CULINARY WATER IMPACT FEE FACILITIES PLAN (IFFP) & IMPACT FEE ANALYSIS (IFA)

CITY OF ST. GEORGE, UTAH

FINAL ADOPTED

JULY 10, 2014

LEWIS YOUNG
ROBERTSON & BURNINGHAM, INC.

GATEWAY PLAZA BUILDING - 41 N. RIO GRANDE, STE 101 - SALT LAKE CITY, UT 84101
(P) 801-596-0700 - (TF) 800-581-1100 - (F) 801-596-2800 - WWW.LEWISYOUNG.COM

Certification for Impact Fee Facilities Plan and Impact Fee Analysis

IFFP Certification

LYRB certifies that the attached impact fee facilities plan:

1. includes only the costs of public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
    a. costs of operation and maintenance of public facilities;
    b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
    c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement; and,
3. complies in each and every relevant respect with the Impact Fees Act.

IFA Certification

LYRB certifies that the attached impact fee analysis:

1. includes only the costs of public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
    a. costs of operation and maintenance of public facilities;
    b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
    c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement;
3. offsets costs with grants or other alternate sources of payment; and,
4. complies in each and every relevant respect with the Impact Fees Act.

LYRB makes this certification with the following caveats:

1. All of the recommendations for implementation of the IFFP made in the IFFP documents or in the IFA documents are followed by City Staff and elected officials.
2. If all or a portion of the IFFP or IFA are modified or amended, this certification is no longer valid.
3. All information provided to LYRB is assumed to be correct, complete, and accurate. This includes information provided by the City as well as outside sources.

LEWIS YOUNG ROBERTSON & BURNINGHAM, INC.

LEWIS YOUNG ROBERTSON & BURNINGHAM, INC. SALT LAKE CITY, UTAH 84101 OFFICE 801.596.0700 FAX 801.596.2800

TABLE OF CONTENTS

SECTION 1: EXECUTIVE SUMMARY 4
PROPOSED CULINARY WATER IMPACT FEE 4

SECTION 2: GENERAL IMPACT FEE METHODOLOGY 6

SECTION 3: OVERVIEW OF SERVICE AREA, DEMAND, AND LOS 8
SERVICE AREAS 8
DEMAND UNITS 8
LEVEL OF SERVICE STANDARDS 8

SECTION 4: EXISTING FACILITIES INVENTORY 10
EXCESS CAPACITY 10

SECTION 5: CAPITAL FACILITY ANALYSIS 13
SYSTEM VS. PROJECT IMPROVEMENTS 15
FUNDING OF FUTURE FACILITIES 16
EQUITY OF IMPACT FEES 17
NECESSITY OF IMPACT FEES 17

SECTION 6: CULINARY WATER IMPACT FEE CALCULATION 18
PROPOSED CULINARY WATER IMPACT FEE 18
CONSIDERATION OF ALL REVENUE SOURCES 19
EXPENDITURE OF IMPACT FEES 19
PROPOSED CREDITS OWED TO DEVELOPMENT 19
GROWTH-DRIVEN EXTRAORDINARY COSTS 20
SUMMARY OF TIME PRICE DIFFERENTIAL 20

SECTION 1: EXECUTIVE SUMMARY

The purpose of the Culinary Water Impact Fee Facilities Plan ("IFFP"), with supporting Impact Fee Analysis ("IFA"), is to fulfill the requirements established in Utah Code Title 11 Chapter 36a, the "Impact Fees Act", and assist the City of St. George (the "City") in financing and constructing necessary capital improvements for future growth. This document will address the future culinary water infrastructure needed to serve the City through the next six to ten years, as well as the appropriate impact fees the City may charge to new growth to maintain the existing level of service ("LOS"). The 2011 Culinary Water Distribution System Capital Facilities Plan ("CFP") along with updated information from the City provides much of the information utilized in the analysis for the purposes of calculating impact fees.

- **Impact Fee Service Area:** The service area for culinary water impact fees includes all areas within the City.

- **Demand Analysis:** The demand units utilized in this analysis are based on typical usage patterns measured in gallons per day (gpd) and equivalent residential units (ERUs) generated from land-use types. As residential and commercial growth occurs within the City, additional ERUs will be generated. The culinary water capital improvements identified in this study are based on maintaining the existing level of service.

- **Level of Service:** The **storage** level of service is approximately **1,487 gpd[1]/ERU** *(based on total 2013 storage requirements of 47.65 million gallons (MG) divided by the 2013 ERUs of 32,035)*. The **distribution** level of service is based on **1,085gpd[1]** based on peak daily demand. This analysis does not consider a level of service for source improvements, since water supply is provided by Washington County Water Conservancy District ("WCWCD") and new development will be required to pay an impact fee to WCWCD. **SECTION 3** of this report further explains the level of service.

- **Excess Capacity:** The buy-in cost to growth calculated for **storage** is approximately **$1,253,319**. The buy-in cost to growth within the impact fee horizon for **distribution** is approximately **$4,874,258**.

- **Capital Facilities Analysis:** A total of **$7,176,664** is identified as growth related improvements needed over the next ten years. All of these costs are considered system improvements necessary to maintain the existing level of service and meet the anticipated development activity over that same period of time.

- **Funding of Future Facilities:** This analysis assumes future growth related facilities will be funded on a pay-as-you-go basis, utilizing impact fee and utility fee revenues.

- **Planning Horizon:** The planning horizon is considered to be ten years beginning in 2013.

PROPOSED CULINARY WATER IMPACT FEE

The culinary water impact fees proposed in this analysis will be assessed within all areas of the City. **TABLE 1.1** below illustrates the appropriate buy-in component and the fee associated with projects occurring within the next ten years related to storage and distribution. The proportionate share analysis determines the proportionate cost assignable to new development based on the proposed capital projects and the estimated ERUs served by the proposed projects.

[1] Gallons per day (gpd)

TABLE 1.1: IMPACT FEE PER ERU

	TOTAL COST	COST TO GROWTH	PERCENT WITHIN IFFP WINDOW	COST TO IMPACT FEE	ERUS SERVED	FEE PER ERU
Excess Capacity						
Storage Excess Capacity	$6,860,870	$1,253,319	100%	$1,253,319	11,017	$114
Distribution Airport Line Excess Capacity	$1,235,366	$1,208,238	100%	$1,208,238	11,017	$110
Distribution Regional Line Excess Capacity	$12,864,895	$3,824,475	82%	$3,126,959	11,017	$284
Distribution Little Valley Line Excess Capacity	$1,032,500	$538,978	100%	$539,061	11,017	$49
Subtotal Excess Capacity	**$21,993,631**	**$6,825,010**		**$6,127,577**		**$557**
Future Projects						
Storage	$8,760,903	$5,274,363	56%	$2,928,064	11,017	$267
Distribution	$6,058,514	$3,915,060	100%	$3,915,060	11,017	$355
Flow Control	$119,520	$119,520	100%	$119,520	11,017	$11
Booster Pumps	$204,020	$204,020	100%	$204,020	11,017	$19
Subtotal Future Projects	**$15,142,957**	**$9,512,963**		**$7,176,664**		**$652**
Other						
Professional Expense[2]	$9,675	$9,675	100%	$9,675	6,216	$2
Subtotal Other	**$9,675**	**$9,675**		**$9,675**		**$2**
Total	**$37,146,263**	**$16,347,648**		**$13,313,916**		**$1,211**

TABLE 1.2 shows the appropriate ERU multipliers for various meter sizes and is based on relative capacity of each.

TABLE 1.2: IMPACT FEE PER METER SIZE

METER SIZE (IN)	ERU MULTIPLIER	IMPACT FEE PER METER SIZE	EXISTING IMPACT FEE	% CHANGE
3/4	1.00	$1,211	$1,432	-15%
1	2.16	$2,616	$2,387	10%
1 1/2	7.17	$8,683	$4,774	82%
2	11.54	$13,975	$7,638	83%
3	26.00	$31,486	$16,708	88%
4	46.00	$55,706	$28,643	94%
6	104.00	$125,944	$59,672	111%

ERU multipliers were provided by the City of St. George and are representative of the actual historic water use for the different meter sizes.

NON-STANDARD CULINARY WATER IMPACT FEES

The City reserves the right under the Impact Fees Act to assess an adjusted fee that more closely matches the true impact that the land use will have upon public facilities.[3] This adjustment could result in a higher or lower impact fee if the City determines that a particular user may create a different impact than what is standard for its land use. To determine the impact fee for a non-standard use, the City should use the following formula:

FORMULA FOR NON-STANDARD WATER IMPACT FEES:[4]

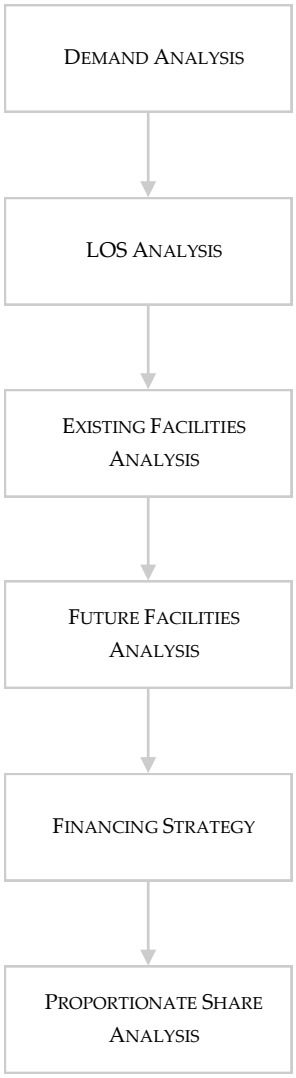
Estimated Usage (gpd) / 1,085 (gpd/ERU) * $1,211 = Impact Fee

[2] This is the actual cost to update the IFFP and IFA. The City can use this portion of the impact fee to reimburse itself for the expense of updating the IFFP and IFA. The cost is divided over the ERUs added in the next six years.
[3] 11-36a-402(1)(c)
[4] 1,085 gpd/ERU is the peak daily demand.

SECTION 2: GENERAL IMPACT FEE METHODOLOGY

The purpose of this study is to fulfill the requirements of the Impact Fees Act regarding the establishment of an IFFP and IFA. The IFFP is designed to identify the demands placed upon the City's existing facilities by future development and evaluate how these demands will be met by the City. The IFFP is also intended to outline the improvements which are intended to be funded by impact fees. The IFA is designed to proportionately allocate the cost of the new facilities and any excess capacity to new development, while ensuring that all methods of financing are considered. Each component must consider the historic level of service provided to existing development and ensure that impact fees are not used to raise that level of service. The following elements are important considerations when completing an IFFP and IFA.

FIGURE 2.1: IMPACT FEE METHODOLOGY



DEMAND ANALYSIS

The demand analysis serves as the foundation for the IFFP. This element focuses on a specific demand unit related to each public service – the existing demand on public facilities and the future demand as a result of new development that will impact public facilities.

LEVEL OF SERVICE ANALYSIS

The demand placed upon existing public facilities by existing development is known as the existing "Level of Service" ("LOS"). Through the inventory of existing facilities, combined with the growth assumptions, this analysis identifies the level of service which is provided to a community's existing residents and ensures that future facilities maintain these standards. Any excess capacity identified within existing facilities can be apportioned to new development. Any demand generated from new development that overburdens the existing system beyond the existing capacity justifies the construction of new facilities.

EXISTING FACILITY INVENTORY

In order to quantify the demands placed upon existing public facilities by new development activity, the Impact Fee Facilities Plan provides an inventory of the City's existing system facilities. To the extent possible, the inventory valuation should consist of the following information:

- Original construction cost of each facility;
- Estimated date of completion of each future facility;
- Estimated useful life of each facility; and,
- Remaining useful life of each existing facility.

The inventory of existing facilities is important to properly determine the excess capacity of existing facilities and the utilization of excess capacity by new development.

FUTURE CAPITAL FACILITIES ANALYSIS

The demand analysis, existing facility inventory and LOS analysis allow for the development of a list of capital projects necessary to serve new growth and to maintain the existing system. This list includes any excess capacity of existing facilities as well as future system improvements necessary to maintain the level of service. Any demand generated from new development that overburdens the existing system beyond the existing capacity justifies the construction of new facilities.

FINANCING STRATEGY – CONSIDERATION OF ALL REVENUE SOURCES

This analysis must also include a consideration of all revenue sources, including impact fees, future debt costs, alternative funding sources and the dedication of system improvements, which may be used to finance system improvements.[5] In conjunction with this revenue analysis, there must be a determination that impact fees are necessary to achieve an equitable allocation of the costs of the new facilities between the new and existing users.[6]

PROPORTIONATE SHARE ANALYSIS

The written impact fee analysis is required under the Impact Fees Act and must identify the impacts placed on the facilities by development activity and how these impacts are reasonably related to the new development. The written impact fee analysis must include a proportionate share analysis, clearly detailing each cost component and the methodology used to calculate each impact fee. A local political subdivision or private entity may only impose impact fees on development activities when its plan for financing system improvements establishes that impact fees are necessary to achieve an equitable allocation to the costs borne in the past and to be borne in the future (UCA 11-36a-302).

