasks associated with making the new connection. These hourly requirements should be based on historical records or by keeping track of the time spent on future connections.

SECTION VII IMPACT FEE ANALYSIS

A. EXISTING IMPACT FEE

An impact fee that is charged by a community may be used to pay for capital costs and the debt service associated with surplus capacity built into a system. The impact fee may also be used to pay for the cost of improvements to the system that are required to support new growth as new connections are added to the system.

The existing impact fee currently charged by the Town of Springdale is associated with the water meter size of the connection and are set as follows:

Table VII.A.1 Existing Impact Fee

Connection	Impact Fee
3/4"	\$1,755
1"	\$3,120
1 1/2"	\$7,025
2"	\$12,490
3"	\$28,110
4"	\$49,975
6"	\$112,445

B. RECOMMENDED IMPACT FEE

An impact fee can only be assessed if the collected funds are used to cover the proportionate share of the costs of impacts on system improvements that are reasonably related to any new development activity. Additionally, these fees may only be expended for the public facilities for which they were collected for and only for those public facility system improvements identified in a facilities plan. The dollars collected must be spent or encumbered within six years. Acceptable expenses associated with project costs include the following: the construction contract price, the cost of acquiring land, improvements, materials, and fixtures, the costs of planning, surveying, and engineering

fees for services provided for and directly related to the construction of the system improvements, and any debt service charges to pay the principle interest on bonds, notes or other obligations issued to finance the costs of the system improvements.

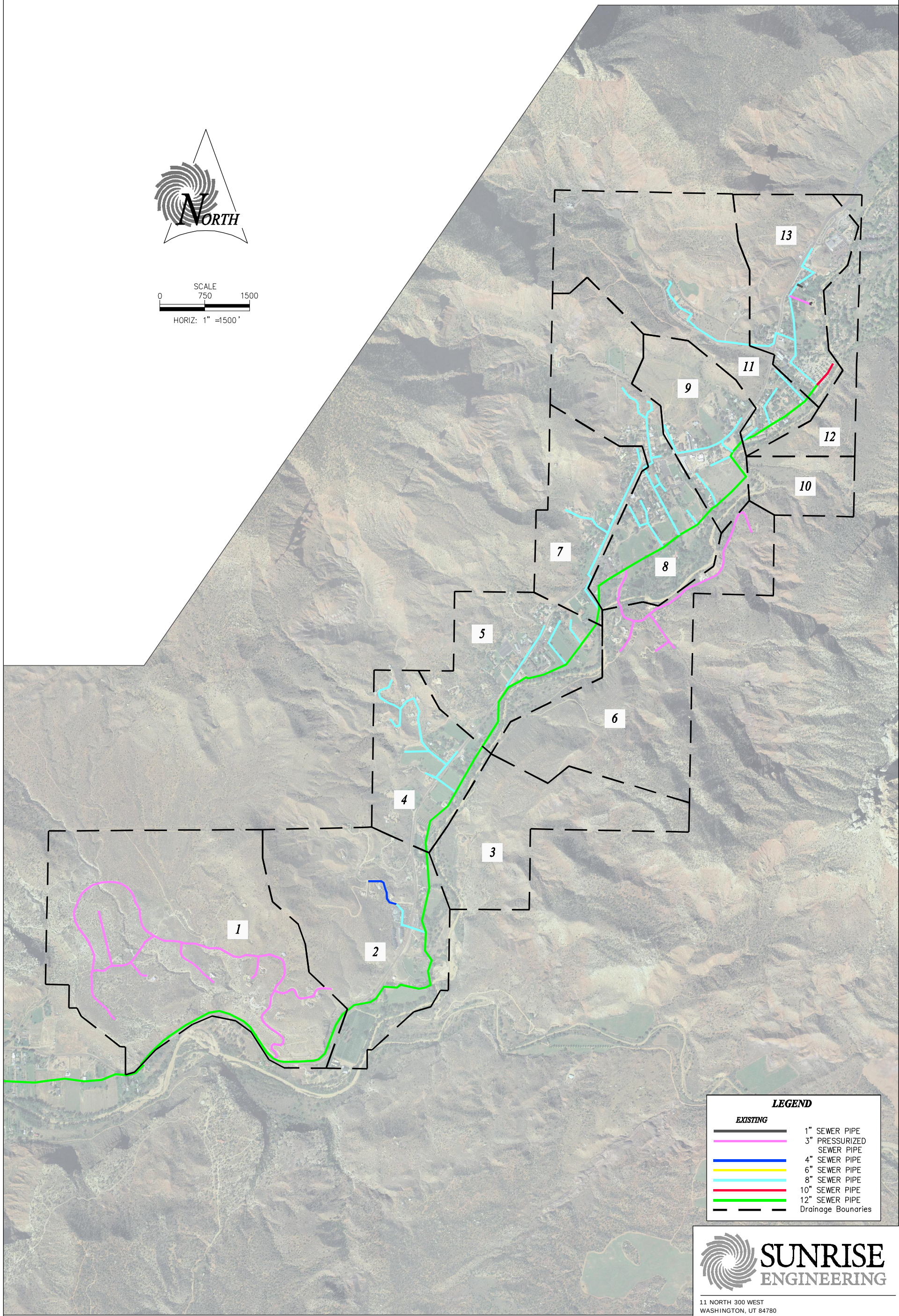
The collection system and treatment facility were initially built to accommodate much of the anticipated future growth in the Town. These improvements have since been paid for and the Town has no existing debt service for any of the past improvements. With this being the case, the Town, according to the restrictions placed on impact fees, cannot charge an impact fee for these past improvements that have already been paid for. It is then recommended that the Town do away with the existing impact fees.

Although the Town had initially built the existing collection system and treatment facility for much of the anticipated future growth, the Town will still need to add additional capacity to certain treatment facility systems and to portions of the current collection system. It is recommended that a facilities plan be updated every three to five years to anticipate when those upgrades will be needed, and then plan accordingly so that the Town can begin to collect impact fees within six years of the anticipated project, keeping within the time allotted for in the impact fee restrictions. It is estimated that when the Town has reached a total of 1,250 ERUs, portions of the main trunk line will need to be upgraded in size. This is projected to occur between 2035 and 2040. Therefore, approximately 6 to 10 years prior, the Town should begin to reevaluate and begin charging an appropriate impact fee.

TOWN OF SPRINGDALE
SEWER DRAINAGE BASINS &
EXISTING COLLECTION SYSTEM
EXHIBIT 1



SCALE
0 750 1500
HORIZ: 1" = 1500'



LEGEND	
EXISTING	
	1" SEWER PIPE
	3" PRESSURIZED SEWER PIPE
	4" SEWER PIPE
	6" SEWER PIPE
	8" SEWER PIPE
	10" SEWER PIPE
	12" SEWER PIPE
	Drainage Boundaries



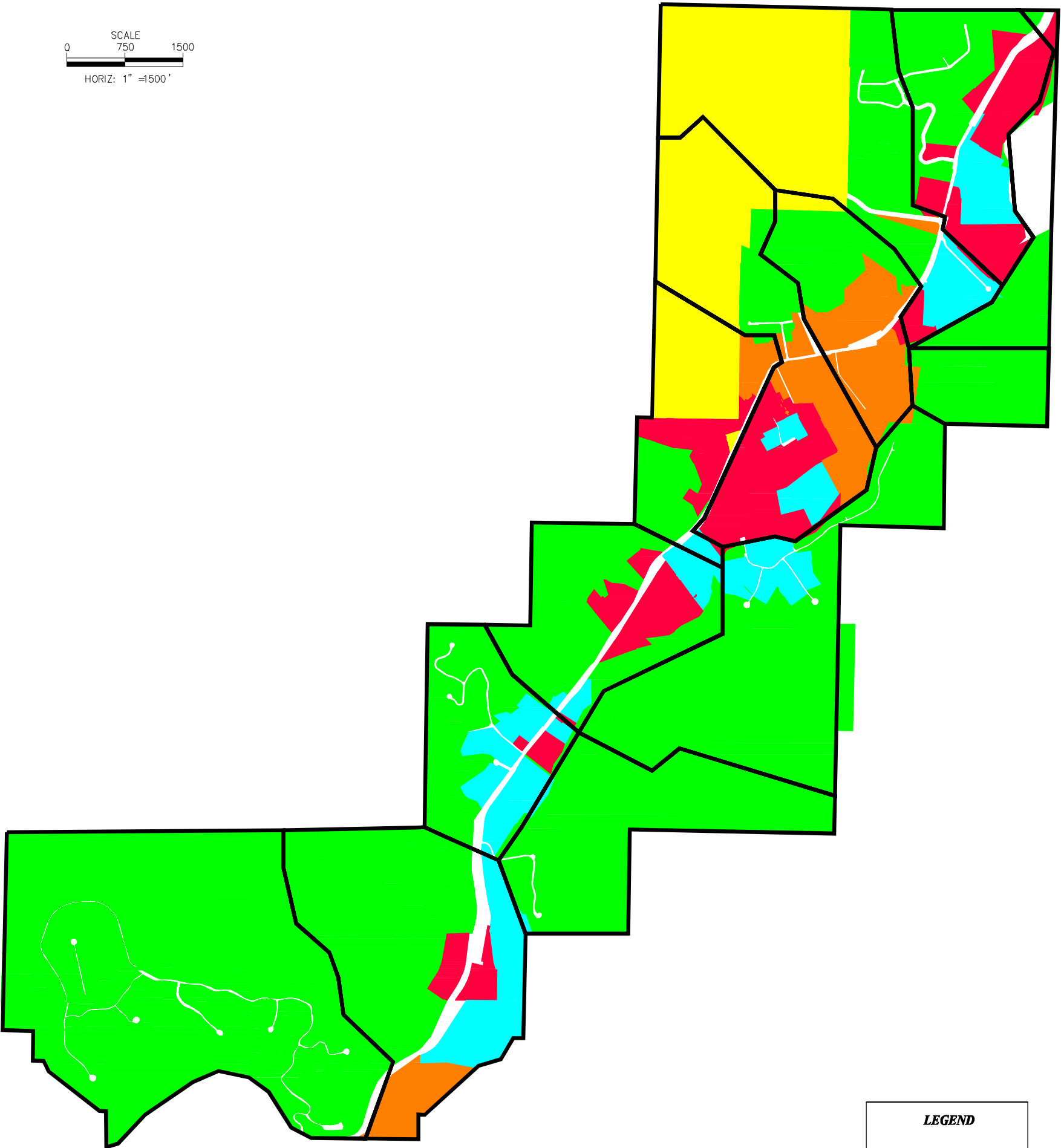
SUNRISE
ENGINEERING

11 NORTH 300 WEST
WASHINGTON, UT 84780
TEL 435.652.8450 • FAX 435.652.8416
www.sunrise-eng.com

TOWN OF SPRINGDALE
ZONING AND DRAINAGE BASINS
EXHIBIT 2



SCALE
0 750 1500
HORIZ: 1" =1500'



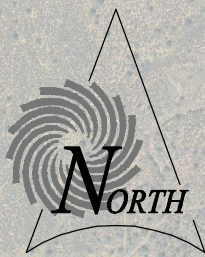
LEGEND	
	Central Commercial
	Foothill Residential
	Public Use
	Valley Residential
	Village Commercial



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**TOWN OF SPRINGDALE
RECOMMENDED IMPROVEMENTS
EXHIBIT 3**



SCALE
0 300 600
HORIZ: 1" = 600'

**PROPOSED 8"
SEWER LINE**

**PROPOSED
METERING STATION**

LEGEND

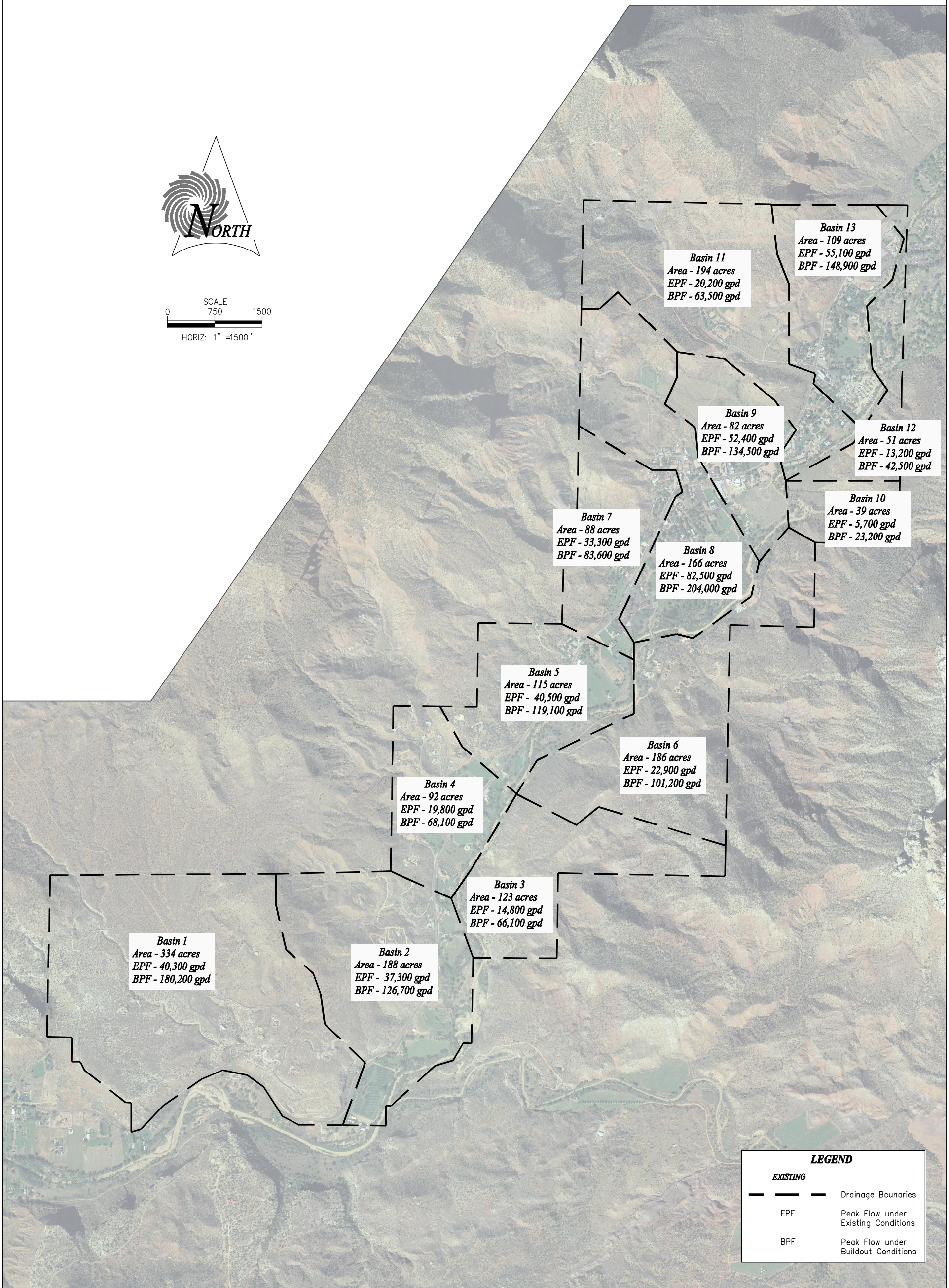
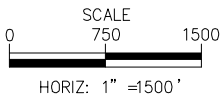
- 3" PRESSURIZED SEWER PIPE
- 8" SEWER PIPE
- 12" SEWER PIPE
- PROPOSED 8" SEWER LINE



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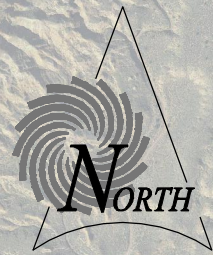
TOWN OF SPRINGDALE
SEWER DRAINAGE BASIN BOUNDARIES & BASIN CHARACTERISTICS
EXHIBIT 4



LEGEND	
EXISTING	
	Drainage Bounaries
EPF	Peak Flow under Existing Conditions
BPF	Peak Flow under Buildout Conditions



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SCALE
0 500 1000
HORIZ: 1" = 1000'

**TOWN OF SPRINGDALE
FUTURE 15" SEWER PIPE SECTION UPGRADE
EXHIBIT 5**

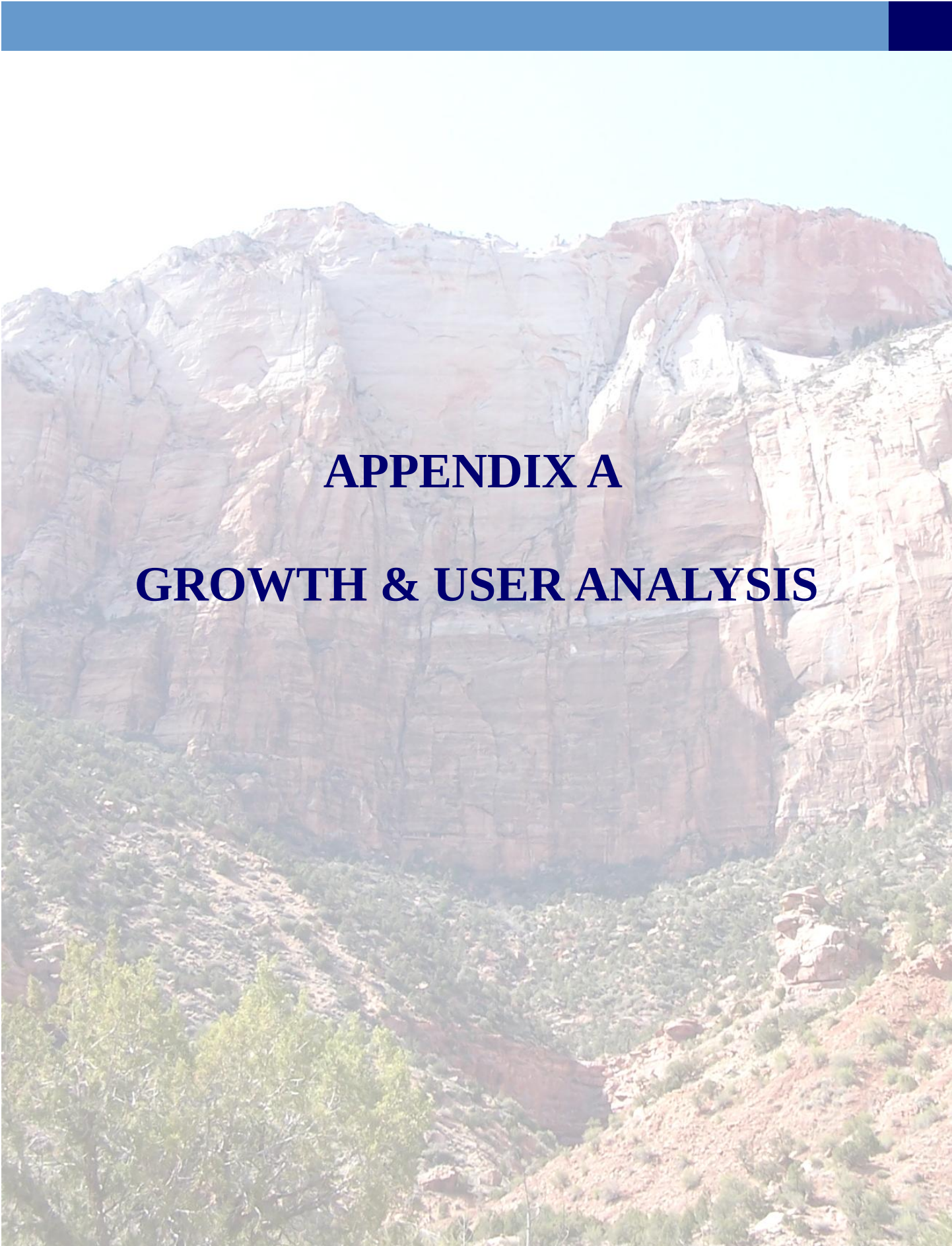
**FUTURE 15" SECTION
UPGRADE**

LEGEND	
	3" PRESSURIZED SEWER PIPE
	8" SEWER PIPE
	12" SEWER PIPE
	PROPOSED 8" SEWER LINE
	FUTURE 15" SECTION UPGRADE



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APPENDIX A

GROWTH & USER ANALYSIS

Billing, Connection, and ERU Data for Wastewater System

	Jan-07		Feb-07		Mar-07		Apr-07		May-07	
	Conn	Rev	Conn	Rev	Conn	Rev	Conn	Rev	Conn	Rev
Residential	209	\$ 7,256	210	\$ 5,444	210	\$ 6,344	210	\$ 6,590	211	\$ 7,312
Outside	55	\$ 1,184	55	\$ 1,145	55	\$ 1,163	54	\$ 1,164	54	\$ 1,164
Unconnected	15	\$ 210	15	\$ 210	15	\$ 210	15	\$ 210	15	\$ 210
Unconn. Outside	4	\$ 56	4	\$ 56	4	\$ 56	4	\$ 56	4	\$ 56
Commercial	79	\$ 3,726	80	\$ 4,484	79	\$ 7,603	79	\$ 11,155	79	\$ 13,592
Rockville Commercial	4	\$ 216	4	\$ 216	4	\$ 213	4	\$ 216	4	\$ 216
\$/Conn										
Residential	12401.5	\$ 34.72	10105.76	\$ 25.93	11224.47	\$ 30.21	11529.84	\$ 31.38	12385.02	\$ 34.65
Outside		\$ 21.53		\$ 20.82		\$ 21.15		\$ 21.56		\$ 21.56
Unconnected		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03
Unconn. Outside		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03
Commercial	15651.55	\$ 47.17	17970.2	\$ 56.05	28463.46	\$ 96.24	40203.06	\$ 141.20	48257.46	\$ 172.05
Rockville Commercial		\$ 53.91		\$ 53.91		\$ 53.24		\$ 53.91		\$ 53.91

	Jun-07		Jul-07		Aug-07		Sep-07		Oct-07	
	Conn	Rev	Conn	Rev	Conn	Rev	Conn	Rev	Conn	Rev
Residential	210	\$ 5,738	212	\$ 10,911	214	\$ 6,440	212	\$ 7,241	212	\$ 7,178
Outside	54	\$ 1,164	54	\$ 1,164	54	\$ 1,164	54	\$ 1,164	54	\$ 1,164
Unconnected	15	\$ 210	15	\$ 210	14	\$ 196	14	\$ 196	14	\$ 196
Unconn. Outside	4	\$ 56	4	\$ 56	4	\$ 56	4	\$ 56	4	\$ 56
Commercial	79	\$ 1,108	79	\$ 31,199	79	\$ 14,246	79	\$ 11,789	79	\$ 13,386
Rockville Commercial	4	\$ 216	4	\$ 216	4	\$ 216	4	\$ 216	4	\$ 216
\$/Conn										
Residential	10470.79	\$ 27.32	16775.26	\$ 51.47	11194.49	\$ 30.09	12255.27	\$ 34.16	12177.1	\$ 33.86
Outside		\$ 21.56		\$ 21.56		\$ 21.56		\$ 21.56		\$ 21.56
Unconnected		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03
Unconn. Outside		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03
Commercial	7000	\$ 14.03	106449.7	\$ 394.92	50419.84	\$ 180.33	42299.27	\$ 149.23	47576.89	\$ 169.44
Rockville Commercial		\$ 53.91		\$ 53.91		\$ 53.91		\$ 53.91		\$ 53.91

	Nov-07		Dec-07		Jan-08		Feb-08		Mar-08	
	Conn	Rev	Conn	Rev	Conn	Rev	Conn	Rev	Conn	Rev
Residential	214	\$ 6,330	212	\$ 6,059	213	\$ 6,490	215	\$ 6,002	213	\$ 6,774
Outside	55	\$ 1,165	54	\$ 1,186	54	\$ 1,164	54	\$ 1,164	55	\$ 1,164
Unconnected	14	\$ 196	14	\$ 196	14	\$ 196	16	\$ 142	14	\$ 196
Unconn. Outside	4	\$ 56	4	\$ 56	4	\$ 56	4	\$ 56	4	\$ 56
Commercial	79	\$ 7,100	80	\$ 3,498	80	\$ 4,466	80	\$ 4,209	79	\$ 8,791
Rockville Commercial	4	\$ 216	4	\$ 216	4	\$ 216	4	\$ 216	4	\$ 216
\$/Conn										
Residential	11059.89	\$ 29.58	10798.62	\$ 28.58	11291.89	\$ 30.47	10625.47	\$ 27.92	11639.9	\$ 31.80
Outside		\$ 21.18		\$ 21.96		\$ 21.56		\$ 21.56		\$ 21.17
Unconnected		\$ 14.03		\$ 14.03		\$ 14.03		\$ 8.89		\$ 14.03
Unconn. Outside		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03		\$ 14.03
Commercial	26802.62	\$ 89.87	14753.66	\$ 43.73	17913.12	\$ 55.83	17072.13	\$ 52.61	32391.58	\$ 111.28
Rockville Commercial		\$ 53.91		\$ 53.91		\$ 53.91		\$ 53.91		\$ 53.91

Billing, Connection, and ERU Data for Wastewater System (cont.)