[5] 11-36a-302(2)
[6] 11-36a-302(3)

SECTION 3: OVERVIEW OF SERVICE AREA, DEMAND, AND LOS

SERVICE AREAS

Utah Code requires the impact fee enactment to establish one or more service areas within which impact fees will be imposed.[7] The impact fees identified in this document will be assessed to a single, city-wide service area.

It is anticipated that the growth projected over the next five to ten years, and through buildout, will impact the City's existing services. Culinary water infrastructure will need to be expanded in order to maintain the existing level of service. Impact fees are a logical and sound mechanism for funding growth-related infrastructure. The CFP and this analysis are designed to accurately assess the true impact of a particular user upon the City's infrastructure and prevent existing users from subsidizing new growth. This analysis also ensures that new growth isn't paying for existing system deficiencies. Impact fees should be used to fund the costs of growth-related capital infrastructure based upon the historic funding of the existing infrastructure and the intent of the City to equitably allocate the costs of growth-related infrastructure in accordance with the true impact that a user will place on the system.

DEMAND UNITS

As shown in **TABLE 3.1**, the growth in ERUs is expected to reach 43,052 units by 2023. This represents an increase of 11,017 ERUs from 2013. **TABLE 3.2** shows the ERU multipliers as determined by the City of St. George based on actual historic water use for the different meter sizes.

TABLE 3.1: CITY-WIDE ERU PROJECTIONS

YEAR	EST. ERUS
2013	32,035
2014	32,996
2015	33,986
2016	35,006
2017	36,056
2018	37,137
2019	38,251
2020	39,399
2021	40,581
2022	41,798
2023	43,052
2024	44,344
2025	45,674
2030	52,949
2040	71,159

Source: 2013 ERUs were provided by the City of St. George. A growth rate of three percent was used to project ERUs through 2040. Three percent is a reasonable estimate based on historic population growth as shown in the Census 2010 and the GOPB.

TABLE 3.2: ILLUSTRATION ERU CONVERSION

METER SIZE (IN)	ERU MULTIPLIER
3/4	1.00
1	2.16
1 1/2	7.17
2	11.54
3	26.00
4	46.00
6	104.00

Source: Provided by the City of St. George

LEVEL OF SERVICE STANDARDS

Impact fees cannot be used to finance an increase in the level of service to current or future users of system improvements. Therefore, it is important to identify the culinary water level of service currently provided within the City to ensure that the new capacities of projects financed through impact fees do not exceed the established standard.

[7] UC 11-36a-402(a)

SOURCE

Since water supply is provided by WCWCD, this analysis does not consider a level of service for source improvements.

STORAGE

TABLE 3.3 shows the current gpd/ERU for indoor, outdoor, emergency, and fire storage as defined in the 2011 Culinary Water Distribution System CFP. Using these criteria and the ERUs for 2013, the level of service for storage has been calculated in **TABLE 3.4** and is estimated to be **1,487 gpd/ERU**.[8]

TABLE 3.3: STORAGE LEVEL OF SERVICE (LOS)

	GPD/ERU
Indoor Storage	400
Outdoor Storage	480
Emergency Storage	540
Fire Storage	180,000 gallons per pressure zone
Source: 2011 Culinary Water Distribution System CFP, page 7-2	

TABLE 3.4: STORAGE LEVEL OF SERVICE (LOS)

	# ERU'S	# ZONES	STORAGE REQUIREMENTS (MILLION GALLONS)			FIRE	TOTAL STORAGE (MILLION GALLONS)	AVG. GPD/ERU
			INDOOR	OUTDOOR	EMERGENCY			
2013	32,035	12	12.81	15.38	17.30	2.16	47.65	1,487

DISTRIBUTION

The CFP identifies the distribution level of service of **1,085 gallons per day (gpd)**, based on the peak daily demand per year from 2008 through 2010.[9]

According to the CFP, existing infrastructure was analyzed relative to needed improvements to develop the list of capital projects necessary to serve new growth. Generally the system is at capacity resulting in needed future improvements. However, there is one specific waterline that has significant excess capacity. This excess capacity will be calculated in the next section.

[8] These numbers are calculated by multiplying the number of ERUs (32,035) by the storage LOS in Table 3.3 and dividing by 1,000,000. For example, the Indoor Storage LOS is calculated by multiplying 32,035 by 400 and then dividing by 1,000,000 which equals 12.81 MG (million gallons).

[9] 2011 Culinary Water Distribution System Capital Facilities Plan, page 4-1 & 4-2.

LEWIS YOUNG ROBERTSON & BURNINGHAM, INC. SALT LAKE CITY, UTAH 84101 OFFICE 801.596.0700 FAX 801.596.2800

SECTION 4: EXISTING FACILITIES INVENTORY

EXCESS CAPACITY

The intent of the equity buy-in component is to recover the costs of the unused capacity in existing infrastructure from new development. This section addresses any excess capacity within the culinary water system.

SOURCE

The City is part of the Washington County Water Conservancy District ("WCWCD"). Since joining the WCWCD Regional Pooling Agreement in 2006, the City does not collect impact fees to develop new water sources as the WCWCD is charged with developing new water sources to provide water for future growth. While the City utilizes some of its own existing sources of water, as well as purchase water from the WCWCD, there is no excess capacity associated with the source component.

STORAGE

A comparison of existing storage capacity relative to the future storage requirements per ERU illustrates excess capacity within the existing system, as well as a need to build additional capacity. Based on the LOS of 1,487 gpd/ERU, the City's storage needs in 2013 total **47.65 MG**.[10] The total capacity of the existing system is **58.3 MG**, for a difference of 10.65 MG. Assuming the same LOS (1,487 gpd/ERU), the excess capacity should serve 7,160 ERUs. However, the growth projections indicate approximately 11,017 new ERUs over the planning horizon. As a result, an additional 5.7 MG of storage capacity will need to be provided within the impact fee planning horizon. The City has currently planned 10.3 MG of storage capacity during the planning horizon, which is shown in this report. However, since only 5.7 MG of storage will be required, only 55.7 percent of the costs of the future storage facility will be included in the calculation of the impact fee. The calculation and analysis is provided in greater detail below in **TABLE 4.1.**

TABLE 4.1: ILLUSTRATION OF EXCESS CAPACITY AND NEW STORAGE REQUIREMENTS

TANK	VOLUME (MGD)	GPD	ERUS SERVED
Total Storage (2013)	47.65	47,650,000	32,035
Existing Storage Capacity	58.30	58,300,000	39,195
Excess Capacity	**10.65**	**10,650,000**	**7,160**
		ERUs in Planning Horizon	**11,017**
		Difference	**3,857**
		New Storage Needed (Gal) at 1,487 gpd/ERU	**5,737,576**

The buy-in component is calculated using the original cost of existing assets as presented in the City's financial records, as more fully described in **TABLE 4.2.**

TABLE 4.2: DETERMINATION OF VALUE OF EXISTING STORAGE FACILITIES RELATED TO NEW GROWTH

Base Value of Existing Facilities	$6,860,870	Based on existing depreciation schedules
Total Value of Existing Facilities	**$6,860,870**	
Percent Excess Capacity	18.3%	See **TABLE 4.3**: ERUs Served by Excess Capacity / Total Existing Storage Capacity ERUs
Buy-in Cost to Growth	**$1,253,319**	Calculation of Buy-in does not include the future capital cost to provide the additional 5.7 MG of storage

[10] Calculated by multiplying the level of service (1,487 gpd/ERU) by the number of ERUs in 2013 (32,035).

DISTRIBUTION

According to the CFP, existing infrastructure was analyzed relative to needed improvements to develop the list of capital projects necessary to serve new growth. Generally the system is at capacity resulting in needed future improvements. However, a few particular waterlines have significant excess capacity. These waterlines include the Airport Waterline, the Regional Pipeline Phase 1, and the Little Valley Line.

AIRPORT WATERLINE EXCESS CAPACITY

The Airport Waterline was installed to serve the airport and future connections. The City has determined that approximately 97.8 percent of the waterline has excess capacity which would serve an additional 4,543 ERUs. The buy-in component is calculated using the original cost of the waterline and is shown in Table 4.4.

TABLE 4.3: ILLUSTRATION OF EXCESS CAPACITY FOR AIRPORT WATERLINE

CAPACITY ANALYSIS	ERUS
Capacity	4,645
Current Demand	102
Excess Capacity	**4,543**
% Excess Capacity	97.8%
Source: The City of St. George Water Services Department	

TABLE 4.4: DETERMINATION OF VALUE OF EXISTING AIRPORT WATERLINE RELATED TO NEW GROWTH

	VALUE	
Base Value of Existing Airport Waterline	$1,235,366	Source: Water Services Department
Total Value of Existing Airport Waterline	**$1,235,366**	
Percent Excess Capacity	97.8%	See **TABLE 4.3:** ERUs Served by Excess Capacity / Total Existing Capacity ERUs
Buy-in Cost to Growth	**$1,208,238**	

REGIONAL PIPELINE PHASE 1 EXCESS CAPACITY

The Regional Pipeline Phase 1 is a 60″ diameter pipeline that runs from the Quail Creek Water Treatment Plant to Washington Fields. WCWCD bonded for the entire project (including Phase 2 & Phase 3) and the City remits its portion of the bond payment to WCWCD each year. The principal and interest components related to Phase 1 amounts to approximately $18,457,526. This is used to calculate the buy-in component shown in Table 4.6.

TABLE 4.5: ILLUSTRATION OF EXCESS CAPACITY FOR REGIONAL PIPELINE PHASE I

CAPACITY ANALYSIS	GPM	ERUS
Total Capacity	49,000	
Total City Capacity	34,153	
Peak Day Demand	**24,000**	
Excess Capacity	**10,153**	**13,475**
% Excess Capacity	29.7%	
Source: The City of St. George Water Services Department		

TABLE 4.6: DETERMINATION OF VALUE OF EXISTING REGIONAL PIPELINE PHASE I RELATED TO NEW GROWTH

	VALUE	
Total Value of Regional Pipeline	$18,457,526	Source: WCWCD Series 2002 Bonds & 2007A Refunding Bonds (principal & interest related to 60″ Pipeline)
City Purchased Capacity	69.7%	Source: WCWCD Bond Payment Schedule allocation to the City of St. George
Total City Value	**$12,864,895**	

	VALUE	
Percent Excess Capacity	29.7%	See **TABLE 4.5**: GPM served by Excess Capacity / Total City Capacity
Buy-in Cost to Growth	**$3,824,475**	

LITTLE VALLEY LINE EXCESS CAPACITY

The Little Valley Line is a 30″ diameter pipeline that runs from Washington Fields to the Little Valley Pump Station. The City did not issue debt to fund this improvement thus the buy-in component is calculated using the original cost of the waterline and is shown in Table 4.4.

TABLE 4.7: ILLUSTRATION OF EXCESS CAPACITY FOR LITTLE VALLEY LINE

CAPACITY ANALYSIS	GPM	ERUS
Total Capacity	15,900	
Current Demand (Peak Daily)	7,600	
Excess Capacity	**8,300**	**11,016**
% Excess Capacity	52.2%	
Source: The City of St. George Water Services Department		

TABLE 4.8: DETERMINATION OF VALUE OF EXISTING LITTLE VALLEY LINE

	VALUE	
Value of Existing Little Valley Line	$1,032,500	Source: Water Services Department
Total Value of Existing Little Valley Line		
% Excess Capacity	52.2%	See **TABLE 4.7**: GPM served by Excess Capacity / Total Capacity
Buy-in Cost to Growth	**$538,978**	

The buy-in cost to growth identified in the tables above will be applied to the new development anticipated over the IFFP horizon. In addition to this excess capacity, new development will require additional distribution system improvements. The cumulative value of excess capacity and future facilities will be necessary to serve new development and will be spread over the number of ERUs anticipated in the next ten years.

MANNER OF FINANCING EXISTING PUBLIC FACILITIES

The City has funded its existing capital infrastructure through a combination of different revenue sources, including impact fees, user fees, dedications, the issuance of debt, and grant monies. This analysis has removed all funding that has come from federal grants and donations to ensure that none of those infrastructure items are included in the level of service.

SECTION 5: CAPITAL FACILITY ANALYSIS

The estimated costs attributed to new growth were analyzed based on existing development versus future development patterns, as well as through an analysis of flow data. From this analysis, a portion of future infrastructure costs were attributed to new growth and included in this impact fee analysis as shown in **TABLE 5.1.** The costs of capital projects related to curing existing deficiencies cannot be funded through impact fees and were not included in the calculation of the impact fees, but are included in the capital improvement list shown below in Table 5.1.