Average (Jan 07 - Mar 08)			
	Conn	\$/Conn	ERU/Conn
Residential	211.8	\$ 32.14	1
Outside (Rockville Res.)	54.3	\$ 21.46	0.67
Unconnected	14.6	\$ 13.69	0.43
Unconn. Outside	4.0	\$ 14.03	0.44
Commercial	79.3	\$ 118.26	3.68
Rockville Commercial	4.0	\$ 53.87	1.68

Connection & ERU Data (Mar 08)			
	Conn	ERU/Conn	Total ERU
Residential	213	1	213
Outside	55	0.67	37
Unconnected	14	0.43	6
Unconn. Outside	4	0.44	2
Commercial	79	3.68	291
Rockville Commercial	4	1.68	7
	Total		555

		Springdale	Rockville			Springdale	Rockville	Total ERUs
		ERU/Commercial	Conn			Total ERUs by Month		
Jan	1.26	1.36	1.68			312	61	373
Feb	1.78	2.16	1.68			353	61	414
Mar	2.78	3.50	1.68			432	61	493
Apr	3.49	4.50	1.68			488	61	549
May	3.90	4.96	1.68			521	61	582
Jun	6.00	7.32	1.68			687	61	748
Jul	6.35	7.67	1.68			715	61	776
Aug	4.50	5.99	1.68			569	61	630
Sep	3.45	4.37	1.68			485	61	546
Oct	3.91	5.00	1.68			522	61	583
Nov	2.42	3.04	1.68			404	61	465
Dec	1.37	1.53	1.68			320	61	381

Connections and ERU's for Springdale

RESIDENTIAL ERU GROWTH RATE

3.10%

COMMERCIAL GROWTH RATE

1.81%

Year	Estimated Residential ERUs	Estimated Population **			
2006	217	550	2032	478	1,212 *
2007	222	563	2033	493	1,250
2008	229	580	2034	508	1,288
2009	236	598	2035	524	1,328
2010	243	616	2036	540	1,369
2011	251	636	2037	557	1,412
2012	259	656	2038	574	1,455
2013	267	677	2039	592	1,500
2014	275	697	2040	610	1,546
2015	284	720	2041	629	1,594
2016	293	743	2042	648	1,642
2017	302	765	2043	668	1,693
2018	311	788	2044	689	1,746
2019	321	814	2045	710	1,800
2020	331	839	2046	732	1,855
2021	341	864	2047	755	1,914
2022	352	892	2048	778	1,972
2023	363	920	2049	802	2,033
2024	374	948	2050	827	2,096
2025	386	978	2051	853	2,162
2026	398	1,009	2052	879	2,228
2027	410	1,039	2053	906	2,296
2028	423	1,072	2054	934	2,367
2029	436	1,105	2055	963	2,441
2030	450	1,141	2056	993	2,517
2031	464	1,176	2057	1,024	2,595

Year	Estimated Commercial ERUs	Estimated Population **			
2006	435	550	2032	700	1,774
2007	447	1,133	2033	713	1,807
2008	455	1,153	2034	726	1,840
2009	463	1,174	2035	739	1,873
2010	471	1,194	2036	752	1,906
2011	480	1,217	2037	766	1,941
2012	489	1,239	2038	780	1,977
2013	498	1,262	2039	794	2,012
2014	507	1,285	2040	808	2,048
2015	516	1,308	2041	823	2,086
2016	525	1,331	2042	838	2,124
2017	535	1,356	2043	853	2,162
2018	545	1,381	2044	868	2,200
2019	555	1,407	2045	884	2,241
2020	565	1,432	2046	900	2,281
2021	575	1,457	2047	916	2,322
2022	585	1,483	2048	933	2,365
2023	596	1,511	2049	950	2,408
2024	607	1,538	2050	967	2,451
2025	618	1,566	2051	985	2,497
2026	629	1,594	2052	1,003	2,542
2027	640	1,622	2053	1,021	2,588
2028	652	1,653	2054	1,040	2,636
2029	664	1,683	2055	1,059	2,684
2030	676	1,713	2056	1,078	2,732
2031	688	1,744	2057	1,098	2,783

POPULATION DATA:

Town of Springdale			Population	% Growth
1970 Census Population			182	
1980 Census Population			258	3.6%
1990 Census Population			275	0.6%
2000 Census Population			457	5.2%
2006 Estimated Population			550	3.1%
3.6%			Growth rate experienced between 1970 & 1980	
0.6%			Growth rate experienced between 1980 & 1990	
2.1%			Growth rate experienced between 1970 & 1990	
5.2%			Growth rate experienced between 1990 & 2000	
3.1%			Growth rate experienced between 1970 & 2000	
3.1%			Growth rate experienced between 2000 & 2006	
3.1%			Growth rate experienced between 1970 & 2006	
3.10%				
Year	Est. Residential Growth Rate	Estimated Residential ERUs	Estimated Population*	
2005	-	210	532	
2006	-	217	550	
2007	-	222	563	
2008	3.1%	229	580	
2009	3.1%	236	598	
2010	3.1%	243	616	
2011	3.1%	251	636	
2012	3.1%	259	656	
2013	3.1%	267	677	
2014	3.1%	275	697	
2015	3.1%	284	720	
2016	3.1%	293	743	
2017	3.1%	302	765	
2018	3.1%	311	788	
2019	3.1%	321	814	
2020	3.1%	331	839	
2021	3.1%	341	864	
2022	3.1%	352	892	
2023	3.1%	363	920	
2024	3.1%	374	948	
2025	3.1%	386	978	
2026	3.1%	398	1,009	
2027	3.1%	410	1,039	
2028	3.1%	423	1,072	
2029	3.1%	436	1,105	
2030	3.1%	450	1,141	
2031	3.1%	464	1,176	
2032	3.1%	478	1,212	
2033	3.1%	493	1,250	
2034	3.1%	508	1,288	
2035	3.1%	524	1,328	
2036	3.1%	540	1,369	
2037	3.1%	557	1,412	
2038	3.1%	574	1,455	
2039	3.1%	592	1,500	
2040	3.1%	610	1,546	
2041	3.1%	629	1,594	
2042	3.1%	648	1,642	
2043	3.1%	668	1,693	
2044	3.1%	689	1,746	
2045	3.1%	710	1,800	
2046	3.1%	732	1,855	
2047	3.1%	755	1,914	
2048	3.1%	778	1,972	
2049	3.1%	802	2,033	
2050	3.1%	827	2,096	
2051	3.1%	853	2,162	
2052	3.1%	879	2,228	
2053	3.1%	906	2,296	
2054	3.1%	934	2,367	
2055	3.1%	963	2,441	
2056	3.1%	993	2,517	
2057	3.1%	1,024	2,595	

Town of Rockville			Population	% Growth
1970 Census Population			na	
1980 Census Population			156	
1990 Census Population			182	1.6%
2000 Census Population			247	3.1%
2006 Estimated Population			262	1.0%
1.6%			Growth rate experienced between 1980 & 1990	
3.1%			Growth rate experienced between 1990 & 2000	
2.3%			Growth rate experienced between 1980 & 2000	
1.0%			Growth rate experienced between 2000 & 2006	
2.0%			Growth rate experienced between 1980 & 2006	
2.00%				
Year	Est. Residential Growth Rate	Estimated Population* *		
2005	-	245		
2006 *	-	253		
2007	-	262		
2008	2.0%	267		
2009	2.0%	272		
2010	2.0%	277		
2011	2.0%	283		
2012	2.0%	289		
2013	2.0%	295		
2014	2.0%	301		
2015	2.0%	307		
2016	2.0%	313		
2017	2.0%	319		
2018	2.0%	325		
2019	2.0%	332		
2020	2.0%	339		
2021	2.0%	346		
2022	2.0%	353		
2023	2.0%	360		
2024	2.0%	367		
2025	2.0%	374		
2026	2.0%	381		
2027	2.0%	389		
2028	2.0%	397		
2029	2.0%	405		
2030	2.0%	413		
2031	2.0%	421		
2032	2.0%	429		
2033	2.0%	438		
2034	2.0%	447		
2035	2.0%	456		
2036	2.0%	465		
2037	2.0%	474		
2038	2.0%	483		
2039	2.0%	493		
2040	2.0%	503		
2041	2.0%	513		
2042	2.0%	523		
2043	2.0%	533		
2044	2.0%	544		
2045	2.0%	555		
2046	2.0%	566		
2047	2.0%	577		
2048	2.0%	589		
2049	2.0%	601		
2050	2.0%	613		
2051	2.0%	625		
2052	2.0%	638		
2053	2.0%	651		
2054	2.0%	664		
2055	2.0%	677		
2056	2.0%	691		
2057	2.0%	705		



APPENDIX B

SEWER SYSTEM CAPACITY

PIPE SEGMENT: Zion National Park to Treatment Lagoons for 2008

Pipeline Data						Flow Analysis								
pipe segment number	manning's coefficient (n)	pipe segment length (ft)	Upstream invert elevation (ft)	Downstream invert elevation (ft)	pipe slope (%)	upstream fluid inflow (cfs)	cumulative pipe flow, Q (cfs)	calculated required size (in)	nearest standard size (in)	chosen pipe size (in)	full pipe capacity, Q _{full} (cfs)	Q / Q _{full}	V / V _{full}	actual pipe velocity, V (cfs)
1	0.013	362	3931.57	3929.86	0.47%	0.410	0.410	6.1	8	8	0.8	0.49	0.84	2.0
2	0.013	230	3929.86	3918.39	4.99%	0.000	0.410	3.9	8	8	2.7	0.15	0.62	4.8
3	0.013	342	3918.39	3916.42	0.58%	0.000	0.410	5.9	8	8	0.9	0.45	0.82	2.2
4	0.013	235	3916.42	3913.43	1.27%	0.000	0.410	5.1	8	8	1.4	0.30	0.73	2.9
5	0.013	403	3913.43	3908.25	1.29%	0.000	0.410	5.1	8	8	1.4	0.30	0.73	2.9
6	0.013	364	3908.25	3902.42	1.60%	0.000	0.410	4.9	8	8	1.5	0.27	0.71	3.1
7	0.013	238	3902.42	3897.18	2.20%	0.031	0.441	4.7	8	8	1.8	0.25	0.70	3.6
8	0.013	738	3897.18	3882.45	2.00%	0.000	0.441	4.8	8	8	1.7	0.26	0.71	3.5
9	0.013	325	3882.45	3878.22	1.30%	0.106	0.547	5.7	8	8	1.4	0.40	0.79	3.1
10	0.013	424	3878.22	3874.27	0.93%	0.000	0.547	6.0	8	8	1.2	0.47	0.83	2.8
11	0.013	292	3874.27	3871.05	1.10%	0.000	0.547	5.8	8	12	3.8	0.15	0.61	2.9
12	0.013	362	3871.05	3866.82	1.17%	0.009	0.556	5.8	8	12	3.9	0.14	0.61	3.0
13	0.013	455	3866.82	3863.66	0.69%	0.000	0.556	6.4	8	12	3.0	0.19	0.65	2.5
14	0.013	518	3863.66	3860.31	0.65%	0.081	0.637	6.8	8	12	2.9	0.22	0.68	2.5
15	0.013	348	3860.31	3859.41	0.26%	0.000	0.637	8.1	10	12	1.8	0.35	0.76	1.8
16	0.013	336	3859.41	3858.62	0.24%	0.000	0.637	8.3	10	12	1.7	0.37	0.77	1.7
17	0.013	456	3858.62	3857.55	0.23%	0.000	0.637	8.3	10	12	1.7	0.37	0.77	1.7
18	0.013	342	3857.55	3856.78	0.23%	0.000	0.637	8.3	10	12	1.7	0.38	0.78	1.7
19	0.013	342	3856.78	3855.98	0.23%	0.000	0.637	8.3	10	12	1.7	0.37	0.78	1.7
20	0.013	360	3855.98	3854.21	0.49%	0.128	0.764	7.7	8	12	2.5	0.31	0.74	2.4
21	0.013	347	3854.21	3851.43	0.80%	0.000	0.764	7.0	8	12	3.2	0.24	0.69	2.8
22	0.013	358	3851.43	3848.80	0.73%	0.035	0.800	7.3	8	12	3.1	0.26	0.71	2.8
23	0.013	186	3848.80	3847.33	0.79%	0.000	0.800	7.2	8	12	3.2	0.25	0.70	2.8
24	0.013	396	3847.33	3835.04	3.10%	0.000	0.800	5.5	8	12	6.3	0.13	limits	limits
25	0.013	255	3835.04	3830.03	1.96%	0.051	0.851	6.2	8	12	5.0	0.17	0.64	4.0
26	0.013	404	3830.03	3827.22	0.70%	0.000	0.851	7.5	8	12	3.0	0.29	0.73	2.8
27	0.013	428	3827.22	3818.34	2.07%	0.000	0.851	6.1	8	12	5.1	0.17	0.63	4.1
28	0.013	420	3818.34	3813.65	1.12%	0.000	0.851	6.9	8	12	3.8	0.23	0.68	3.3
29	0.013	391	3813.65	3811.35	0.59%	0.000	0.851	7.7	8	12	2.7	0.31	0.74	2.6
30	0.013	225	3811.35	3810.80	0.24%	0.000	0.851	9.1	10	12	1.8	0.48	0.84	1.9
31	0.013	312	3810.80	3809.09	0.55%	0.063	0.914	8.1	10	12	2.6	0.35	0.76	2.6
32	0.013	328	3809.09	3803.73	1.63%	0.000	0.914	6.6	8	12	4.6	0.20	0.66	3.8
33	0.013	364	3803.73	3801.20	0.70%	0.000	0.914	7.7	8	12	3.0	0.31	0.74	2.8
34	0.013	378	3801.20	3799.94	0.33%	0.000	0.914	8.9	10	12	2.1	0.44	0.82	2.1
35	0.013	319	3799.94	3798.27	0.52%	0.000	0.914	8.1	10	12	2.6	0.35	0.77	2.5
36	0.013	312	3798.27	3796.54	0.55%	0.000	0.914	8.0	10	12	2.7	0.34	0.76	2.6
37	0.013	268	3796.54	3795.14	0.52%	0.031	0.944	8.2	10	12	2.6	0.37	0.77	2.5
38	0.013	377	3795.14	3792.89	0.60%	0.000	0.944	8.0	10	12	2.8	0.34	0.76	2.7
39	0.013	371	3792.89	3791.90	0.27%	0.000	0.944	9.3	10	12	1.8	0.51	0.85	2.0
40	0.013	408	3791.90	3791.06	0.21%	0.023	0.967	9.9	10	12	1.6	0.60	0.90	1.8
41	0.013	363	3791.06	3790.35	0.20%	0.000	0.967	10.0	10	12	1.6	0.61	0.90	1.8
42	0.013	546	3790.35	3789.26	0.20%	0.000	0.967	10.0	10	12	1.6	0.61	0.90	1.8
43	0.013	204	3789.26	3788.08	0.58%	0.000	0.967	8.2	10	12	2.7	0.36	0.77	2.7
44	0.013	317	3788.08	3785.73	0.74%	0.058	1.025	8.0	8	12	3.1	0.33	0.75	3.0
45	0.013	384	3785.73	3784.01	0.45%	0.000	1.025	8.7	10	12	2.4	0.43	0.81	2.5
46	0.013	441	3784.01	3777.72	1.43%	0.000	1.025	7.0	8	12	4.3	0.24	0.69	3.8
47	0.013	402	3777.72	3776.14	0.39%	0.000	1.025	9.0	10	12	2.2	0.46	0.83	2.4
48	0.013	563	3776.14	3774.78	0.24%	0.000	1.025	9.8	10	12	1.8	0.58	0.89	2.0
49	0.013	521	3774.78	3772.34	0.47%	0.000	1.025	8.7	10	12	2.4	0.42	0.80	2.5
50	0.013	472	3772.34	3770.45	0.40%	0.000	1.025	8.9	10	12	2.3	0.45	0.82	2.4
51	0.013	477	3770.45	3769.39	0.22%	0.000	1.025	10.0	10	12	1.7	0.61	0.90	1.9
52	0.013	492	3769.39	3766.78	0.53%	0.000	1.025	8.5	10	12	2.6	0.39	0.79	2.6
53	0.013	342	3766.78	3764.27	0.73%	0.062	1.087	8.1	10	12	3.1	0.36	0.77	3.0
54	0.013	506	3764.27	3759.27	0.99%	0.000	1.087	7.7	8	12	3.6	0.31	0.74	3.3
55	0.013	408	3759.27	3755.30	0.97%	0.000	1.087	7.7	8	12	3.5	0.31	0.74	3.3
56	0.013	791	3755.30	3752.32	0.38%	0.000	1.087	9.2	10	12	2.2	0.50	0.85	2.4
57	0.013	456	3752.32	3746.80	1.21%	0.000	1.087	7.4	8	12	3.9	0.28	0.72	3.6
58	0.013	524	3746.80	3743.31	0.67%	0.000	1.087	8.3	10	12	2.9	0.37	0.78	2.9
59	0.013	566	3744.31	3742.08	0.39%	0.000	1.087	9.2	10	12	2.2	0.48	0.84	2.4
60	0.013	872	3743.08	3740.42	0.31%	0.000	1.087	9.6	10	12	2.0	0.55	0.88	2.2
61	0.013	507	3740.42	3739.22	0.24%	0.000	1.087	10.1	12	12	1.7	0.63	0.91	2.0
62	0.013	639	3739.22	3736.67	0.40%	0.000	1.087	9.1	10	12	2.3	0.48	0.84	2.4
63	0.013	272	3736.67	3735.98	0.25%	0.000	1.087	9.9	10	12	1.8	0.60	0.90	2.1
64	0.013	724	3735.98	3733.30	0.37%	0.000	1.087	9.3	10	12	2.2	0.50	0.85	2.3
65	0.013	288	3734.30	3732.06	0.78%	0.000	1.087	8.1	10	12	3.2	0.35	0.76	3.1
66	0.013	667	3733.06	3728.75	0.65%	0.000	1.087	8.3	10	12	2.9	0.38	0.78	2.9
67	0.013	814	3728.75	3725.50	0.40%	0.000	1.087	9.1	10	12	2.3	0.48	0.84	2.4
68	0.013	746	3725.50	3722.14	0.45%	0.000	1.087	8.9	10	12	2.4	0.45	0.82	2.5
69	0.013	435	3722.14	3718.67	0.80%	0.000	1.087	8.0	10	12	3.2	0.34	0.76	3.1
70	0.013	611	3718.67	3714.39	0.70%	0.000	1.087	8.2	10	12	3.0	0.36	0.77	2.9
71	0.013	558	3714.39	3711.01	0.61%	0.103	1.191	8.7	10	12	2.8	0.43	0.81	2.9
72	0.013	1129	3711.01	3706.74	0.38%	0.000	1.191	9.5	10	12	2.2	0.54	0.87	2.4
73	0.013	411	3706.74	3704.84	0.46%	0.000	1.191	9.2	10	12	2.4	0.49	0.84	2.6
74	0.013	704	3704.84	3701.31	0.50%	0.000	1.191	9.1	10	12	2.5	0.47	0.83	2.7
75	0.013	380	3701.31	3699.10	0.58%	0.000	1.191	8.8	10	12	2.7	0.44	0.81	2.8
76	0.013	269	3699.10	3696.90	0.82%	0.000	1.191	8.3	10	12	3.2	0.37	0.78	3.2