There are several projects listed under future capital improvements in the following section that relate to improvements to the City's water source. Since joining the WCWCD Regional Pooling Agreement in 2006, the City does not collect impact fees to develop new water sources. The WCWCD is charged with developing new water sources to provide water for future growth. The City does, however, utilize its own existing sources of water, as well as purchase water from the WCWCD. The "Source" projects listed under the Capital Improvements are to improve some of the City's existing water sources. Over time, a groundwater well will gradually lose capacity and require rehabilitation to restore its original capacity. The projects listed are to rehabilitate and restore some of the City's own water sources to their original capacity. These projects are not funded by nor attributed to new growth and therefore are not included in the impact fee calculations.

TABLE 5.1: ILLUSTRATION OF CAPITAL IMPROVEMENTS

PROJECT	CONSTRUCTION YEAR	2013 CONSTRUCTION COST	CONSTRUCTION YEAR COST	% FUNDED BY DEVELOPER	% TO NON-GROWTH	% TO GROWTH AND CITY FUNDED
Source (Wells)						
Sunbrook #1 Well Rehab	2016	$100,000	$103,030	0%	100%	0%
Gunlock #6 Re-Drill	2019	$1,000,000	$1,061,520	0%	100%	0%
Millcreek Well #3 Re-Drill	2020	$1,225,000	$1,313,366	0%	100%	0%
Sunbrook Well #3 Equipment	2020	$300,000	$321,641	0%	100%	0%
Subtotal:		**$2,625,000**	**$2,799,557**			
Distribution Lines						
Bloomington Hills Upper Tank Loop Line	2014	$180,000	$181,800	0%	0%	100%
City Center Waterline Replacement and Upsize	2014	$325,000	$328,250	0%	100%	0%
3050 East Waterline Replacement	2015	$280,000	$285,628	0%	100%	0%
Re-Use Extension to River Road	2014	$536,000	$541,360	50%	0%	50%
Mall Drive Bridge Waterline Crossing	2015	$490,000	$499,849	0%	25%	75%
Dixie Downs Waterline Replacement and Upsize	2015	$420,000	$428,442	0%	100%	0%
Mall Drive Bridge Irrigation Line Crossing	2015	$420,000	$428,442	0%	25%	75%
Trails Development Connection to Ledges	2017	$300,150	$312,337	50%	0%	50%
Plantations Pipeline	2018	$420,750	$442,212	100%	0%	0%
Upper Ft. Pierce Industrial Park Tank and Booster Pump (PIPELINE)	2015	$423,594	$432,108	0%	0%	100%
Ft. Pierce - Airport Connection	2018	$622,750	$654,517	0%	0%	100%
White Dome Water Tank	2022	$500,000	$546,843	0%	0%	100%
Sand Hollow Pipeline Connection to 2000 S	2016	$948,000	$976,725	0%	0%	100%
Subtotal:		**$5,866,244**	**$6,058,514**			

Flow Control Valves (PRV, PSV, ALT, etc.)						
Ft. Pierce - Airport Connection	2018	$50,000	$52,551	0%	0%	100%
Sand Hollow Pipeline Connection to 2000 South	2016	$65,000	$66,970	0%	0%	100%
Subtotal:		**$115,000**	**$119,520**			
Storage						
Industrial Tank Replacement & Expansion	2014	$2,000,000	$2,020,000	0%	50%	50%
Stone Cliff Tank	2014	$350,000	$353,500	0%	0%	100%
2 MG Storage Tank	2019	$2,000,000	$2,123,040	0%	0%	100%
Upper Ft. Pierce Industrial Park Tank	2015	$1,500,000	$1,530,150	0%	0%	100%
White Dome Water Tank	2022	$2,500,000	$2,734,213	0%	0%	100%
Subtotal:		**$8,350,000**	**$8,760,903**			
Booster Pump Stations						
Upper Ft. Pierce Booster Pump	2015	$200,000	$204,020	0%	0%	100%
Subtotal:		**$200,000**	**$204,020**			
Total Capital Projects		**$17,156,244**	**$17,942,514**			

Source: St. George Culinary Water Distribution CFP (2011), p. 9-5, Update provided by City in 2013

As shown above, a total of **$17,942,514** in system improvements is planned through 2023. **TABLE 5.2** illustrates the capital improvements that are planned related to new growth to maintain the existing LOS.

TABLE 5.2: ILLUSTRATION OF CAPITAL IMPROVEMENTS RELATED TO GROWTH

PROJECT	% TO GROWTH AND CITY FUNDED	TOTAL IMPACT FEE ELIGIBLE COST TO GROWTH
Source (Wells)		
Sunbrook #1 Well Rehab	0%	$0
Gunlock #6 Re-Drill	0%	$0
Millcreek Well #3 Re-Drill	0%	$0
Sunbrook Well #3 Equipment	0%	$0
Subtotal:		$0
Distribution Lines		
Bloomington Hills Upper Tank Loop Line	100%	$181,800
City Center Waterline Replacement and Upsize	0%	$0
3050 East Waterline Replacement	0%	$0
Re-Use Extension to River Road	50%	$270,680
Mall Drive Bridge Waterline Crossing	75%	$374,887
Dixie Downs Waterline Replacement and Upsize	0%	$0
Mall Drive Bridge Irrigation Line Crossing	75%	$321,332
Trails Development Connection to Ledges	50%	$156,169
Plantations Pipeline	0%	$0
Upper Ft. Pierce Industrial Park Tank and Booster Pump (PIPELINE)	100%	$432,108
Ft. Pierce - Airport Connection	100%	$654,517
White Dome Water Tank	100%	$546,843
Sand Hollow Pipeline Connection to 2000 S	100%	$976,725
Subtotal:		**$3,915,060**
Flow Control Valves (PRV, PSV, ALT, etc.)		
Ft. Pierce - Airport Connection	100%	$52,551
Sand Hollow Pipeline Connection to 2000 South	100%	$66,970
Subtotal:		**$119,520**

PROJECT	% TO GROWTH AND CITY FUNDED	TOTAL IMPACT FEE ELIGIBLE COST TO GROWTH
Storage		
Industrial Tank Replacement (expanded to add 2 MG)	50%	$1,010,000
Stone Cliff Tank	100%	
2 MG Storage Tank	100%	
Upper Ft. Pierce Industrial Park Tank (2 MG)	100%	$1,530,150
White Dome Water Tank (4 MG)	100%	$2,734,213
Subtotal:		**$5,274,363**
Booster Pump Stations		
Upper Ft. Pierce Booster Pump	100%	$204,020
Subtotal:		**$204,020**
Total Capital Projects		**$9,512,963**
Source: St. George Culinary Water Distribution CFP (2011), p. 9-5, Update provided by City in 2013		

The City has determined the projects included in this IFFP using capital project and engineering data, planning analysis and other information. The City has provided all future capital project data including project descriptions and estimated project costs. The accuracy and correctness of this plan is contingent upon the accuracy of the data and assumptions. Any deviations or changes in the assumptions due to changes in the economy or other relevant information used by the City for this study may cause this plan to be inaccurate and may require modifications.

In addition, while the $9.5 million is identified above as the impact fee eligible cost to growth, only 56 percent of the future storage facilities may be included in the calculation of the impact fee. This is due to the fact that the City has planned 10.3 MG of storage capacity during the planning horizon while only 5.7 MG of storage will actually be required by the demand within this horizon. The 56 percent is applied in **TABLE 5.3** below.

TABLE 5.3: SUMMARY OF CAPITAL IMPROVEMENT COSTS TO GROWTH WITHIN IFFP HORIZON

FUTURE PROJECTS	CONSTRUCTION YEAR COST	COST TO GROWTH	PERCENT WITHIN IFFP WINDOW	COST TO IMPACT FEE
Source	$2,799,557	$0	0%	$0
Distribution	$6,058,514	$3,915,060	100%	$3,915,060
Flow Control	$119,520	$119,520	100%	$119,520
Storage	$8,760,903	$5,274,363	56%	$2,938,064
Booster Pumps	$204,020	$204,020	100%	$204,020
Subtotal Future Projects	**$17,942,514**	**$9,512,963**		**$7,176,664**

SYSTEM VS. PROJECT IMPROVEMENTS

System improvements are defined as existing and future public facilities that are intended to provide services to service areas within the community at large.[11] Project improvements are improvements and facilities that are planned and designed to provide service for a specific development (resulting from a development activity) and considered necessary for the use and convenience of the occupants or users of that development.[12] This analysis only includes the costs of system improvements related to new growth within the proportionate share analysis.

[11] UC 11-36a-102(20)
[12] UC 11-36a102(13)

FUNDING OF FUTURE FACILITIES

The IFFP must also include a consideration of all revenue sources, including impact fees and the dedication (donations) of system improvements, which may be used to finance system improvements.[13] In conjunction with this revenue analysis, there must be a determination that impact fees are necessary to achieve an equitable allocation of the costs of the new facilities between the new and existing users.[14]

In considering the funding of future facilities, the City has determined the portion of future projects that will be funded by impact fees as growth-related, system improvements. Impact fees are an appropriate funding and repayment mechanism of the growth-related improvements. Where applicable, impact fees will offset the cost of future facilities. However, impact fees cannot be used to fund non-qualified expenses (i.e. the costs to cure existing deficiencies, to raise the level of service, to recoup more than the actual cost of system improvements, the cost to fund overhead cannot be included in the calculation of impact fees. Other revenues such as utility rate revenue, property taxes, grants, or loans can be used to fund these types of expenditures, as described below.

UTILITY RATE REVENUES

Utility rate revenues serve as the primary funding mechanism within enterprise funds. Rates are established to ensure appropriate coverage of all operations and maintenance expenses, debt service coverage, and fund non-growth related capital project needs.

PROPERTY TAX REVENUES

Property tax revenues are not specifically identified in this analysis as a funding source for growth-related capital projects, but inter-fund loans can be made from the general fund which will ultimately include some property tax revenues. Inter-fund loans will be repaid once sufficient impact fee revenues have been collected. The City does not currently assess interest on money borrowed from the general fund; however, the City may adopt a policy to do so.

GRANTS AND DONATIONS

Grants and donations are not currently contemplated in this IFFP. However, the impact fees will be adjusted if grants become available to reflect the grant monies received. A donor will be entitled to a reimbursement for the value of the system improvements funded through impact fees if donations are made by new development.

IMPACT FEE REVENUES

Impact fees have become a logical mechanism for funding growth-related infrastructure. Impact fees are charged to ensure that new growth pays its proportionate share of the costs for the development of public infrastructure. Impact fee revenues can also be attributed to the future expansion of public infrastructure if the revenues are used to maintain an existing level of service. Increases to an existing level of service cannot be funded with impact fee revenues. Analysis is required to accurately assess the true impact of a particular user upon the City infrastructure and to prevent existing users from subsidizing new growth. Impact fee revenues are generally considered non-operating revenues and help offset future capital costs.

DEBT FINANCING

In the event the City has not amassed sufficient impact fees to pay for the construction of time sensitive or urgent capital projects needed to accommodate new growth, the City must look to revenue sources other than impact fees for funding. The Impact Fees Act allows for the costs related to the financing of future capital projects to be legally included in the impact fee. This allows the City to finance and quickly construct infrastructure for new development and reimburse itself later from impact fee revenues for the costs of principal and interest.

This analysis assumes future growth related facilities will be funded on a pay-as-you-go basis, utilizing impact fee and utility fee revenues.

---

[13] 11-36a-302(2)
[14] 11-36a-302(3)

EQUITY OF IMPACT FEES

Impact fees are intended to recover the costs of capital infrastructure that relate to future growth. The impact fee calculations are structured for impact fees to fund 100% of the growth-related facilities identified in the proportionate share analysis as presented in the impact fee analysis. Even so, there may be years that impact fee revenues cannot cover the annual growth-related expenses. In those years, other revenues such as general fund revenues may be used to make up any annual deficits. Any borrowed funds are to be repaid in their entirety through impact fees.

NECESSITY OF IMPACT FEES

An entity may only impose impact fees on development activity if the entity's plan for financing system improvements establishes that impact fees are necessary to achieve parity between existing and new development. This analysis has identified the improvements to public facilities and the funding mechanisms to complete the suggested improvements. Impact fees are identified as a necessary funding mechanism to help offset the costs of new capital improvements related to new growth. In addition, alternative funding mechanisms are identified to help offset the cost of future capital improvements.

SECTION 6: CULINARY WATER IMPACT FEE CALCULATION

The City currently provides culinary water to its residents and businesses. As a result of new growth, the culinary water system is in need of expansion to perpetuate the level of service that the City has historically maintained. The 2011 Culinary Water Distribution System Capital Facilities Plan, and updates, provided by the City outline the recommended capital projects that will maintain the established level of service.

PROPOSED CULINARY WATER IMPACT FEE

The IFFP must properly complete the legislative requirements found in the Impact Fee Act if it is to serve as a working document in the calculation of appropriate impact fees. The calculation of impact fees relies upon the information contained in this analysis. Impact fees are then calculated based on many variables centered on proportionality share and level of service. The following paragraphs describe the methodology used for calculating impact fees in this analysis.

PLAN BASED (FEE BASED ON DEFINED CAPITAL IMPROVEMENT PLAN)

Impact fees can be calculated using a specific set of costs specified for future development. The improvements are identified in the IFFP, CFP or CIP as growth related projects. The total project costs are divided by the total demand units the projects are designed to serve. Under this methodology, it is important to indentify the existing level of service and determine any excess capacity in existing facilities that could serve new growth.

CULINARY WATER IMPACT FEE CALCULATION

The culinary water impact fees proposed in this analysis will be assessed within all areas of the City. **TABLE 6.1** below illustrates the appropriate buy-in component, the fee associated with projects occurring in the next six to ten years and the applicable costs related to the conveyance of new water sources. The impact fee calculations also include the costs of constructing future water projects and the related improvements and any debt related expense. The proportionate share analysis determines the proportionate cost assignable to new development based on the proposed capital projects and the estimated ERU demand served by the proposed projects, in this case, the ERUs over the next ten years.

TABLE 6.1: CALCULATION OF PROPORTIONATE IMPACT FEE

	TOTAL COST	COST TO GROWTH	PERCENT WITHIN IFFP WINDOW	COST TO IMPACT FEE	ERUS SERVED	FEE PER ERU
Excess Capacity						
Storage Excess Capacity	$6,860,870	$1,253,319	100%	$1,253,319	11,017	$114
Distribution Airport Line Excess Capacity	$1,235,366	$1,208,238	100%	$1,208,238	11,017	$110
Distribution Regional Line Excess Capacity	$12,864,895	$3,824,475	82%	$3,126,959	11,017	$284
Distribution Little Valley Line Excess Capacity	$1,032,500	$538,978	100%	$539,061	11,017	$49
Subtotal Excess Capacity	**$21,993,631**	**$6,825,010**		**$6,127,577**		**$557**
Future Projects						
Storage	$8,760,903	$5,274,363	56%	$2,928,064	11,017	$267
Distribution	$6,058,514	$3,915,060	100%	$3,915,060	11,017	$355
Flow Control	$119,520	$119,520	100%	$119,520	11,017	$11
Booster Pumps	$204,020	$204,020	100%	$204,020	11,017	$19
Subtotal Future Projects	**$15,142,957**	**$9,512,963**		**$7,176,664**		**$652**
Other						
Professional Expense[15]	$9,675	$9,675	100%	$9,675	6,216	$2
Subtotal Other	**$9,675**	**$9,675**		**$9,675**		**$2**
Total	**$37,146,263**	**$16,347,648**		**$13,313,916**		**$1,211**

[15] This is the actual cost to update the IFFP and IFA. The City can use this portion of the impact fee to reimburse itself for the expense of updating the IFFP and IFA. The cost is divided over the ERUs added in the next six years.

A total of $13.3 million is identified as the necessary buy-in and future capital cost to maintain the level of service for new development activity within the next ten years. The cost to growth for excess capacity and future capital facilities is applied to the ERUs projected over the planning horizon (11,017).

The impact fee per meter size is illustrated in the **TABLE 6.2.**

TABLE 6.2: IMPACT FEE PER METER SIZE

METER SIZE (IN)	ERU MULTIPLIER	IMPACT FEE PER METER SIZE	EXISTING IMPACT FEE	% CHANGE
3/4	1.00	$1,211	$1,432	-15%
1	2.16	$2,616	$2,387	10%
1 1/2	7.17	$8,683	$4,774	82%
2	11.54	$13,975	$7,638	83%
3	26.00	$31,486	$16,708	88%
4	46.00	$55,706	$28,643	94%
6	104.00	$125,944	$59,672	111%

ERU multipliers were provided by the City of St. George and are representative of the actual historic water use for the different meter sizes.

NON-STANDARD CULINARY WATER IMPACT FEES

The City reserves the right under the Impact Fees Act[16] to assess an adjusted fee that more closely matches the true impact that the land use will have upon the City's culinary water system. This adjustment could result in a different impact fee if evidence suggests a particular user will create a different impact than what is standard for its category. The impact fee for non-standard development would be determined based on the water utilization (in gallons per day) divided by the peak daily demand (1,085 gpd/ERU), multiplied by the impact fee per ERU, as shown below.

FORMULA FOR NON-STANDARD WATER IMPACT FEES:

Estimated Usage (gpd) / 1,085 (gpd) * $1,211 = Impact Fee

CONSIDERATION OF ALL REVENUE SOURCES

The Impact Fees Act requires the proportionate share analysis to demonstrate that impact fees paid by new development are the most equitable method of funding growth-related infrastructure. See **SECTION 5** for further discussion regarding the consideration of revenue sources.

EXPENDITURE OF IMPACT FEES

Legislation requires that impact fees should be spent or encumbered with six years after each impact fee is paid. Impact fees collected in the next five to six years should be spent only on those projects outlined in the IFFP as growth related costs to maintain the LOS.

PROPOSED CREDITS OWED TO DEVELOPMENT

The Impact Fees Act requires that credits be paid back to development for future fees that will pay for growth-driven system projects included in the Impact Fee Facilities Plan that would otherwise be paid for through user fees. Credits may also be paid to developers who have constructed and donated system facilities to that City that are included in the IFFP in-lieu of impact fees. This situation does not apply to developer exactions or improvements required to offset density or as a condition of development. Any project that a developer funds must be included in the IFFP if a credit is to be issued.

[16] UC 11-36a-402(1)(c)

In the situation that a developer chooses to construct system facilities found in the IFFP in-lieu of impact fees, the decision must be made through negotiation with the developer and the City on a case-by-case basis.

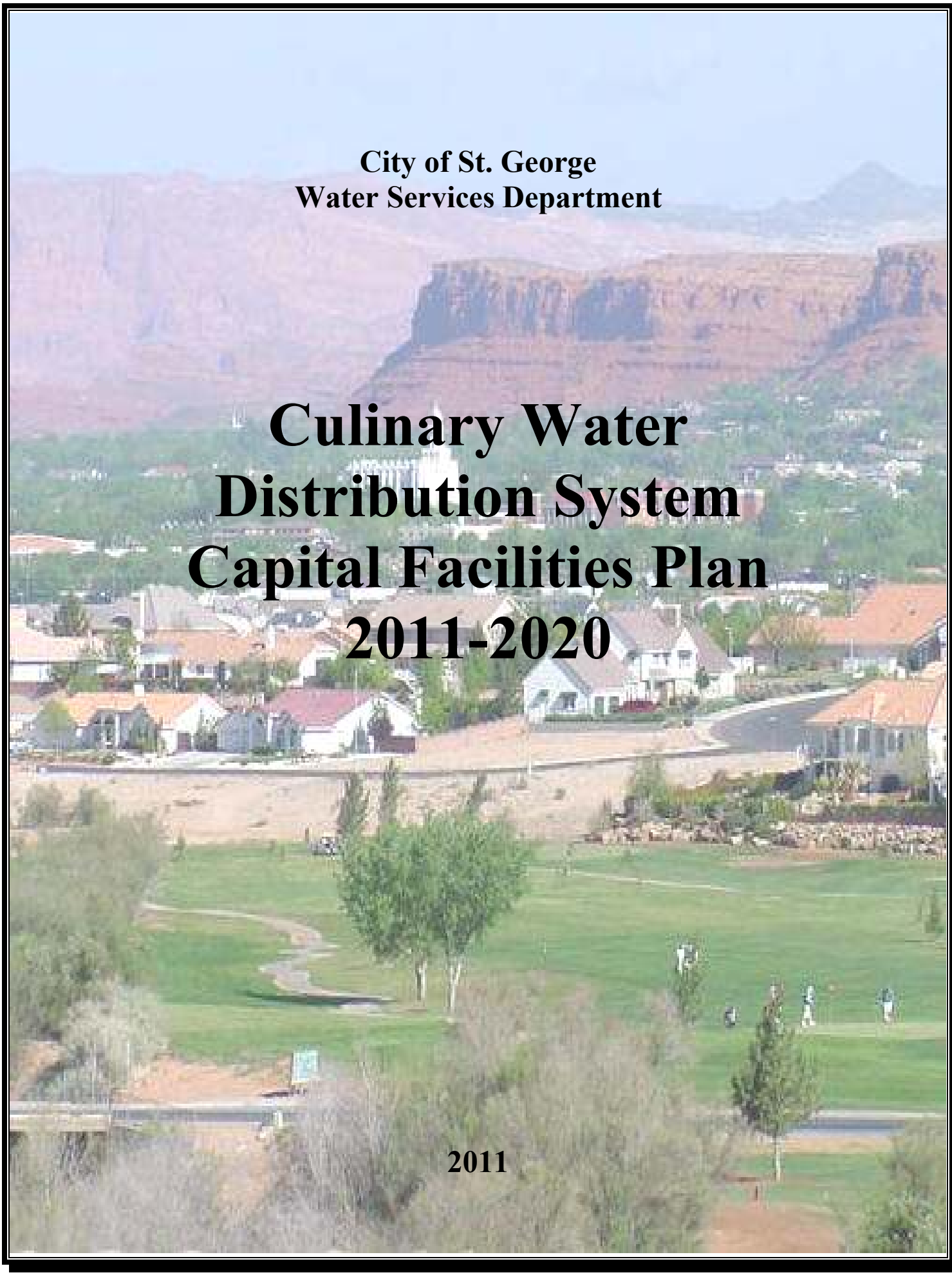
GROWTH-DRIVEN EXTRAORDINARY COSTS

The City does not anticipate any extraordinary costs necessary to provide services to future development.

SUMMARY OF TIME PRICE DIFFERENTIAL

The Impact Fees Act allows for the inclusion of a time price differential to ensure that the future value of costs incurred at a later date are accurately calculated to include the costs of construction inflation. A one percent annual construction inflation adjustment is applied to projects completed after 2013 (the base year cost estimate).

APPENDIX A: 2011 CULINARY WATER DISTRIBUTION CAPITAL FACILITIES PLAN (CFP)



City of St. George
Water Services Department

Culinary Water Distribution System Capital Facilities Plan 2011-2020

2011

Table of Contents

Section 1- Executive Summary

Section 2- Introduction

Section 3- Demographics
- Current Population
- Projected Populations
- Service Planning Areas

Section 4- Demand Estimate
- ERU Demand Calculations
- ERU Densities for Various Land Uses

Section 5- Design Criteria

Section 6- Water Supply Evaluation
- Existing Developed Supplies
- Future Supplies
- Regional Pooling Agreement

Section 7- Water Storage Capacity Evaluation
- Existing Storage Facilities
- Existing Pressure Zones
- Future Storage Facilities

Section 8- Water Distribution System Modeling and Analysis
- Computer Software and Methodology
- Node Allocation
- Existing Distribution System Facilities
- Future Distribution System Requirements

Section 9- Recommended System Improvements
- Required Infrastructure for Future Demand
- Estimated Cost of System Improvements

I. EXECUTIVE SUMMARY

This Capital Facilities Plan has been prepared by the City of St. George Water Services Department as an update to their existing capital facilities plan. A comprehensive culinary water master plan entitled Culinary Water Resources and Water Distribution System Master Plan, dated July 1997 was previously prepared and published by Carollo Engineers. In 2000, Alpha Engineering prepared a document entitled City of St. George Culinary Water Capital Facilities and Water Impact Fee Analysis that updated the culinary water master plan. Both of these previous documents will be referenced herein.

From 2005-2008, the City experienced a rather large growth rate. While the growth rate has dropped considerably since 2008 as a result of an economic downturn, it is anticipated that the City of St. George (City) will continue to experience a constant and substantial growth rate in the future. Based on the 2010 census data, there are 72,897 residents in the City. It is anticipated that over the next three decades, over 175,000 people will reside within the City.

This Capital Facilities Plan was developed as a “road map” to plan for future water distribution system improvements that will be required to provide an acceptable level of service for future development. A hydraulic water distribution model was developed and utilized to identify system improvements that will be required to provide water service to future development. In this Capital Facilities Plan, the required system improvements are identified and associated costs are estimated. The required system improvements and associated costs are separated into three different time periods, based on an anticipated manner of growth. The following table summarizes the cost of required system improvements.