PIPE SEGMENT: Zion National Park to Treatment Lagoons for Buildout

Pipeline Data						Flow Analysis								
pipe segment number	manning's coefficient (n)	pipe segment length (ft)	Upstream invert elevation (ft)	Downstream invert elevation (ft)	pipe slope (%)	upstream fluid inflow (cfs)	cumulative pipe flow, Q (cfs)	calculated required size (in)	nearest standard size (in)	chosen pipe size (in)	full pipe capacity, Q _{full} (cfs)	Q / Q _{full}	V / V _{full}	actual pipe velocity, V (cfs)
1	0.013	362	3931.57	3929.86	0.47%	0.508	0.508	6.7	8	8	0.8	0.61	0.90	2.2
2	0.013	230	3929.86	3918.39	4.99%	0.000	0.508	4.3	8	8	2.7	0.19	0.65	5.0
3	0.013	342	3918.39	3916.42	0.58%	0.000	0.508	6.4	8	8	0.9	0.55	0.88	2.3
4	0.013	235	3916.42	3913.43	1.27%	0.000	0.508	5.5	8	8	1.4	0.37	0.78	3.0
5	0.013	403	3913.43	3908.25	1.29%	0.000	0.508	5.5	8	8	1.4	0.37	0.78	3.1
6	0.013	364	3908.25	3902.42	1.60%	0.000	0.508	5.3	8	8	1.5	0.33	0.75	3.3
7	0.013	238	3902.42	3897.18	2.20%	0.098	0.606	5.3	8	8	1.8	0.34	0.76	3.9
8	0.013	738	3897.18	3882.45	2.00%	0.000	0.606	5.4	8	8	1.7	0.35	0.77	3.8
9	0.013	325	3882.45	3878.22	1.30%	0.296	0.902	6.8	8	8	1.4	0.65	0.92	3.6
10	0.013	424	3878.22	3874.27	0.93%	0.000	0.902	7.3	8	8	1.2	0.77	0.97	3.3
11	0.013	292	3874.27	3871.05	1.10%	0.000	0.902	7.0	8	12	3.8	0.24	0.69	3.3
12	0.013	362	3871.05	3866.82	1.17%	0.036	0.938	7.1	8	12	3.9	0.24	0.70	3.4
13	0.013	455	3866.82	3863.66	0.69%	0.000	0.938	7.8	8	12	3.0	0.32	0.74	2.8
14	0.013	518	3863.66	3860.31	0.65%	0.208	1.146	8.5	10	12	2.9	0.40	0.79	2.9
15	0.013	348	3860.31	3859.41	0.26%	0.000	1.146	10.1	12	12	1.8	0.63	0.91	2.1
16	0.013	336	3859.41	3858.62	0.24%	0.000	1.146	10.3	12	12	1.7	0.66	0.92	2.0
17	0.013	456	3858.62	3857.55	0.23%	0.000	1.146	10.3	12	12	1.7	0.66	0.92	2.0
18	0.013	342	3857.55	3856.78	0.23%	0.000	1.146	10.4	12	12	1.7	0.68	0.93	2.0
19	0.013	342	3856.78	3855.98	0.23%	0.000	1.146	10.3	12	12	1.7	0.66	0.93	2.0
20	0.013	360	3855.98	3854.21	0.49%	0.316	1.462	9.8	10	12	2.5	0.58	0.89	2.8
21	0.013	347	3854.21	3851.43	0.80%	0.000	1.462	9.0	10	12	3.2	0.46	0.83	3.4
22	0.013	358	3851.43	3848.80	0.73%	0.157	1.618	9.5	10	12	3.1	0.53	0.86	3.4
23	0.013	186	3848.80	3847.33	0.79%	0.000	1.618	9.3	10	12	3.2	0.51	0.85	3.4
24	0.013	396	3847.33	3835.04	3.10%	0.000	1.618	7.2	8	12	6.3	0.26	0.71	5.7
25	0.013	255	3835.04	3830.03	1.96%	0.129	1.748	8.1	10	12	5.0	0.35	0.76	4.9
26	0.013	404	3830.03	3827.22	0.70%	0.000	1.748	9.8	10	12	3.0	0.59	0.89	3.4
27	0.013	428	3827.22	3818.34	2.07%	0.000	1.748	8.0	10	12	5.1	0.34	0.76	5.0
28	0.013	420	3818.34	3813.65	1.12%	0.000	1.748	9.0	10	12	3.8	0.46	0.83	4.0
29	0.013	391	3813.65	3811.35	0.59%	0.000	1.748	10.1	12	12	2.7	0.64	0.91	3.2
30	0.013	225	3811.35	3810.80	0.24%	0.000	1.748	12.0	12	12	1.8	0.99	1.04	2.3
31	0.013	312	3810.80	3809.09	0.55%	0.184	1.932	10.7	12	12	2.6	0.73	0.95	3.2
32	0.013	328	3809.09	3803.73	1.63%	0.000	1.932	8.7	10	12	4.6	0.42	0.81	4.7
33	0.013	364	3803.73	3801.20	0.70%	0.000	1.932	10.2	12	12	3.0	0.65	0.92	3.5
34	0.013	378	3801.20	3799.94	0.33%	0.000	1.932	11.7	12	12	2.1	0.94	1.03	2.7
35	0.013	319	3799.94	3798.27	0.52%	0.000	1.932	10.8	12	12	2.6	0.75	0.96	3.2
36	0.013	312	3798.27	3796.54	0.55%	0.000	1.932	10.7	12	12	2.7	0.73	0.95	3.2
37	0.013	268	3796.54	3795.14	0.52%	0.105	2.037	11.0	12	12	2.6	0.79	0.98	3.2
38	0.013	377	3795.14	3792.89	0.60%	0.000	2.037	10.7	12	12	2.8	0.74	0.96	3.4
39	0.013	371	3792.89	3791.90	0.27%	0.000	2.037	12.5	15	15	3.3	0.61	0.90	2.5
40	0.013	408	3791.90	3791.06	0.21%	0.102	2.140	13.3	15	15	2.9	0.73	0.95	2.3
41	0.013	363	3791.06	3790.35	0.20%	0.000	2.140	13.5	15	15	2.9	0.75	0.96	2.2
42	0.013	546	3790.35	3789.26	0.20%	0.000	2.140	13.4	15	15	2.9	0.74	0.96	2.3
43	0.013	204	3789.26	3788.08	0.58%	0.000	2.140	11.0	12	15	4.9	0.43	0.81	3.3
44	0.013	317	3788.08	3785.73	0.74%	0.196	2.336	10.8	12	15	5.6	0.42	0.80	3.7
45	0.013	384	3785.73	3784.01	0.45%	0.000	2.336	11.9	12	15	4.3	0.54	0.87	3.1
46	0.013	441	3784.01	3777.72	1.43%	0.000	2.336	9.6	10	15	7.7	0.30	0.74	4.6
47	0.013	402	3777.72	3776.14	0.39%	0.000	2.336	12.2	15	15	4.1	0.58	0.89	2.9
48	0.013	563	3776.14	3774.78	0.24%	0.000	2.336	13.4	15	15	3.2	0.73	0.96	2.5
49	0.013	521	3774.78	3772.34	0.47%	0.000	2.336	11.8	12	15	4.4	0.53	0.86	3.1
50	0.013	472	3772.34	3770.45	0.40%	0.000	2.336	12.2	15	15	4.1	0.57	0.88	3.0
51	0.013	477	3770.45	3769.39	0.22%	0.000	2.336	13.6	15	15	3.1	0.76	0.97	2.4
52	0.013	492	3769.39	3766.78	0.53%	0.000	2.336	11.5	12	15	4.7	0.50	0.85	3.2
53	0.013	342	3766.78	3764.27	0.73%	0.279	2.615	11.3	12	15	5.5	0.47	0.83	3.8
54	0.013	506	3764.27	3759.27	0.99%	0.000	2.615	10.7	12	15	6.4	0.41	0.80	4.2
55	0.013	408	3759.27	3755.30	0.97%	0.000	2.615	10.7	12	15	6.4	0.41	0.80	4.2
56	0.013	791	3755.30	3752.32	0.38%	0.000	2.615	12.8	15	15	4.0	0.66	0.92	3.0
57	0.013	456	3752.32	3746.80	1.21%	0.000	2.615	10.3	12	15	7.1	0.37	0.77	4.5
58	0.013	524	3746.80	3743.31	0.67%	0.000	2.615	11.5	12	15	5.3	0.49	0.85	3.6
59	0.013	566	3744.31	3742.08	0.39%	0.000	2.615	12.7	15	15	4.1	0.64	0.92	3.0
60	0.013	872	3743.08	3740.42	0.31%	0.000	2.615	13.3	15	15	3.6	0.73	0.95	2.8
61	0.013	507	3740.42	3739.22	0.24%	0.000	2.615	14.0	15	15	3.2	0.83	0.99	2.6
62	0.013	639	3739.22	3736.67	0.40%	0.000	2.615	12.7	15	15	4.1	0.64	0.91	3.0
63	0.013	272	3736.67	3735.98	0.25%	0.000	2.615	13.8	15	15	3.3	0.80	0.98	2.6
64	0.013	724	3735.98	3733.30	0.37%	0.000	2.615	12.9	15	15	3.9	0.66	0.93	3.0
65	0.013	288	3734.30	3732.06	0.78%	0.000	2.615	11.2	12	15	5.7	0.46	0.83	3.8
66	0.013	667	3733.06	3728.75	0.65%	0.000	2.615	11.6	12	15	5.2	0.50	0.85	3.6
67	0.013	814	3728.75	3725.50	0.40%	0.000	2.615	12.7	15	15	4.1	0.64	0.91	3.0
68	0.013	746	3725.50	3722.14	0.45%	0.000	2.615	12.4	15	15	4.3	0.60	0.90	3.2
69	0.013	435	3722.14	3718.67	0.80%	0.000	2.615	11.1	12	15	5.8	0.45	0.82	3.9
70	0.013	611	3718.67	3714.39	0.70%	0.000	2.615	11.4	12	15	5.4	0.48	0.84	3.7
71	0.013	558	3714.39	3711.01	0.61%	0.273	2.887	12.2	15	15	5.0	0.57	0.89	3.6
72	0.013	1129	3711.01	3706.74	0.38%	0.000	2.887	13.3	15	15	4.0	0.72	0.95	3.1
73	0.013	411	3706.74	3704.84	0.46%	0.000	2.887	12.8	15	15	4.4	0.66	0.92	3.3
74	0.013	704	3704.84	3701.31	0.50%	0.000	2.887	12.6	15	15	4.6	0.63	0.91	3.4
75	0.013	380	3701.31	3699.10	0.58%	0.000	2.887	12.3	15	15	4.9	0.58	0.89	3.6
76	0.013	269	3699.10	3696.90	0.82%	0.000	2.887	11.5	12	15	5.9	0.49	0.84	4.0

Lagoon Hydraulic Analysis at Buildout

Existing Detention Volume									
Detention Volume (Cell #1) = Total Volume		-	Sludge Volume(18 inches)		=	Detention Volume			
(aeration cells)	35,028,225 gallons	-	5,346,851	gallons	=	29,681,375	gallons		
Detention Volume (Cell #2) = Total Volume		-	Sludge Volume(18 inches)		=	Detention Volume			
(storage cell)	28,620,802 gallons	-	4,364,477	gallons	=	24,256,325	gallons		
Total Existing Detention Volume =						53,937,700	gallons		
Detention Time Calculation									
Rule R317-3-10-F-2a									
Minimum of 30 days or value obtained from									
*Note: Using alternate 45/45 effluents limits, only 77.5% removal is required									
(		1	/	0.225	)	-	1	=	25.0 days
		2.3		X		0.06		so use	30.0 days
Detention Volume Required for the Aeration Cells Only									
Daily Flow Rate =		7382	people	X	100	gallons	=	738,200	gallons
						person -day		day	Extra Volume Remaining (gallons)
Detention Volume Required =		738200	gallons	X	30.00	days	=	22,146,000	gallons
						day	=	2,960,695	ft^3

Collection Basins - Total Flow, Acres by Basin, & Theoretical Populations

Existing Conditions - 2008

Zoning Classification	ERU's per acre	People per acre	Number of Theoretical People in a particular Zone and Drainage Area												
			1	2	3	4	5	6	7	8	9	10	11	12	13
Foothill Residential	0.19	0.48	161	58	59	25	38	80	5	3	16	18	20	21	23
Valley Residential	0.19	0.48	-	17	-	15	4	9	2	7	-	-	9	-	8
Village Commercial	1.69	4.28	-	70	-	39	120	-	97	203	23	-	52	32	189
Central Commercial	1.69	4.28	-	-	-	-	-	2	29	117	170	4	-	-	-
Public Use	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agricultural	0.1	0.25	-	4	-	-	-	-	-	-	-	-	-	-	-
Federal Lands	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Flow at 250 gallons per capita per day (gpcd)			40,292	37,311	14,791	19,763	40,472	22,920	33,274	82,524	52,434	5,681	20,247	13,181	55,138

Zoning Classification		Total Number of Acres of a particular Zone within each Drainage Area													
		1	2	3	4	5	6	7	8	9	10	11	12	13	
Foothill Residential		334.09	119.74	122.64	51.54	77.75	165.54	9.56	7.03	32.97	38.06	40.83	43.18	47.53	
Valley Residential		0.00	34.75	0.00	30.81	9.11	19.51	4.46	13.99	0.00	0.00	18.45	0.00	17.15	
Village Commercial		0.00	16.43	0.00	9.19	28.04	0.00	22.77	47.45	5.46	0.00	12.24	7.45	44.25	
Central Commercial		0.00	0.00	0.00	0.00	0.00	0.56	6.75	27.32	39.84	1.02	0.00	0.00	0.00	
Public Use		0.00	0.00	0.00	0.00	0.00	0.00	44.91	70.13	4.00	0.00	122.95	0.00	0.00	
Agricultural		0.00	17.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Federal Lands		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Area	(ft^2)		14,553,037	8,201,537	5,342,381	3,987,653	5,004,656	8,085,407	3,852,729	7,227,211	3,583,041	1,702,137	8,471,295	2,205,422	4,744,680
	Acres		334	188	123	92	115	186	88	166	82	39	194	51	109

Town of Springdale ERU Estimates			ERC	Current ERUs	Est. ERU Buildout
	Current	Estimated			
Residential Connections	222	1022	1	222	1022
Hotel Rooms	666	1666	0.5	333	833
Restaurants	12	30	5.5	66	165
Other connections ERU	24	50	2	48	100
Totals	924	2768		669	2120

	Current Figures as of 2005				From the General Plan
	Total Acreage		Vacant Acreage		
Residential	1201		721		
Foothill Residential	1053		661		
Valley Residential	148		60		
Commercial	269		114		
Central Commercial	76		32		
Village Commercial	193		81		
	Current as of 2005		Est. at 2008		
	ERUs / Acre		ERUs / Acre		
Residential	0.18		0.19		
Commercial / Other	1.66		1.69		

Collection Basins - Total Flow, Acres by Basin, & Theoretical Populations

Future Conditions - 2057

Zoning Classification	ERU's per acre	People per acre	Number of Theoretical People in a particular Zone and Drainage Area												
			1	2	3	4	5	6	7	8	9	10	11	12	13
Foothill Residential	0.85	2.16	721	258	265	111	168	357	21	15	71	82	88	93	103
Valley Residential	0.85	2.16	-	75	-	66	20	42	10	30	-	-	40	-	37
Village Commercial	4.07	10.31	-	169	-	95	289	-	235	489	56	-	126	77	456
Central Commercial	4.07	10.31	-	-	-	-	-	6	70	282	411	11	-	-	-
Public Use	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agricultural	0.1	0.25	-	4	-	-	-	-	-	-	-	-	-	-	-
Federal Lands	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Flow at 250 gallons per capita per day (gpcd)			180,170	126,761	66,140	68,093	119,096	101,246	83,637	204,012	134,504	23,152	63,519	42,492	148,907

Zoning Classification		Total Number of Acres of a particular Zone within each Drainage Area													
		1	2	3	4	5	6	7	8	9	10	11	12	13	
Foothill Residential		334.09	119.74	122.64	51.54	77.75	165.54	9.56	7.03	32.97	38.06	40.83	43.18	47.53	
Valley Residential		0.00	34.75	0.00	30.81	9.11	19.51	4.46	13.99	0.00	0.00	18.45	0.00	17.15	
Village Commercial		0.00	16.43	0.00	9.19	28.04	0.00	22.77	47.45	5.46	0.00	12.24	7.45	44.25	
Central Commercial		0.00	0.00	0.00	0.00	0.00	0.56	6.75	27.32	39.84	1.02	0.00	0.00	0.00	
Public Use		0.00	0.00	0.00	0.00	0.00	0.00	44.91	70.13	4.00	0.00	122.95	0.00	0.00	
Agricultural		0.00	17.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Federal Lands		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Area	(ft^2)		14,553,037	8,201,537	5,342,381	3,987,653	5,004,656	8,085,407	3,852,729	7,227,211	3,583,041	1,702,137	8,471,295	2,205,422	4,744,680
	Acres		334	188	123	92	115	186	88	166	82	39	194	51	109

Town of Springdale ERU Estimates			ERC	Current ERUs	Est. ERU Buildout
	Current	Estimated			
Residential Connections	222	1022	1	222	1022
Hotel Rooms	666	1666	0.5	333	833
Restaurants	12	30	5.5	66	165
Other connections ERU	24	50	2	48	100
Totals	924	2768		669	2120