	Total Improvement Costs	Added ERU's	Total ERU's	Cost per ERU
2011-2016	$17,406,540	3,956	33,986	$4,400
2016-2025	$42,229,024	11,688	45,674	$3,613
2025-2040	$31,747,225	25,485	71,159	$1,246
TOTAL	**$91,382,789**	**41,129**	**AVG.**	**$2,222**

Table 1.1- System Improvements Cost Summary

It is important to recognize the reason that the 2011-2016 system improvement Cost per ERU ($4,400) is higher than the 2016-2025 or 2025-2040 system improvements Cost per ERU ($3,613 and $1,246 respectively). Due to the location of the future development, main water transmission lines are required to be installed for the new development. These main transmission lines convey water from the water “source” to the new development. The transmission lines are sized not only to convey water to the

immediate new development that will occur between 2011-2016, but also all future development that will occur through 2040. As such, much of the cost of the main transmission lines is “fronted” by the development which will occur within the next five years.

It is also important to understand that the total improvement costs identified in this Capital Facilities Plan, as well as the associated Cost per ERU are not necessarily the cost that the development impact fee are based on. Several of the improvements that are deemed necessary in the Capital Facilities Plan are expected to be funded, or at least partially funded, by the developer. Improvements that are required to accommodate future growth, but only benefit a single development are included in the total improvements costs, but are expected to be funded by the development. There are also various projects that are identified as system improvement projects that are not 100% attributable to new growth. These projects not only provide additional capacity to the system to accommodate new growth, but also provide redundancy, reliability, and overall improvements to the system. Only a portion of these projects are funded through impact fees.

II. INTRODUCTION

The City of St. George is located in the southwestern part of the state of Utah. The City is located 119 miles north of Las Vegas, Nevada, and 303 miles south of Salt Lake City on the Interstate 15. As of the 2010 U.S. Census, St. George had a population of 72,987. From 1990, St. George became one of the fastest-growing metropolitan areas within the United States. Geographically, the city is currently 75 square miles, or 48,000 acre in size. Figure 2.1 shows the current municipal boundaries of the City of St. George.

The Water Services Department is in need of updating their Water Distribution System Capital Facilities Plan. A comprehensive culinary water master plan entitled Culinary Water Resources and Water Distribution System Master Plan, dated July 1997 was previously prepared and published by Carollo Engineers. In 2000, Alpha Engineering prepared a document entitled City of St. George Culinary Water Capital Facilities and Water Impact Fee Analysis that updated the culinary water master plan. Since that time, there has been a number of significant changes that have occurred which resulted in the need to prepare a new Capital Facilities Plan, which focuses primarily on the culinary water distribution system.

On April 23, 2006, the City of St. George signed the *Regional Water Supply Agreement* that was drafted by the Washington County Water Conservancy District. The intent of the Regional Water Supply Agreement is to "provide for cooperative and coordinated action with respect to planning, development, acquisition, construction, operation, and management of water related facilities…, to provide the operational capacity and flexibility necessary to meet the present and future demands for water of the residents…, and to adopt a Capital Facilities Plan to provide for the water supply, storage, treatment, and transportation facilities necessary to meet the current and future demands of the customers."

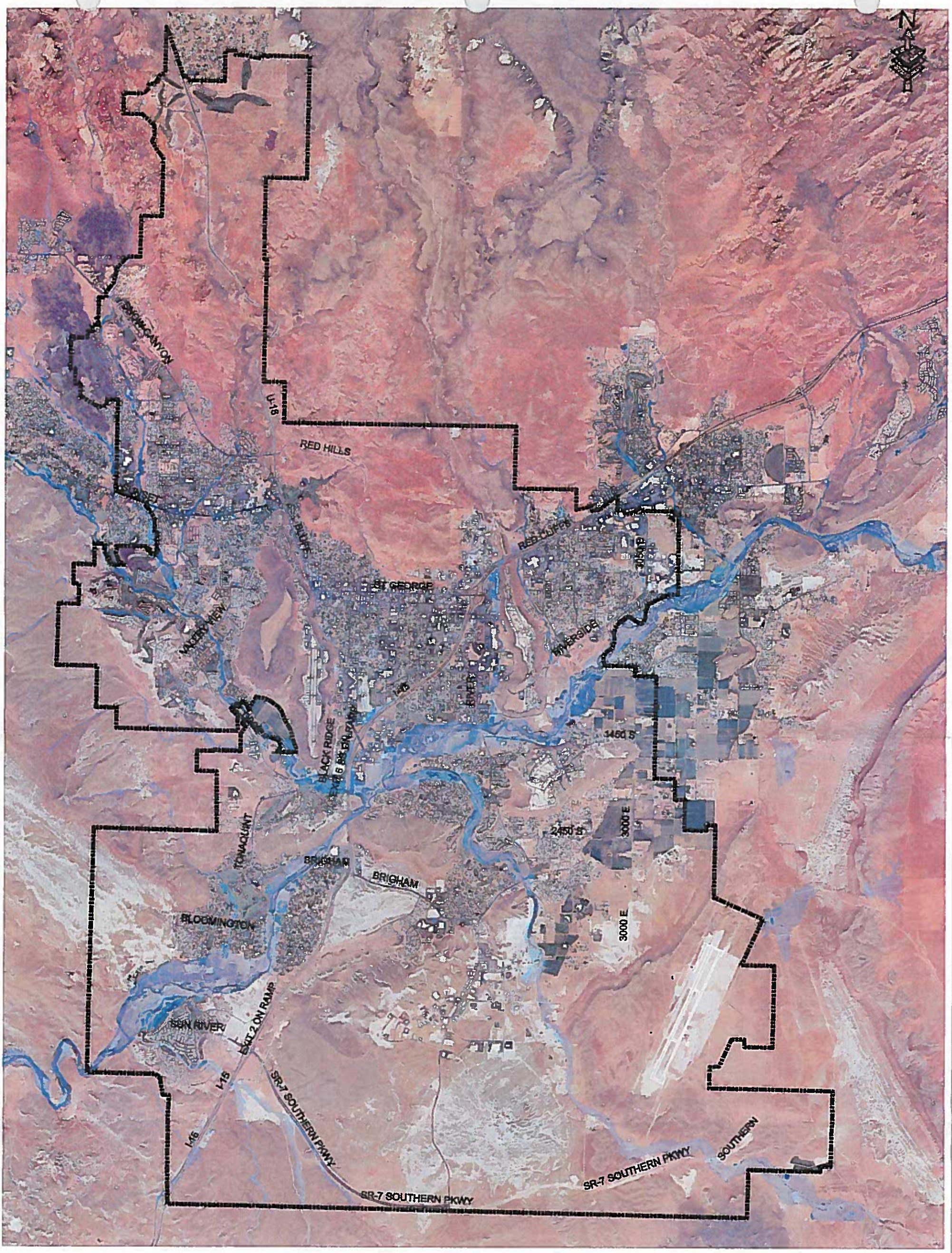
As part of the Regional Water Supply Agreement, the WCWCD levies an impact fee, or a "Water Availability Charge" to pay for the facilities provided by the *WCWCD Regional Capital Facilities Plan.* Prior to entering into the Regional Water Supply Agreement, the City of St. George water impact fee included both the supply and distribution of culinary water required for new development. Since entering into the agreement, the City of St. George water impact fee only covers the cost of distribution of culinary water for new growth. For this reason, this study will focus only on the culinary water distribution.

There are essentially three divisions to this Capital Facilities Plan. Section 3 and Section 4 of this study address demographics of the city as well as the equivalent residential unit water demands. These sections provide information about past and current growth rates, and provide projected growth rates based on past data. In Section 3, the future development in the city is geographically divided into several "Service Planning Areas". Each of these areas are analyzed and evaluated for the potential of new development. Data is collected for each of these areas based on the current Land

Use Plan and Development Master Plans that have been submitted to the City. Section 4 of this study describes the method is which the water demand created by new development is standardized into equivalent residential units, or ERU's.

Sections 5 through 7 of this study describe the design criteria that is used to provide an acceptable level of service for the water distribution system, as well as evaluate the current and future capacities of the culinary water supply and storage requirements.

Section 8 and Section 9 of this study describe the culinary water distribution system computer modeling process and analyze the results of future development. This section also provides estimated costs of system improvements that will be required to support the new growth that is anticipated.



0 3,125 6,250 12,500 Feet

2011 WATER MASTER PLAN UPDATE

City of St. George
Aerial Photo
Figure 2.1

III. DEMOGRAPHICS

During the past, the City has experienced a substantial amount of growth throughout the community. Past census data has shown that the city's population more than doubled between 1980 and 1990. Between 1990 and 2000, the city experienced nearly 75% growth rate, and about the same growth rate between 2000 to present. Figures 3.1 and 3.2 show the number of residential building permits issued each year, as well as the total number of residential dwellings each year between 1985 and 2006.

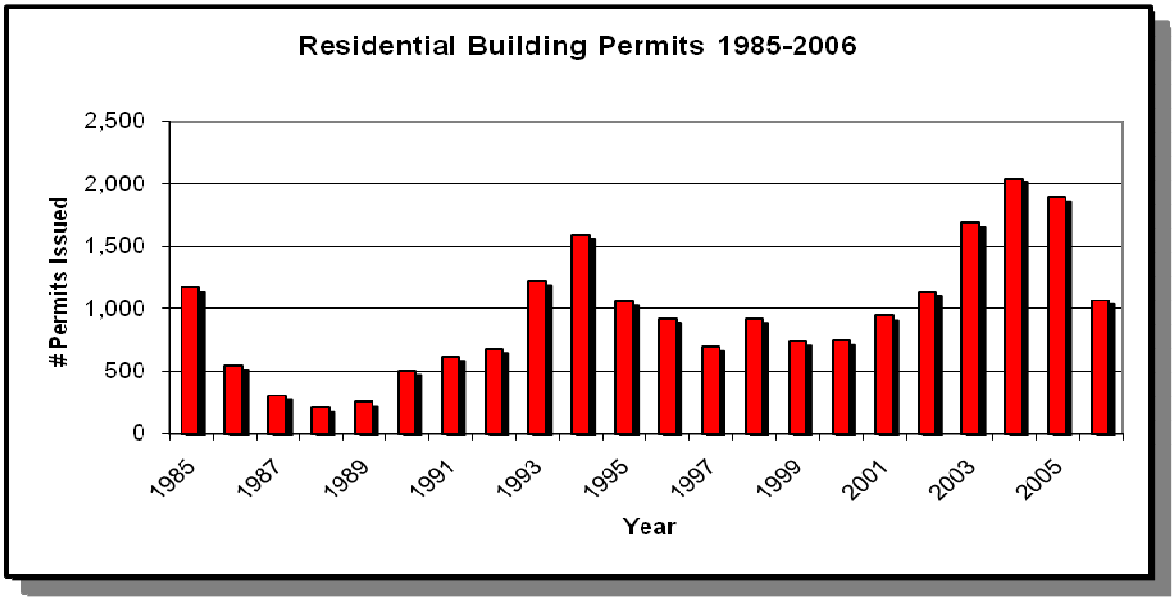


Figure 3.1- Residential Building Permits

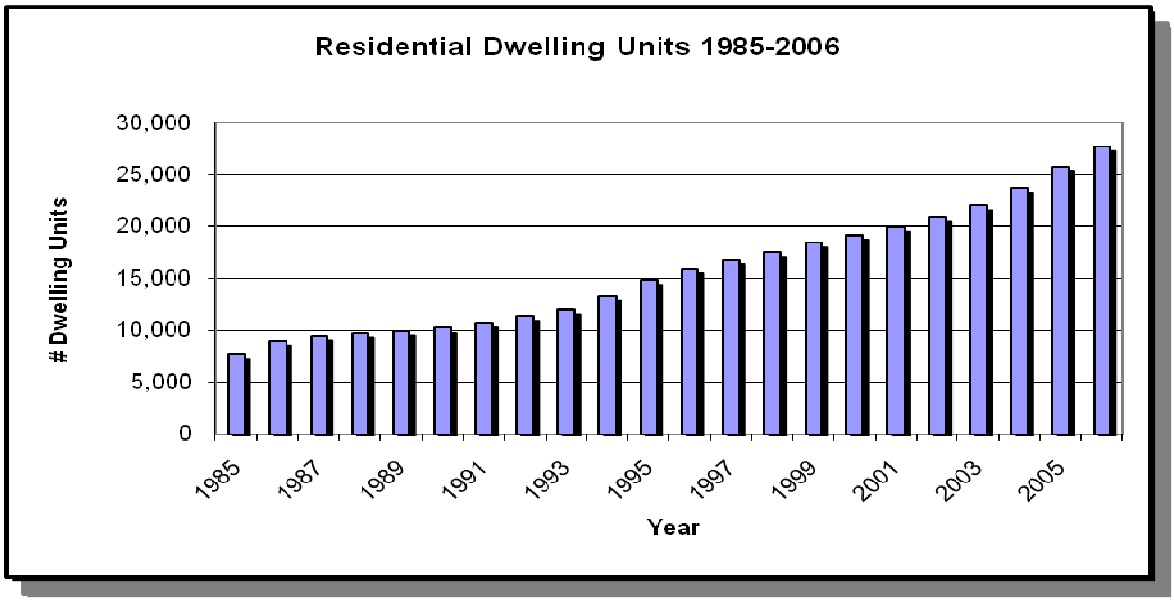


Figure 3.2- Residential Dwelling Units

There are several different methods used to estimate a future population within a community. There are also several sources of data that can be used for these estimations.