	Current Figures as of 2005				From the General Plan
	Total Acreage		Vacant Acreage		
Residential	1201		721		
Foothill Residential	1053		661		
Valley Residential	148		60		
Commercial	269		114		
Central Commercial	76		32		
Village Commercial	193		81		
	Current as of 2005		Est. at Buildout		
	ERUs / Acre		ERUs / Acre		
Residential	0.18		0.85		
Commercial / Other	1.66		4.07		

Flow into Treatment Lagoons based on Actual and Theoretical Data

Flow based on actual data received from the Town of Springdale

Month	Days/Month	total gallons/month by year			Average Total
		2006	2007	2008	Gallons/Month
January	31	1,900,000	2,100,000	1,920,000	1,973,333
February	28	4,530,000	1,620,000	3,120,000	3,090,000
March	31	5,027,000	2,930,000	4,630,000	4,195,667
April	30	3,750,000	3,720,000	5,920,000	4,463,333
May	31	4,890,000	6,450,000	5,730,000	5,690,000
June	30	5,590,000	10,010,000	6,550,000	7,383,333
July	31	6,320,000	9,450,000		7,885,000
August	31	5,690,000	7,990,000		6,840,000
September	30	4,650,000	6,370,000		5,510,000
October	31	3,630,000	4,920,000		4,275,000
November	30	2,860,000	3,100,000		2,980,000
December	31	2,370,000	2,120,000		2,245,000
Actual Total Flow/Year					56,530,667

Flow based on number of ERUs according to month and Connection Data

				Average Flow/ERU/Day					
				185					
				Average Flow/ERU/Month					
				5,550					
		Springdale (gal/month)		Rockville (gal/month)		Zion N. P.	% Difference		
		Residential	Commercial	Residential	Commercial	(gal/month)	From Actual	Total gal/month	
January		1,175,490	555,222	301,550	28,018	434,000	26%	2,494,280	
February		1,175,490	782,290	301,550	39,476	784,000	0%	3,082,806	
March		1,175,490	1,224,240	301,550	61,778	1,395,000	-1%	4,158,058	
April		1,175,490	1,533,979	301,550	77,409	1,800,000	10%	4,888,428	
May		1,175,490	1,714,159	301,550	86,501	2,325,000	-2%	5,602,700	
June		1,175,490	2,639,580	301,550	133,200	2,790,000	-5%	7,039,820	
July		1,175,490	2,791,635	301,550	140,873	3,255,000	-3%	7,664,548	
August		1,175,490	1,981,439	301,550	99,988	2,945,000	-5%	6,503,467	
September		1,175,490	1,518,426	301,550	76,624	2,280,000	-3%	5,352,089	
October		1,175,490	1,718,841	301,550	86,737	1,395,000	9%	4,677,618	
November		1,175,490	1,066,129	301,550	53,800	600,000	7%	3,196,969	
December		1,175,490	601,056	301,550	30,331	496,000	16%	2,604,427	
						Theoretical Total Flow/Year		57,265,211	

Existing Lagoon Organic Analysis

REQUIRED OXYGEN									
Existing Theoretical Population =	2562	people							
Buildout Theoretical Population =	7380	people							
% with Garbage Disposals =	50.0%		Assume	0.22	lbs BOD per Person per Day				
% without Garbage Disposals =	50.0%		Assume	0.17	lbs BOD per Person per Day				
lbs of Oxygen Required per day = (Garbage Disposals)	1281	people	X	0.22	lbs BOD	X	2 lbs Oxygen	=	563.64 <u>lbs Oxygen</u> day
					person - day		lbs BOD		
lbs of Oxygen Required per day = (No Garbage Disposals)	1281	people	X	0.17	lbs BOD	X	2 lbs Oxygen	=	435.54 <u>lbs Oxygen</u> day
					person - day		lbs BOD		
Total lbs of Oxygen Required per day =									999.18 lbs Oxygen/day
Existing lbs of Oxygen Produced per day by three 20 HP Blowers =									3997.41 lbs Oxygen/day
Oxygen Surplus or (Deficit) =									2998.23 lbs Oxygen/day
Max Theoretical Population Served = (Based on Organic Loading)	3997.41	lbs Oxygen	X		lbs BOD	X	person - day	=	<u>9085</u> people
		day	2		lbs Oxygen	0.22	lbs BOD		

APPENDIX C

**ENGINEER'S OPINION
OF PROBABLE COST**

Engineer's Opinion of Probable Cost

SUNRISE ENGINEERING, INC.

11 North 300 West, Washington, Utah 84780

Tel: (435) 652-8450 Fax: (435) 652-8416

Engineer's Opinion of Probable Cost

Install New Metering Station, In Town Sewer Line Replacements

23-Jul-09

Town of Springdale

TJJ

NO.	DESCRIPTION	Estimated Quantity	Units	Unit Price	TOTAL COST
1	Mobilization	1	LS	\$ 6,000.00	\$ 6,000.00
2	Pre-Construction DVD	1	LS	\$ 300.00	\$ 300.00
3	Project Sign	1	LS	\$ 500.00	\$ 500.00
4	Materials Sampling and Testing	1	LS	\$ 1,000.00	\$ 1,000.00
5	Subsurface Investigation	15	Hourly	\$ 150.00	\$ 2,300.00
6	Dust Control and Watering	1	LS	\$ 1,000.00	\$ 1,000.00
7	8" PVC SDR-35 Sewer Main	740	LF	\$ 25.00	\$ 18,500.00
8	48" Precast Concrete Manhole	4	EA	\$ 2,700.00	\$ 10,800.00
9	Imported Pipe Bedding / Drain Gravel	22	CY	\$ 20.00	\$ 400.00
10	4" Service Connection	4	EA	\$ 1,100.00	\$ 4,400.00
11	4" PVC SDR-35 Service Lateral Pipe	160	LF	\$ 17.00	\$ 2,700.00
12	Untreated Base Course	82	CY	\$ 25.00	\$ 2,100.00
13	Restore Surface Improvements	1	LS	\$ 1,000.00	\$ 1,000.00
14	Flodar Metering Device and Flo-Station Display Output	1	LS	\$ 15,000.00	\$ 15,000.00
15	Electrical Connection for Metering Device and Display	1	LS	\$ 5,000.00	\$ 5,000.00
16	Rock Excavation	274	CY	\$ 20.00	\$ 5,500.00
17					
18					
19	Sub-Total				\$ 76,500
20	Contingency	20%			\$ 15,300
21	Total Construction				\$ 91,800
22					
23	INCIDENTALS				
24	Funding & Administrative Services	3.5%	Hourly		\$ 5,000
25	Legal and Fiscal		Est.		\$ 2,000
26	Engineering Design	11.1%	L.S.		\$ 16,000
27	Construction Administration & Observation	9.0%	Hourly		\$ 13,000
28	SWPPP (Storm Water Pollution Protection Plan)		Est.		\$ -
29	Environmental/Archeology		Est.		\$ -
30	Geotechnical Engineering		Est.		\$ 3,500
31	Electrical Engineering		Est.		\$ 3,500
32	Land & R/W Acquisition/Negotiation		Est.		\$ -
33	Survey & GIS Mapping		Est.		\$ 3,000
34	Miscellaneous Engineering Services		Est.		\$ 5,000
35	Loan Origination Fee		Est.		\$ 1,000
36					
37					
38	TOTAL PROJECT COST				\$ 143,800

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.

Engineer's Opinion of Probable Cost

SUNRISE ENGINEERING, INC.

11 North 300 West, Washington, Utah 84780

Tel: (435) 652-8450 Fax: (435) 652-8416

Engineer's Opinion of Probable Cost

In Town Sewer Line Replacements

8-Sep-09

Town of Springdale

TJJ

NO.	DESCRIPTION	Estimated Quantity	Units	Unit Price	TOTAL COST
1	Mobilization	1	LS	\$ 4,000.00	\$ 4,000.00
2	Pre-Construction DVD	1	LS	\$ 300.00	\$ 300.00
3	Materials Sampling and Testing	1	LS	\$ 1,000.00	\$ 1,000.00
4	Subsurface Investigation	15	Hourly	\$ 150.00	\$ 2,300.00
5	Dust Control and Watering	1	LS	\$ 1,000.00	\$ 1,000.00
6	8" PVC SDR-35 Sewer Main	740	LF	\$ 25.00	\$ 18,500.00
7	48" Precast Concrete Manhole	4	EA	\$ 2,700.00	\$ 10,800.00
8	Imported Pipe Bedding / Drain Gravel	22	CY	\$ 20.00	\$ 400.00
9	4" Service Connection	4	EA	\$ 1,100.00	\$ 4,400.00
10	4" PVC SDR-35 Service Lateral Pipe	160	LF	\$ 17.00	\$ 2,700.00
11	Untreated Base Course	82	CY	\$ 25.00	\$ 2,100.00
12	Restore Surface Improvements	1	LS	\$ 1,000.00	\$ 1,000.00
13	Rock Excavation	274	CY	\$ 20.00	\$ 5,500.00
14					
15					
16	Sub-Total				\$ 54,000
17	Contingency	20%			\$ 10,800
18	Total Construction				\$ 64,800
19					
20	INCIDENTALS				
21	Funding & Administrative Services	0.0%	Hourly		\$ -
22	Legal and Fiscal		Est.		\$ -
23	Engineering Design	8.5%	L.S.		\$ 8,000
24	Construction Administration & Observation	10.6%	Hourly		\$ 10,000
25	SWPPP (Storm Water Pollution Protection Plan)		Est.		\$ -
26	Environmental/Archeology		Est.		\$ -
27	Geotechnical Engineering		Est.		\$ -
28	Electrical Engineering		Est.		\$ 3,500
29	Land & R/W Acquisition/Negotiation		Est.		\$ -
30	Survey & GIS Mapping		Est.		\$ 3,000
31	Miscellaneous Engineering Services		Est.		\$ 5,000
32					
33					
34	TOTAL PROJECT COST				\$ 94,300

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.

Engineer's Opinion of Probable Cost

SUNRISE ENGINEERING, INC.