Every ten years, a census is performed throughout the country. These censes provide a good "check point" to determine the accuracy a population projection for a given area. The census also provides an estimation of the future population given the most recent methodology and data collected. Between the times that censes are conducted, the Governor's Office of Planning and Budget perform multiple demographic analyses of each county and several cities throughout the state.

The following table depicts historic populations and growth rates derived from censes dating from 1890 to 2000. Table 3.1 and Figure 3.3 show the future estimated population for St. George that is derived from data prepared by the Five County Association of Governments (FCAOG).

Year	Population (Census)	Growth Rate	Avg. Annual Growth Rate
1890	1,377		
1900	1,600	16.2%	1.6%
1910	1,737	8.6%	0.9%
1920	2,215	27.5%	2.8%
1930	2,434	9.9%	1.0%
1940	3,591	47.5%	4.8%
1950	4,562	27.0%	2.7%
1960	5,130	12.5%	1.2%
1970	7,097	38.3%	3.8%
1980	13,146	85.2%	8.5%
1990	28,502	116.8%	11.7%
2000	49,663	74.2%	7.4%
2010	85,664	72.5%	7.2%
2020	132,497	54.7%	5.5%
2030	185,809	40.2%	4.0%
2040	247,703	33.3%	3.3%
2050	317,818	28.3%	2.8%

Table 3.1- Growth Rate based on Five County Association of Governments, May 2005

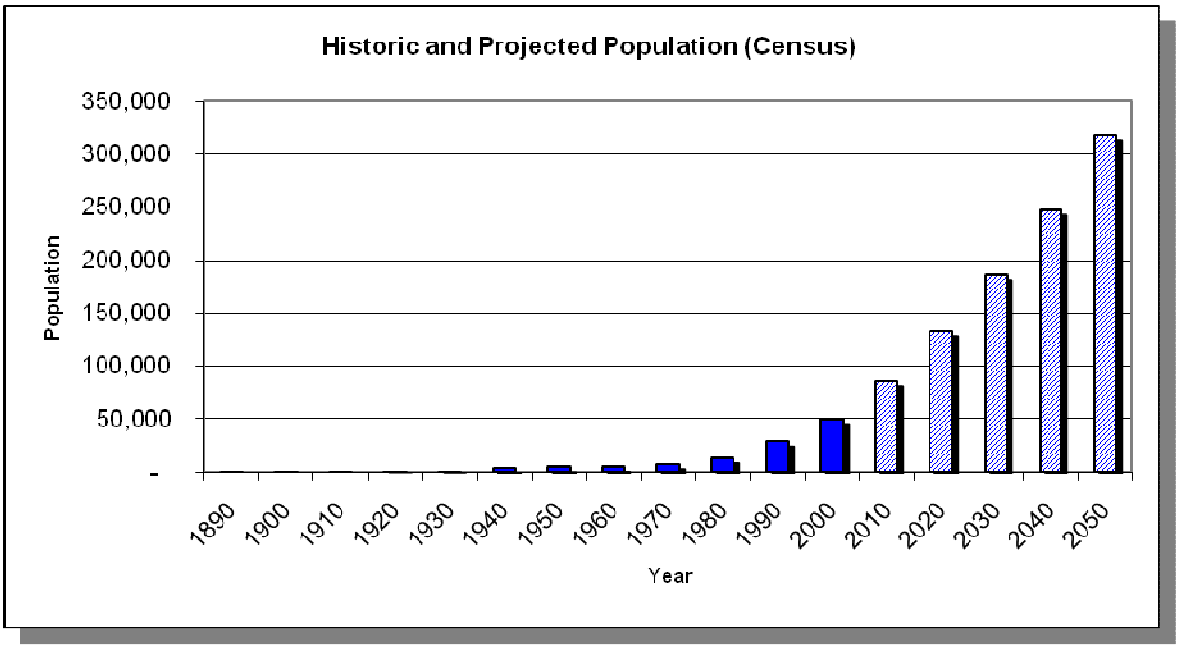


Figure 3.3- Census Population

The above data suggests that based on past data, the estimated population for 2010 was projected to be 85,664 persons. However, the actual population in the City of St. George, based on the 2010 Census was 72,897 persons. This data suggests that the population projections made by the Five County Association of Governments need to be adjusted for actual population counts. The following is a brief summary of the 2000 and 2010 census data.

2000 Census
50,161 population
21,083 housing units
17,367 occupied
3,716 vacant (of which 2,505 are 2nd homes (11.9% of total))
2.89 persons per occupied housing unit

2010 Census
72,897 population
32,089 housing units
25,520 occupied
6,569 vacant (of which 4,115 are 2nd homes (12.9% of total))
2.86 persons per occupied housing unit

While looking at the past and future growth rates to estimate future populations, one must also look at the overall growth capacity of the city. There have been several studies conducted to determine the ultimate build out capacity of the city, based on current land use plans and city boundaries. The most current study was conducted by the City of St. George GIS department. That study used two different methods to estimate the ultimate build out population of the City. The more detailed method looked

at the areas of undeveloped land and overlaid those areas with the current land use plan. The undevelopable areas, such as hillsides, flood plains, and environmental conservation areas were then subtracted from the overlay areas. Using this method, it was determined that the ultimate build out population for the City of St. George is approximately 175,000 people.

In 2000, Alpha Engineering also conducted a similar study in conjunction with a culinary water and power Capital Facilities Plan update. In their study, a similar method was used, with the exception that their study looked at potential areas that were not currently within the City boundaries, but had a potential of future annexation. Their study suggested an ultimate build-out population for the City of St. George of approximately 230,000 people.

While there is some debate as to the actual build-out population that the City will sustain, for the purpose of this study, it is assumed that the build-out population of the City of St. George will be 175,000 persons. Also, the projected population estimate based on growth rate will be adjusted to match the 2010 actual census population and provide a more accurate projection. The following table reflects an adjusted population project that will be used for this study.

Year	Population (Census)	Growth Rate	Avg. Annual Growth Rate
1890	1,377		
1900	1,600	16.2%	1.6%
1910	1,737	8.6%	0.9%
1920	2,215	27.5%	2.8%
1930	2,434	9.9%	1.0%
1940	3,591	47.5%	4.8%
1950	4,562	27.0%	2.7%
1960	5,130	12.5%	1.2%
1970	7,097	38.3%	3.8%
1980	13,146	85.2%	8.5%
1990	28,502	116.8%	11.7%
2000	49,663	74.2%	7.4%
2010	72,897	46.8%	4.7%
2020	94,800	30.0%	3.0%
2030	130,000	37.1%	3.7%
2040	175,000	34.6%	3.5%

Table 3.2- Adjusted Growth Rates and Population Used for this Study

Service Planning Areas

The purpose of this master plan is to provide a "road map" of the near future to assist in planning and preparing the culinary water system infrastructure to accommodate the anticipated growth. This study will focus on growth over the next 30 year, until the year 2040. It is difficult to imagine that one who lived in St. George 30 years ago was part of a population of approximately 13,000. However, during the next 30 years, it is anticipated that population will grow to over 175,000 people.

St. George "central area", which is the area of the city bounded by Foremaster Ridge to the East, the Black Hill to the West, Webb Hill to the South, and the Red Hill to the North is essentially fully developed, as is much of the Green Valley area to the West, the Panorama area to the East, and the Bloomington Hills and Bloomington to the South. These areas will see little or no population change during the next three decades. All other surrounding areas will see the bulk of the changes, with the most growth occurring in the southern end of the city.

Several areas surrounding the now developed areas have been grouped into "Service Planning Areas" or SPA's. These SPA's include the Ledges, Plantations, Hidden Valley, Sun River, South Block, Airport, and Little Valley areas. Also included in the Services Planning Areas is the old airport mesa. These eight areas will experience the majority of the growth over the next 30 years. Also, the majority of these areas have had some development master planning performed over the past few years. References for these master planned development studies are included in the appendices. Exhibit 3.1 identifies the eight distinct Service Planning Areas throughout the city.

SPA-1 The Ledges

The Ledges SPA is located in the northwest portion of the city. The area is mainly comprised of The Ledges and The Trails development, which are both master planned communities. West of these master planned communities, there are some privately owned parcels, as well as some State Institutional Trust Lands Administration (SITLA) property. The total area of SPA-1 is 2,010 acres. The following Table 3.3 is a summary of the Ledges Special Planning Area.

	Area (acres)	ERU's	Population	ERU's/Acre
Ledges				
Residential	506	2,400	6,864	4.74
Resort/Golf Course	100+	-	-	
Parks & Public Facilities	30	49	-	1.65
Open Space	-	-	-	
TOTAL	**536**	**2,449**	**-**	**4.84**
The Trails				

Residential	231.36	925	2,646	4.00
Commercial	1.9	7	-	3.0
Parks & Public Facilities	4.3	7	-	1.65
Open Space	97.98	-	-	0.00
TOTAL	**335.54**	**936**		**2.77**
TOTAL SPA #1	**871.54**	**3,385**	**9,510**	**3.89**

Table 3.3- The Ledges SPA

SPA-2 The Plantations

The Plantations SPA is located south and east of the Green Valley area. The area consists of both the Plantations and the Tonaquint master planned areas. While some of this SPA is located outside of the city limits, it is anticipated that those portions of the area will eventually be annexed into the city. This area is bounded by BLM property to the south and west, which is not anticipated to be annexed into the city. The total area of SPA-2 is 1,940 acres. Table 3.4 is a summary of the Plantations SPA-2.

	Area (acres)	ERU's	Population	ERU's/Acre
The Lakes				
Residential	458.77	3,491	9,984	7.61
Mixed Use	27.48	274	784	9.97
Roadways	39.89	-	-	-
Open Space	204.54	-	-	-
TOTAL	**730.68**	**3,765**	**10,768**	**-**
Tonaquint Area				
Residential	320.5	1,896	5,423	5.92
Commercial	14.6	51	-	3.5
Parks	38.1	63	-	1.65
Open Space / ROW	2,994	-	-	-
TOTAL	**3,367.2**	**2,010**	**5,423**	**0.60**
TOTAL SPA #2	**4,097.88**	**5,775**	**16,190**	**1.41**

Table 3.4- The Plantations SPA

SPA-3 Hidden Valley

The Hidden Valley SPA is located south of Brigham Road and is bounded on the west by the I-15 corridor and to the south by undevelopable hillside. This area is comprised of the Hidden Valley master planned community. The total area is SPA-3 is 430 acres. Approximately 30% of the area is already developed. Table 3.5 shows summary of the Hidden Valley SPA-3.

	Area (acres)	ERU's	Population	ERU's/Acre
Hidden Valley				
Residential	128.4	935	2,674	7.28
Church/School	18.5	27.75	-	1.5
Parks & Public Facilities	8.1	13.37	-	1.65
Open Space	46	-	-	-
TOTAL	**201**	**976**	**2,674**	**-**
TOTAL SPA #3	**201**	**976**	**2,674**	**4.85**

Table 3.5- Hidden Valley SPA

SPA-4 Sun River

The Sun River SPA is located along the southern city boundary directly west of the I-15 corridor. The SPA is mainly comprised of the Sun River master planned community, which is approximately 70% developed. The total area is SPA-4 is 658 acres. Table 3.6 is a summary of the Sun River SPA-4.

	Area (acres)	ERU's	Population	ERU's/Acre
Atkinville Interchange Area				
Residential	69.2	1,107	3,166	16.00
Commercial	126.8	443	-	3.5
Mixed Use	19.7	40	-	2.0
Employment	98.5	197	-	2.0
RV Park	18.9	57	-	3.0
Public Facilities	8.6	14	-	1.65
Open Space	166.1	-	-	-
TOTAL	**507.8**	**1,858**	**3,166**	**3.66**
Sun River				
Residential	150	458	1,415	3.05
TOTAL	**150**	**458**	**1,415**	**3.05**
TOTAL SPA #4	**658**	**1,565**	**4,581**	**2.38**

Table 3.6- Sun River SPA

SPA-5 South Block

The South Block area is that area directly north of the Utah/Arizona border. The area is bounded on the south by the State border, to the north by the Ft. Pierce Industrial Park, on the West by the I-15 corridor, and on the east by the new airport area. The majority of the property in this SPA is owned by SITLA. SITLA has prepared a master plan of the area, which has reviewed and accepted. The total area is SPA-5 is 5,742 acres. Table 3.7 is a summary of the South Block SPA-5.

	Area (acres)	ERU's	Population	ERU's/Acre
South Block Area (SITLA)				
Residential	1,702.7	11,807	33,768	6.93
Mixed Use	50	1,200	3,432	24.00
Commercial	68	238	-	3.5
Employment	335.4	771	-	2.0
Industrial	331	331	-	1.0
Future Development	866.3	3,464	-	4.0
Schools/Churches/ Fire	158.6	238	-	1.5
Parks & Public Facilities	197.6	326	-	1.65
Open Space/ ROW/ Roadways	2,032.8	-	-	-
TOTAL	**6,115.4**	**18,375**	**37,200**	**3.0**
TOTAL SPA #5	**6,115.4**	**18,375**	**37,200**	**3.0**

Table 3.7- South Block SPA

SPA-6 Airport

The Airport SPA is located in the Southeast portion of the city, surrounding the new airport. The area consists mainly of properties owned by SITLA and the Desert Canyon Development. Both of these property owners have prepared development master plans for the city's approval. To date, the City has accepted the Desert Canyons development master plan, but have not yet accepted SITLA's development master plan for the area directly around the new airport. The total area of SPA-6 is 5,462 acres. Table 3.8 is a summary of the Airport SPA-6.

	Area (acres)	ERU's	Population	ERU's/Acre
Desert Canyons				
Residential	925.15	4,647	13,290	5.02
Town Center (Mixed Use)	119.52	1,434	4,101	12.00
Business Park	307.85	615	-	2.0
Commercial	83.8	293	-	3.5
School/Church	18.12	28	-	1.5
Resort/Golf Course	220.3	364	-	1.65
Parks & Public Facilities	107.32	177	-	1.65
Open Space	650.22	-	-	-
TOTAL	**2,432.28**	**7,558**	**17,392**	**3.10**
Airport Area (SITLA)				
Residential	424.28	1,560	4,462	3.68
Business Park	514.5	1,029	-	2.0
Commercial	21.75	76	-	3.5

Parks & Public Facilities	7.35	12	-	1.65
Open Space	2,062	-	-	-
TOTAL	**3,030**	**2,677**	**4,462**	**1.96**
TOTAL SPA #6	**5,462**	**10,235**	**21,853**	**2.70**

Table 3.8- Airport SPA

SPA-7 Little Valley

The Little Valley SPA is generally located along the easterly border of the City. The area is bounded on the southeast by the Airport area. To the east, the area is bounded by the St. George / Washington border. To the north, the area is bounded by the Virgin River. The area is bounded by the existing Franklin Place, Meadow Valley, The Knolls, and Little Valley Ranchos developments to the west.

The majority of this area is currently zoned and used as an agriculture area. Over the past few years, there has been a lot of interest by local developers to allow higher density housing in this area, rather than the larger, agriculture style lots that are shown on the General Plan. There have been a couple of development master plans for portions of the area that have been presented to the city council.

In calculating densities for this area, a combination of proposed development master plans and the adopted General Plan will be used. The total area of SPA-7 is 2,980 acres. Table 3.9 is a summary of the Little Valley SPA-7.

	Area (acres)	ERU's	Population	ERU's/Acre
Residential	2,347	8,919	25,508	3.80
Parks	268	442	-	1.65
Open Space	243	-	-	-
TOTAL	**2,858**	**9,361**	**25,508**	**3.58**
Summerset at Little Valley Farms				
Residential	106.73	480	1,373	4.50
Parks	15.2	25	-	1.65
Open Space	-	-	-	-
TOTAL	**121.93**	**505**	**1,373**	**4.14**
TOTAL SPA #7	**2,737**	**9,866**	**26,881**	**3.60**

Table 3.9- Little Valley SPA

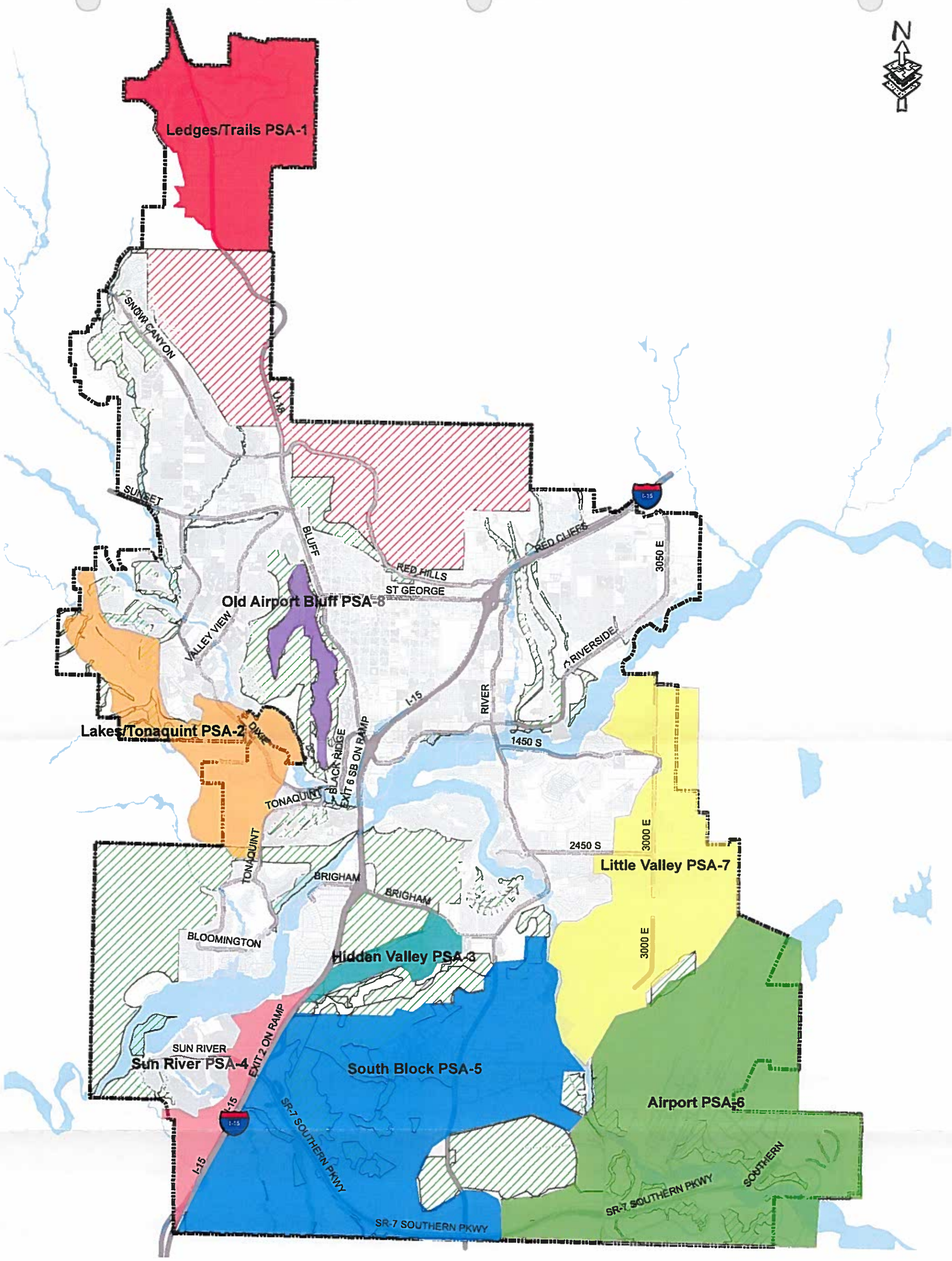
SPA-8 Back Hill Mesas

The Black Hill Mesas SPA is that area located on the top of the “Black Hill” bluff where the St. George Municipal Airport used to be located. There is also some area on top of the higher “Black Hill” bluff that is available for development. The total area of SPA-8 is 406 acres. Table 3.10 is a summary of the Black Hill Mesas SPA-8.

	Area (acres)	ERU's	Population	ERU's/Acre
Black Hill Bluffs				
Residential	406	1,238	3,825	3.05
TOTAL	**406**	**1,238**	**3,825**	**3.05**
TOTAL SPA #8	**406**	**1,238**	**3,825**	**3.05**

Land Use Plan

Several development master plans have been prepared and submitted to the city for their review and approval. These approved master plans include The Ledges, The Trails, The Lakes, SITLA South Block, and Desert Canyons. Other development master plans are in a draft phase, including the Tonaquint area, the SITLA property surrounding the new airport, and a portion of the Little Valley area. Where approved and adopted master plans are available, unit densities and zoning types are be used per the approved master plans. Where the development master plans have not been accepted, population projects are taken from either the general land use plan, the draft development master plan, or a combination of both. For other areas throughout the City, the General Plan Map is used to determine future land use and population densities. Exhibit 3.2 shows the City of St. George General Plan as it is currently adopted.



Legend

Special Planning Areas

Name

- Ledges/Trails PSA-1
- Lakes/Tonaquint PSA-2
- Hidden Valley PSA-3
- Sun River PSA-4
- South Block PSA-5
- Airport PSA-6
- Little Valley PSA-7
- Old Airport Bluff PSA-8

Non Developable Areas

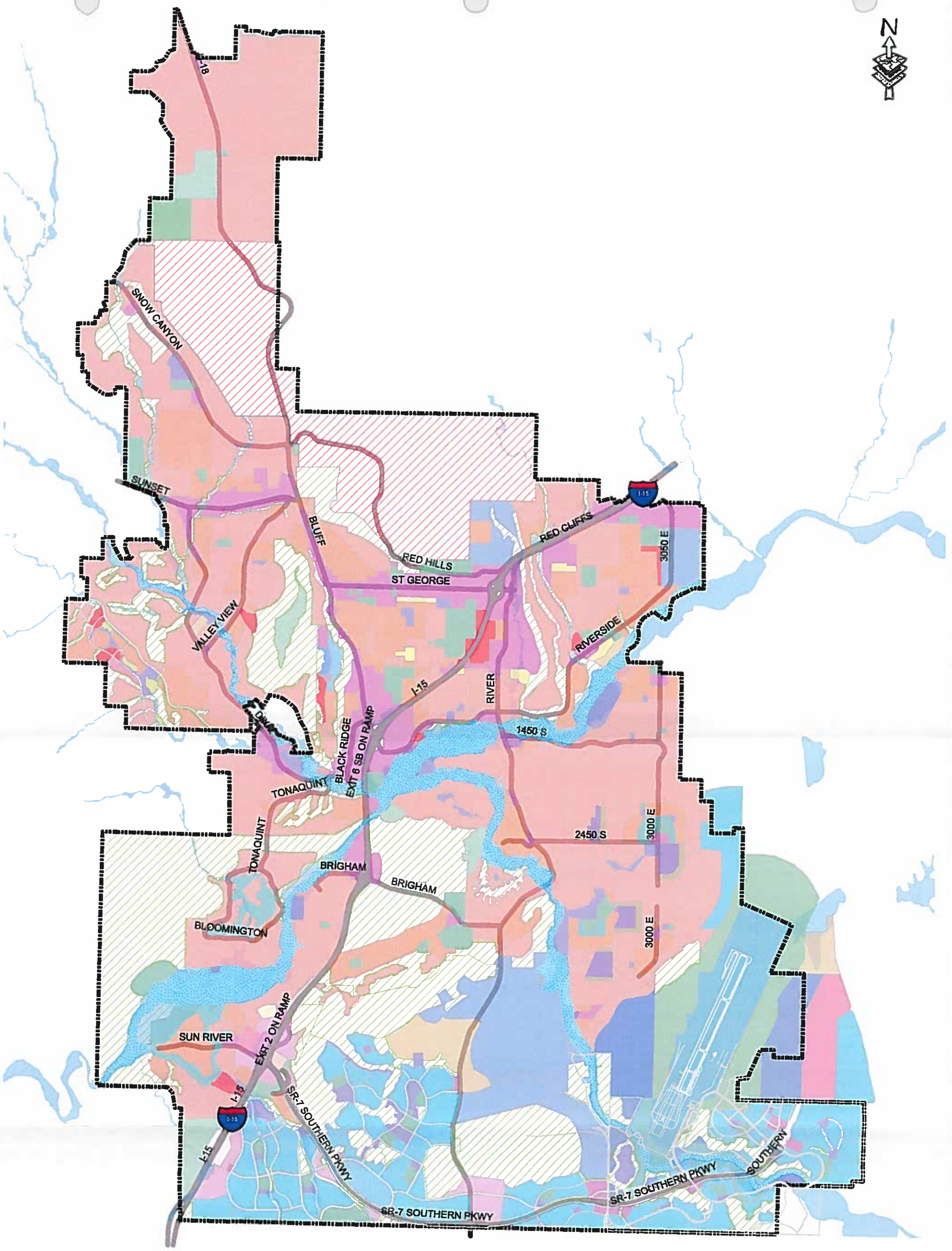
Non Developable Areas

- HCP
- Open Space

0 3,000 6,000 12,000 Feet

2011 WATER MASTER PLAN UPDATE

City of St. George
Planning Service Areas
Figure 3.1



Legend

Land Use Plan

Catagory

- AF
- AIRPORT
- ASBP
- AVI
- BP
- COM
- E
- EQ BUFFER
- FP
- GC
- HCP
- HDR
- IND
- LAKE
- LDR
- MDR
- MHD
- MU
- OS
- PF
- PK
- PO
- RD
- RES
- RESORT
- ROW
- RR
- RV
- SC
- TC
- VC1
- VC2
- VLDR

0 3,000 6,000 12,000 Feet

2011 WATER MASTER PLAN UPDATE

City of St. George
Current Land Use Plan
Figure 3.2

IV. DEMAND ESTIMATES

As for most water distribution master plans or capital facility plans, the key to the study is to determine the average daily water use per equivalent residential unit (ERU). This study does not distinguish between different types of water uses (ie. residential, commercial, industrial, institutional, etc.), but rather differentiates uses by water meter size. In the City of St. George, the common residential water connection is a ¾" water meter. There are various culinary water meter sizes in use throughout the City. Obviously, those water users with larger meters and water services will use more water on a monthly basis than does the standard ¾" meter user. In order to compare the larger water users to the standard ¾" water user, an analysis of monthly water usage was performed over a several year period. The following Table 4.1 illustrates the relative water use several large water services compared to the standard ¾" water service. The "multiplier" column shows the average amount of water used by each meter size relative to the average ¾" water user.