11 North 300 West, Washington, Utah 84780

Tel: (435) 652-8450 Fax: (435) 652-8416

Engineer's Opinion of Probable Cost

Install New Metering Station

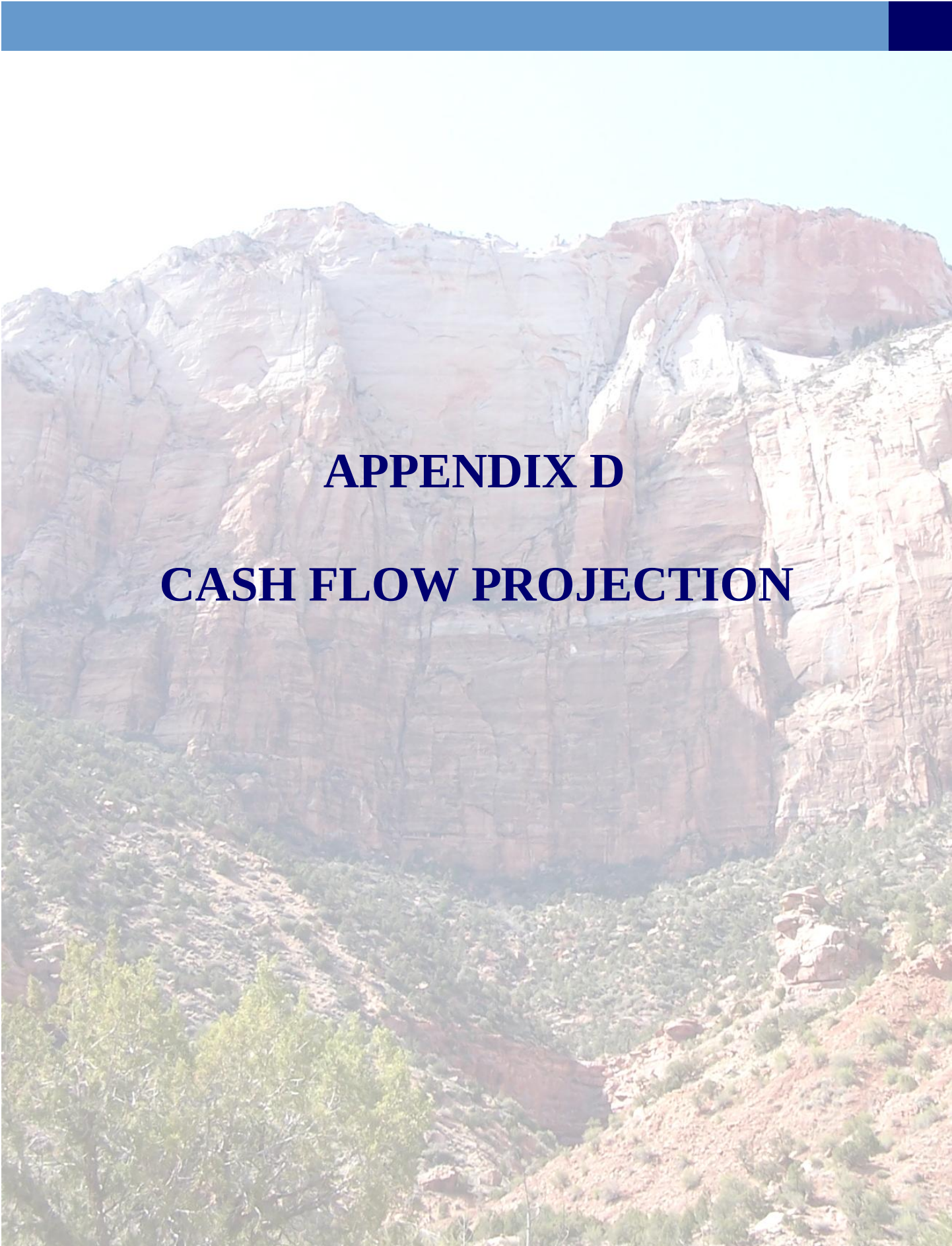
8-Sep-09

Town of Springdale

TJJ

NO.	DESCRIPTION	Estimated Quantity	Units	Unit Price	TOTAL COST
1	Mobilization	1	LS	\$ 2,000.00	\$ 2,000.00
2	Pre-Construction DVD	1	LS	\$ 300.00	\$ 300.00
3	Materials Sampling and Testing	1	LS	\$ 250.00	\$ 300.00
4	Subsurface Investigation	5	Hourly	\$ 150.00	\$ 800.00
5	Dust Control and Watering	1	LS	\$ 500.00	\$ 500.00
6	Restore Surface Improvements	1	LS	\$ 1,000.00	\$ 1,000.00
7	Floodar Metering Device and Flo-Station Display Output	1	LS	\$ 15,000.00	\$ 15,000.00
8	Electrical Connection for Metering Device and Display	1	LS	\$ 5,000.00	\$ 5,000.00
9					
10					
11	Sub-Total				\$ 24,900
12	Contingency	20%			\$ 5,000
13	Total Construction				\$ 29,900
14					
15	INCIDENTALS				
16	Funding & Administrative Services	0.0%	Hourly		\$ -
17	Legal and Fiscal		Est.		\$ -
18	Engineering Design	9.1%	L.S.		\$ 4,000
19	Construction Administration & Observation	8.0%	Hourly		\$ 3,500
20	SWPPP (Storm Water Pollution Protection Plan)		Est.		\$ -
21	Environmental/Archeology		Est.		\$ -
22	Geotechnical Engineering		Est.		\$ -
23	Electrical Engineering		Est.		\$ 3,500
24	Land & R/W Acquisition/Negotiation		Est.		\$ -
25	Survey & GIS Mapping		Est.		\$ 500
26	Miscellaneous Engineering Services		Est.		\$ 2,500
27					
28					
29	TOTAL PROJECT COST				\$ 43,900

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.



APPENDIX D

CASH FLOW PROJECTION

Annual Population Growth Rate	3.10%	Annual Rate Increase	2.00%
Annual Inflation Rate	3.25%	Interest Rate	3.50%

Cash Flow Analysis

There is no money put into the "Renewal & Replacement Account" since it's being accounted for in "Depreciation"

Fiscal Year Beginning July 1 Ending June 30		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	Average Rate ERU	\$17.69	\$26.11	\$30.23	\$27.89	\$28.45	\$29.02	\$32.14	\$32.78	\$33.44	\$34.11	\$34.79	\$35.49	\$36.19	\$36.92	\$37.66	\$38.41	\$39.18
2	Connection Fee	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3	Impact fee	\$1,755	\$1,755	\$1,755	\$1,755	\$1,755	\$1,755	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4	System Users:																	
5	Total Existing ERU's	497	513	530	547	565	583	601	621	640	661	682	704	726	749	773	798	823
6	New ERU's:	12	16	17	17	18	18	18	20	19	21	21	22	22	23	24	25	25
7																		
8	REVENUES:																	
9	2 User Fees (Water Sales)	\$140,510	\$200,829	\$226,071	\$221,453	\$195,962	\$206,149	\$235,265	\$248,231	\$260,619	\$274,836	\$289,100	\$304,463	\$320,107	\$336,921	\$354,730	\$373,578	\$392,803
10	Impact	\$10,300	\$24,570	\$17,555	\$8,775	\$15,795	\$15,795	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
11	Zion National Park	\$35,000	\$40,077	\$33,830	\$38,370	\$38,642	\$38,148	\$39,635	\$40,070	\$40,561	\$41,391	\$41,996	\$42,659	\$43,381	\$44,065	\$44,778	\$45,507	\$46,239
12	Miscellaneous	\$18,427	\$30,579	\$17,500	\$3,500	\$18,070	\$17,978	\$14,726	\$14,010	\$16,722	\$16,374	\$15,960	\$16,279	\$16,865	\$16,902	\$17,038	\$17,316	\$17,584
13	Garbage collection revenue																	
14	Interest Income/Bond Discount	\$4,042	\$5,157	\$7,791	\$10,118	\$7,014	\$7,783	\$8,463	\$8,637	\$8,253	\$8,574	\$8,779	\$8,860	\$8,918	\$9,090	\$9,224	\$9,339	\$9,463
15	TOTAL REVENUE:	\$173,279	\$261,135	\$268,917	\$243,846	\$236,841	\$247,706	\$298,088	\$310,947	\$326,156	\$341,176	\$355,834	\$372,261	\$389,271	\$406,978	\$425,769	\$445,740	\$466,089
16																		
17	EXPENSES: (Inc. O&M & Debt Serv.)	4.80% = Annual Inflation rate + 1/2 Annual Growth Rate																
18	Salaries, wages and benefits	\$78,884	\$71,411	\$49,968	\$53,307	\$55,866	\$58,547	\$61,358	\$64,303	\$67,389	\$70,624	\$74,014	\$77,567	\$81,290	\$85,192	\$89,281	\$93,566	\$98,058
19	Office expenses and travel	\$1,695	\$1,083	\$2,736	\$1,935	\$2,028	\$2,125	\$2,227	\$2,334	\$2,446	\$2,564	\$2,687	\$2,816	\$2,951	\$3,092	\$3,241	\$3,396	\$3,559
20	Repairs and maintenance	\$8,894	\$9,093	\$6,158	\$29,396	\$30,807	\$32,286	\$33,835	\$35,460	\$37,162	\$38,945	\$40,815	\$42,774	\$44,827	\$46,979	\$49,234	\$51,597	\$54,074
21	Utilities	\$10,941	\$9,643	\$9,416	\$9,070	\$9,505	\$9,962	\$10,440	\$10,941	\$11,466	\$12,016	\$12,593	\$13,198	\$13,831	\$14,495	\$15,191	\$15,920	\$16,684
22	Legal and professional fees	\$3,373	\$4,519	\$16,700	\$18,961	\$19,871	\$20,825	\$21,825	\$22,872	\$23,970	\$25,121	\$26,326	\$27,590	\$28,914	\$30,302	\$31,757	\$33,281	\$34,879
23	Garbage collection																	
24	Contract services	\$7,644	\$7,807	\$6,417	\$1,415	\$1,483	\$1,554	\$1,629	\$1,707	\$1,789	\$1,875	\$1,965	\$2,059	\$2,158	\$2,261	\$2,370	\$2,484	\$2,603
25	Insurance	\$7,825	\$8,418	\$9,134	\$5,266	\$5,519	\$5,784	\$6,061	\$6,352	\$6,657	\$6,977	\$7,312	\$7,663	\$8,030	\$8,416	\$8,820	\$9,243	\$9,687
26	Miscellaneous	\$4,345	\$557	\$1,466	\$7,660	\$8,028	\$8,413	\$8,817	\$9,240	\$9,684	\$10,148	\$10,635	\$11,146	\$11,681	\$12,242	\$12,829	\$13,445	\$14,090
27	Depreciation	\$63,251	\$63,276	\$62,803	\$63,091	\$66,119	\$69,293	\$72,619	\$76,105	\$79,758	\$83,586	\$87,598	\$91,803	\$96,210	\$100,828	\$105,668	\$110,740	\$116,055
28	Sub-Total Operation & Maintenance	\$186,852	\$175,807	\$164,798	\$190,101	\$199,226	\$208,789	\$218,811	\$229,313	\$240,320	\$251,856	\$263,945	\$276,614	\$289,892	\$303,807	\$318,389	\$333,672	\$349,688
29																		
30	EXISTING DEBT SERVICE (810-820)																	
31	Sewer Revenue Bonds, Series 1995	\$36,000	\$36,000	\$36,000	\$0													
32	Interest Free, Matures August 1, 2006																	
33																		
34	Sub-Total Existing Debt Service	\$36,000	\$36,000	\$36,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
35																		
36	NEW DEBT SERVICE (810-820)																	
37	3 2030 Loan (Collection System Replacement)																	
38	Loan Reserve (Payment/10)																	
39																		
40	Sub-Total New Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
41	Total Debt Service	\$36,000	\$36,000	\$36,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
42																		
43	Renewal and Replacement Fund (590)																	
44	TOTAL EXPENSES:	\$222,852	\$211,807	\$200,798	\$190,101	\$199,226	\$208,789	\$218,811	\$229,313	\$240,320	\$251,856	\$263,945	\$276,614	\$289,892	\$303,807	\$318,389	\$333,672	\$349,688
45																		
46	Net Cash flow	-\$49,573	\$49,328	\$68,119	\$53,745	\$37,616	\$38,917	\$79,277	\$81,634	\$85,835	\$89,320	\$91,889	\$95,646	\$99,379	\$103,171	\$107,380	\$112,068	\$116,400
47																		
48	CASH ON HAND																	
49	Self Participation paid from Fund Balance for Install New Metering Station In Town Sewer Line Replacements Town Entire Collection System Replacement							\$ 43,900			\$ 94,300							
50	4 Fund Balance				\$626,161	\$665,078	\$744,355	\$782,089	\$867,924	\$957,244	\$954,833	\$1,050,480	\$1,149,859	\$1,253,030	\$1,360,410	\$1,472,478	\$1,588,878	
51	Self Participation paid from R&R Account Balance																	
52	5 Renewal and Replacement (R&R) Account Balance					\$69,293	\$141,912	\$218,017	\$297,775	\$381,361	\$468,960	\$560,763	\$656,973	\$757,800	\$863,468	\$974,208	\$1,090,263	
53	New Bond Reserves																	
54	Total	\$0	\$0	\$0	\$0	\$626,161	\$734,371	\$886,268	\$1,000,106	\$1,165,699	\$1,338,605	\$1,423,793	\$1,611,242	\$1,806,831	\$2,010,830	\$2,223,878	\$2,446,686	\$2,679,141

1 The 2009/2010 fiscal year represents the existing average user per ERU as recommended by this Plan.

2 The revenue from these user fees includes ERU's from Rockville

3 It is anticipated that full replacement of the Town's wastewater collection system will be approximately 2030. This loan is for the portion of the project not paid for by self participation. Inflation was taken into account when determining the probable cost of this project.

4 Fund Balance is obtained by adding the previous year's balance to the net cash flow, minus any self funded portion of future projects. The initial value in 2007/2008 was taken from the Town's audit information for that fiscal year.

5 Renewal and Replacement Balance is obtained by adding the previous year's balance to the depreciation value for that fiscal year, minus any self funded portion of future projects.

Cash Flow Analysis

There is no money put into the "Renewal & Replacement Account" since it's being accounted for in "Depreciation"

	Fiscal Year Beginning July 1 Ending June 30	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
1	Average Rate ERU	\$39.96	\$40.76	\$41.58	\$42.41	\$43.26	\$44.12	\$45.00	\$45.90	\$46.82	\$47.76	\$48.71	\$49.69	\$50.68	\$51.70	\$52.73	\$53.78
2	Connection Fee	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3	Impact fee	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,733	\$2,733	\$2,733	\$2,733	\$2,733	\$2,733	\$2,733	\$2,733
4	System Users:																
5	Total Existing ERU's	849	876	904	933	963	993	1025	1058	1091	1126	1162	1199	1237	1277	1317	1359
6	New ERU's:	26	27	28	29	30	30	32	33	33	35	36	37	38	40	40	42
7																	
8	REVENUES:																
9	2 User Fees (Water Sales)	\$413,367	\$435,086	\$458,007	\$482,179	\$507,655	\$533,692	\$562,187	\$591,884	\$622,263	\$655,340	\$689,783	\$725,939	\$763,872	\$804,584	\$845,985	\$890,657
10	Impact	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$45,091	\$47,824	\$49,191	\$50,557	\$51,923	\$54,656	\$54,656	\$57,389
11	Zion National Park	\$46,987	\$47,747	\$48,518	\$49,303	\$50,100	\$50,909	\$51,732	\$52,569	\$53,418	\$54,282	\$55,159	\$56,051	\$56,957	\$57,877	\$58,813	\$59,763
12	Miscellaneous	\$17,769	\$17,993	\$18,239	\$18,478	\$18,709	\$18,951	\$19,199	\$19,446	\$19,696	\$19,951	\$20,209	\$20,470	\$20,734	\$21,002	\$21,274	\$21,548
13	Garbage collection revenue																
14	Interest Income/Bond Discount	\$9,604	\$9,736	\$9,869	\$10,006	\$10,147	\$10,288	\$10,430	\$10,575	\$10,723	\$10,872	\$11,023	\$11,176	\$11,331	\$11,489	\$11,649	\$11,811
15	TOTAL REVENUE:	\$487,727	\$510,563	\$534,634	\$559,966	\$586,610	\$613,840	\$643,548	\$674,474	\$751,192	\$788,269	\$825,365	\$864,192	\$904,818	\$949,608	\$992,376	\$1,041,169
16																	
17	EXPENSES: (Inc. O&M & Debt Serv.)																
18	Salaries, wages and benefits	\$102,764	\$107,697	\$112,866	\$118,284	\$123,962	\$129,912	\$136,148	\$142,683	\$149,531	\$156,709	\$164,231	\$172,114	\$180,376	\$189,034	\$198,107	\$207,616
19	Office expenses and travel	\$3,730	\$3,909	\$4,097	\$4,294	\$4,500	\$4,716	\$4,942	\$5,179	\$5,428	\$5,688	\$5,961	\$6,248	\$6,547	\$6,862	\$7,191	\$7,536
20	Repairs and maintenance	\$56,669	\$59,389	\$62,240	\$65,227	\$68,358	\$71,640	\$75,078	\$78,682	\$82,459	\$86,417	\$90,565	\$94,912	\$99,468	\$104,242	\$109,246	\$114,489
21	Utilities	\$17,485	\$18,324	\$19,204	\$20,126	\$21,092	\$22,104	\$23,165	\$24,277	\$25,442	\$26,663	\$27,943	\$29,285	\$30,690	\$32,163	\$33,707	\$35,325
22	Legal and professional fees	\$36,553	\$38,307	\$40,146	\$42,073	\$44,092	\$46,209	\$48,427	\$50,751	\$53,187	\$55,740	\$58,416	\$61,220	\$64,159	\$67,238	\$70,466	\$73,848
23	Garbage collection																
24	Contract services	\$2,728	\$2,859	\$2,996	\$3,140	\$3,290	\$3,448	\$3,614	\$3,787	\$3,969	\$4,160	\$4,359	\$4,569	\$4,788	\$5,018	\$5,259	\$5,511
25	Insurance	\$10,152	\$10,639	\$11,150	\$11,685	\$12,246	\$12,834	\$13,450	\$14,095	\$14,772	\$15,481	\$16,224	\$17,003	\$17,819	\$18,674	\$19,570	\$20,510
26	Miscellaneous	\$14,767	\$15,476	\$16,218	\$16,997	\$17,813	\$18,668	\$19,564	\$20,503	\$21,487	\$22,518	\$23,599	\$24,732	\$25,919	\$27,163	\$28,467	\$29,834
27	Depreciation	\$121,626	\$127,464	\$133,582	\$139,994	\$146,714	\$153,756	\$161,136	\$168,871	\$176,977	\$185,471	\$194,374	\$203,704	\$213,482	\$223,729	\$234,468	\$245,722
28	Sub-Total Operation & Maintenance	\$366,473	\$384,064	\$402,499	\$421,819	\$442,066	\$463,286	\$485,523	\$508,828	\$533,252	\$558,848	\$585,673	\$613,785	\$643,247	\$674,123	\$706,481	\$740,392
29																	
30	EXISTING DEBT SERVICE (810-820)																
31	Sewer Revenue Bonds, Series 1995																
32	Interest Free, Matures August 1, 2006																
33																	
34	Sub-Total Existing Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
35																	
36	NEW DEBT SERVICE (810-820)																
37	3 2030 Loan (Collection System Replacement)														\$231,411.57	\$231,411.57	\$231,411.57
38	Loan Reserve (Payment/10)														\$23,141.16	\$23,141.16	\$23,141.16
39																	
40	Sub-Total New Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$254,553	\$254,553	\$254,553
41	Total Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$254,553	\$254,553	\$254,553
42																	
43	Renewal and Replacement Fund (590)																
44	TOTAL EXPENSES:	\$366,473	\$384,064	\$402,499	\$421,819	\$442,066	\$463,286	\$485,523	\$508,828	\$533,252	\$558,848	\$585,673	\$613,785	\$643,247	\$674,123	\$706,481	\$740,392
45																	
46	Net Cash flow	\$121,254	\$126,499	\$132,135	\$138,147	\$144,544	\$150,554	\$158,025	\$165,646	\$217,939	\$229,420	\$239,692	\$250,407	\$261,571	\$20,933	\$31,343	\$46,224
47																	
48	CASH ON HAND																
49	Self Participation paid from Fund Balance for Install New Metering Station In Town Sewer Line Replacements Town Entire Collection System Replacement														\$3,401,827		
50	4 Fund Balance	\$1,710,132	\$1,836,630	\$1,968,765	\$2,106,912	\$2,251,456	\$2,402,011	\$2,560,035	\$2,725,681	\$2,943,621	\$3,173,041	\$3,412,733	\$3,663,140	\$3,924,711	\$543,817	\$575,160	\$621,384
51	Self Participation paid from R&R Account Balance														\$3,401,827		
52	5 Renewal and Replacement (R&R) Account Balance	\$1,211,888	\$1,339,352	\$1,472,934	\$1,612,928	\$1,759,642	\$1,913,398	\$2,074,534	\$2,243,404	\$2,420,381	\$2,605,852	\$2,800,226	\$3,003,930	\$3,217,412	\$39,314	\$273,782	\$519,504
53	New Bond Reserves																
54	Total	\$2,922,020	\$3,175,983	\$3,441,699	\$3,719,840	\$4,011,098	\$4,315,408	\$4,634,569	\$4,969,086	\$5,364,002	\$5,778,893	\$6,212,959	\$6,667,070	\$7,142,123	\$583,131	\$848,942	\$1,140,889

Cash Flow Analysis

There is no money put into the "Renewal & Replacement Account" since it's being accounted for in "Depreciation"

	Fiscal Year Beginning July 1 Ending June 30	2036	2037	2038	2039	2040	2041	2042	2043	2044
		2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Average Rate ERU	\$54.86	\$55.96	\$57.08	\$58.22	\$59.38	\$60.57	\$61.78	\$63.02	\$64.28
2	Connection Fee	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3	Impact fee	\$2,733	\$2,733	\$2,733	\$2,733	\$2,733	\$2,733	\$2,733	\$2,733	\$2,733
4	System Users:									
5	Total Existing ERU's	1403	1447	1494	1541	1590	1641	1693	1747	1803
6	New ERU's:	44	44	47	47	49	51	52	54	56
7										
8	REVENUES:									
9	2 User Fees (Water Sales)	\$938,095	\$986,401	\$1,039,348	\$1,092,969	\$1,150,457	\$1,211,262	\$1,274,409	\$1,341,487	\$1,412,282
10	Impact	\$60,122	\$60,122	\$64,221	\$64,221	\$66,954	\$69,687	\$71,053	\$73,786	\$76,519
11	Zion National Park	\$60,729	\$61,711	\$62,708	\$63,722	\$64,752	\$65,799	\$66,862	\$67,943	\$69,041
12	Miscellaneous	\$21,827	\$22,109	\$22,394	\$22,683	\$22,976	\$23,273	\$23,574	\$23,878	\$24,187
13	Garbage collection revenue									
14	Interest Income/Bond Discount	\$11,975	\$12,141	\$12,310	\$12,481	\$12,655	\$12,831	\$13,009	\$13,190	\$13,374
15	TOTAL REVENUE:	\$1,092,747	\$1,142,484	\$1,200,981	\$1,256,077	\$1,317,794	\$1,382,851	\$1,448,907	\$1,520,285	\$1,595,402
16										
17	EXPENSES: (Inc. O&M & Debt Serv.)									
18	Salaries, wages and benefits	\$217,582	\$228,026	\$238,971	\$250,442	\$262,463	\$275,061	\$288,264	\$302,101	\$316,602
19	Office expenses and travel	\$7,898	\$8,277	\$8,674	\$9,091	\$9,527	\$9,984	\$10,464	\$10,966	\$11,492
20	Repairs and maintenance	\$119,985	\$125,744	\$131,780	\$138,105	\$144,734	\$151,682	\$158,962	\$166,593	\$174,589
21	Utilities	\$37,021	\$38,798	\$40,660	\$42,612	\$44,657	\$46,801	\$49,047	\$51,401	\$53,869
22	Legal and professional fees	\$77,393	\$81,107	\$85,001	\$89,081	\$93,357	\$97,838	\$102,534	\$107,456	\$112,613
23	Garbage collection									
24	Contract services	\$5,776	\$6,053	\$6,343	\$6,648	\$6,967	\$7,301	\$7,652	\$8,019	\$8,404
25	Insurance	\$21,494	\$22,526	\$23,607	\$24,740	\$25,928	\$27,172	\$28,477	\$29,843	\$31,276
26	Miscellaneous	\$31,266	\$32,766	\$34,339	\$35,987	\$37,715	\$39,525	\$41,422	\$43,411	\$45,494
27	Depreciation	\$257,517	\$269,878	\$282,832	\$296,408	\$310,635	\$325,546	\$341,172	\$357,548	\$374,711
28	Sub-Total Operation & Maintenance	\$775,931	\$813,175	\$852,208	\$893,114	\$935,983	\$980,910	\$1,027,994	\$1,077,338	\$1,129,050
29										
30	EXISTING DEBT SERVICE (810-820)									
31	Sewer Revenue Bonds, Series 1995									
32	Interest Free, Matures August 1, 2006									
33										
34	Sub-Total Existing Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
35										
36	NEW DEBT SERVICE (810-820)									
37	3 2030 Loan (Collection System Replacement)	\$231,411.57	\$231,411.57	\$231,411.57	\$231,411.57	\$231,411.57	\$231,411.57	\$231,411.57	\$231,411.57	\$231,411.57
38	Loan Reserve (Payment/10)	\$23,141.16	\$23,141.16	\$23,141.16	\$23,141.16	\$23,141.16	\$23,141.16	\$23,141.16		
39										
40	Sub-Total New Debt Service	\$254,553	\$254,553	\$254,553	\$254,553	\$254,553	\$254,553	\$254,553	\$231,412	\$231,412
41	Total Debt Service	\$254,553	\$254,553	\$254,553	\$254,553	\$254,553	\$254,553	\$254,553	\$231,412	\$231,412
42										
43	Renewal and Replacement Fund (590)									
44	TOTAL EXPENSES:	\$1,030,483	\$1,067,728	\$1,106,760	\$1,147,666	\$1,190,536	\$1,235,463	\$1,282,547	\$1,308,749	\$1,360,461
45										
46	Net Cash flow	\$62,264	\$74,756	\$94,221	\$108,410	\$127,259	\$147,388	\$166,360	\$211,535	\$234,941
47										
48	CASH ON HAND									
49	Self Participation paid from Fund Balance for Install New Metering Station In Town Sewer Line Replacements Town Entire Collection System Replacement									
50	4 Fund Balance	\$683,648	\$758,404	\$852,625	\$961,036	\$1,088,294	\$1,235,682	\$1,402,042	\$1,613,578	\$1,848,519
51	Self Participation paid from R&R Account Balance									
52	5 Renewal and Replacement (R&R) Account Balance	\$777,021	\$1,046,899	\$1,329,731	\$1,626,139	\$1,936,775	\$2,262,320	\$2,603,493	\$2,961,041	\$3,335,752
53	New Bond Reserves									
54	Total	\$1,460,669	\$1,805,304	\$2,182,356	\$2,587,175	\$3,025,069	\$3,498,003	\$4,005,535	\$4,574,619	\$5,184,270