Meter Size (in.)	Multiplier	# Meters	ERU's
3/4"	1.00	18,737	18,737
1"	2.16	766	1,655
1-1/2"	7.17	386	2,768
2"	11.54	558	6,439
3"	26.00	6	156
4"	46.00	6	276
		TOTAL	30,031

Table 4.1- Equivalent Residential Units

The above table shows that in 2010 there were 30,031 ERU's within the City of St. George. Over 18,000 of these ERU's are accounted for by ¾-inch water services.

In the Culinary Water Resources and Water Distribution System Master Plan prepared by Carollo Engineers in July 1997, a detailed calculation was performed to establish the system demands. At that time, the total annual culinary water production was divided by 365 days to determine the average daily production, which was assumed to be the average daily system demand. The average daily demand was divided by the total number of ERU's to determine the average daily demand per ERU. At that time, it was determined that the average daily demand of the system was 647 gpd/ERU. Using the same methodology over the past few of years, an average daily demand of 657 gpd/ERU, 655 gpd/ERU and 625 gpd/ERU were calculated for 2008, 2009, and 2010, respectively. For the purpose of this study, a conservative average daily demand of 650 gpd/ERU will be used.

The 1997 Carollo Engineers study established the Peak Day Demand and Peak Hourly Demands as 1.67 and 3.0 times the average daily demand. For the purpose of this

study, the same Peak Daily and Peak Hourly Demand factors of 1.67 and 3.0, respectively, will be used. For this study, the Peak Daily Demand is 1,085 gpd/ERU, and the Peak Hourly Demand is 1,950 gpd/ERU.

With 2010 census population of 72,897 people, and a total annual water consumption of 7.48 billion gallons, the average daily water demand is calculated at 281 gallons per capita per day (gpcpd).

The 2010 census shows that there were 32,089 housing units in the City of St. George in 2010. Of those housing units, 25,520 were currently occupied. In 2010, 20.5% of the housing units were unoccupied, the majority of which are classified as "second homes". This is an increase from the 2000 census, which showed that 17.6% of the housing units were unoccupied. These unoccupied housing units still demand a substantial amount of water for outside watering, as well as temporary occupancy, in the case of the "second homes". Many of the "second homes" are occupied 4 to 5 months out of the year, yet their occupants are not accounted in the city's population.

It is important to understand that because of the high rate of unoccupied housing units, especially the amount of "second homes" in St. George, the average per capita daily demand of 281 gallons is artificially inflated. The actual per capita water use is significantly less.

Based on the growth rates that were established in Section 3 of this study, the following Table 4.2 shows the projected average and peak day water demands for the next 30 years.

	Population Projection	ERU's	Annual Water Supply (acre-ft)[1]	Average Day Demand (MGD)[2]	Peak Day Demand (MGD)[3]
2010	72,897	30,031	23,046	19.52	32.58
2015	83,849	33,986	24,745	22.09	36.87
2020	94,800	39,399	28,686	25.61	42.75
2025	112,400	45,674	33,255	29.69	49.56
2030	130,000	52,949	38,552	34.42	57.45
2035	152,500	61,383	44,693	39.90	66.60
2040	175,000	71,159	51,811	46.25	77.21

[1] Based on 2008-2010 Calculations of 226,000 Gallons per ERU
[2] Based on 650 gpd per ERU
[3] Based on 1,085 gpd per ERU (1.67 x Avg. Day Demand)

Table 4.2- Projected Water Demand

Based on the above Table 4.2, by the year 2040, the water system must have an annual water supply of 51,811 acre-ft of water, and needs to be capable of producing and delivering a peak daily flow of 77.21 MGD to its customers.

V. Design Criteria

The culinary water system design criteria is used to set a standard in which to evaluate the existing system, as well as provide a guideline for future improvements to the culinary water transmission and distribution system. The design criteria is established using a combination of AWWA standards, criteria established by the Utah State Division of Drinking Water, and criteria accepted by the City of St. George Water Services Department. The established design criteria are summarized below.

- The Minimum Level of Service (LOS) for the culinary water system is capable of meeting the Peak Day and Peak Hour demands of the City's residences and businesses. The water system needs to be able to provide adequate fire flow capacity, while at the same time providing service during it's Peak Day Demand. The distribution system should be sized to accommodate peak hourly instantaneous flows, with a minimum system pressure of 40 psi. Fire flow demands plus peak day demands should be supplied with a minimum of 20 psi to meet the state requirements per Utah Administrative Code Rule 309-105-3.
- Operational storage requirements are based on 400 gallons per ERU for inside use
- Operational storage requirements are based on 480 gallons per ERU for outside use. This requirement is based on 4,800 gallons per acre storage requirements of Zone 6 in the Utah State Drinking Water Code.
- Fire flow storage is based on a fire flow of 1,500 gpm for a 2 hour duration, which equates to 180,000 gallons of storage. In cases where a storage tank serves multiple pressure zones, fire storage is only required for one zone. It is not likely that a fire will be fought at the same time in two pressure zones serviced by the same storage tank.

- Emergency Storage- A provision for emergency storage has been established by the Water Services Department. Fifty percent of the peak day demand is required for emergency storage.
- The minimum meter size requirement for new developments is as shown:
    - ¾" service for Single Family Residential
    - 1" service for Multi-Family Residential (more than 4 units)
    - 1-1/2" service for Multi-Family Residential (5 to 11 units)
    - 2" service for Multi-Family Residential (12-20 units)

    - Commercial, Industrial, or Institutional services based on designed water service requirements.

- The maximum pipe velocity is 5.5 feet per second (fps) during Peak Day Demands, and a maximum of 10 fps during Peak Hourly Demand or fire flow conditions.
- There is no minimum pipe velocity requirement. However, dead-end mains greater than 600 feet in length are not allowed. The pipeline should be designed to maintain high water quality standards.
- The maximum pressure in the distribution system should not exceed 150 psi.
- 1,500 gpm fire flow.

VI. WATER SOURCE EVALUATION

AS described in an earlier section of this report, by the year 2040, it is anticipated that the city's culinary water infrastructure will need to be able to provide an average day demand of nearly 47 mgd, and a peak day demand of nearly 78 mgd. Along with the demand on the infrastructure, there needs to be a reliable source of culinary water able to provide a little over 52,000 acre-feet of water on an annual basis by the year 2040.

Between 2008 and 2010, the City of St. George consumed approximately 23,000 acre-feet of culinary water annually. Over the next 30 years, the City will need to secure additional culinary water such that by 2040, an additional 29,000 acre-feet will be required.

On April 23, 2006, the City of St. George signed the *Regional Water Supply Agreement* that was drafted by the Washington County Water Conservancy District. The intent of the Regional Water Supply Agreement is to "provide for cooperative and coordinated action with respect to planning, development, acquisition, construction, operation, and management of water related facilities…, to provide the operational capacity and flexibility necessary to meet the present and future demands for water of the residents…, and to adopt a Capital Facilities Plan to provide for the water supply, storage, treatment, and transportation facilities necessary to meet the current and future demands of the customers."

As part of the Regional Water Supply Agreement, the WCWCD levies an impact fee, or a "Water Availability Charge" to pay for the facilities provided by the *WCWCD Regional Capital Facilities Plan.* Prior to entering into the Regional Water Supply Agreement, the City of St. George water impact fee included both the supply and distribution of culinary water required for new development. Since entering into the agreement, the City of St. George water impact fee only covers the cost of distribution of culinary water for new growth. These costs include pumping, storage, and conveyance infrastructure and associated appurtenances. The costs of developing new water sources is accounted for in the WCWCD impact fees.

Since entering the Regional Water Supply Agreement, the WCWCD has developed a Regional Capital Facilities Plan which addresses the future water supply needs for all of

the communities within the Regional Water Supply “Pool”. The City of St. George plays an active roll in contributing to the development and maintenance of the WCWCD Regional Capital Facilities Plan in an effort to ensure that the future water supply needs of the City are met.

VII. WATER STORAGE ANALYSIS

The purpose of water storage facilities within a water distribution system is to provide operational, fire flow, and emergency demands in the system. The storage tanks provide the additional flows required during the peak hourly demand. During low demand periods, the tanks are generally filling, preparing for the higher demands. During the higher demand periods of the day, the tanks are generally emptying. During a 24 hour period, the tanks should equalize their filling and emptying.

Table 7.1 summarized the existing tanks and capacities in the water distribution system.

Reservoir Name	Capacity (MG)	Material	Year Install	Base Elevation	Height
Country Club Tank	0.9	Steel	1969	2721	30
Bloomington Area Tank (BAT)	5.1	Steel	2002	2860	21.5
Bloomington Hills Upper Tank	2.2	Steel	1985	2933	38
Quail Creek WTP #1	9.1	Concrete	1985	2900	22.5
Quail Creek WTP #2	8.9	Steel	2005	2900	23
Quail Creek WTP #3	10	Concrete	2011	2900	20
Southgate Tank	0.9	Steel	1996	2910	16
Main Street Tank	1.9	Steel	1965	2982	35
Green Tank	1.6	Steel	1967	2994	21
GAP Tank	1.9	Steel	1990	2996	24
Concrete Tank	1.1	Concrete	1940	3005	15
Middleton Tank	2.2	Steel	1985	3018	40
Industrial Tank	2.0	Conc./Hypalon	1978	3093	22
Snow Canyon Tank #1	2.6	Concrete	1977	3293	18
Snow Canyon Tank #2	2.6	Concrete	1977	3293	18
Gunlock Tank	3.0	Steel	1990	3338	38
T-Bone Mesa Tank	3.0	Steel	1998	3381	38
Stone Cliff Tank	0.3	Steel	1996	3004	18
Ledges Tank	3.0	Concrete	2006	4018	20
Airport Tank	2.0	Concrete	2009	3040	20
East Bloomington Tank	4.0	Concrete	2010	2860	20
TOTAL	**68.3**				

Table 7.1- Existing Water Storage Reservoirs

It is important to note that while Table 7.1 shows a total existing storage capacity of 68.3 million gallons, the actual storage capacity available to the City of St. George is somewhat less. Prior to joining the Washington County Water Conservancy District Regional Pooling Agreement, both Quail Creek WTP #1 and #2 tanks were owned and operated exclusively by the City. Since joining, these tanks, as well as the new Quail Creek WTP#3 tank are operated by the WCWCD. The City no longer has exclusive rights to the storage capacity. Other communities within the pooling region have access to the storage capacities of the tanks.

The Snow Canyon #1 and #2 storage tanks are part of the Snow Canyon Compact. The Snow Canyon Compact is a joint compact between the municipalities of St. George, Ivins, and Santa Clara. The Compact jointly owns and operates the Snow Canyon well field and storage tanks. Therefore, the storage capacity of the Snow Canyon tanks (5.2 million gallons) is jointly owned by the three municipalities.

Taking into account the joint storage capacities of some of the water storage tanks, the City currently has access to approximately 58 million gallons of culinary water storage capacity.

Section 5 of this study describes the design criteria for the water distribution system. As noted, the tanks should be designed to provide 400 gpd per ERU for indoor use, 480 gpd per ERU for outdoor use, 540 gpd per ERU for emergency storage, and 180,000 gallons per pressure zone for fire protection.

Table 7.2 shows the required system storage for the next 30 years. Currently, the amount of water storage in the system is adequate, but by about the year 2017, additional storage will be required. Ultimately, the City will need an additional 58 million gallons of culinary water storage.

			Storage Requirements (million gallons)				Total Storage (million gallons)
	# ERU's	# Zones	Indoor[1]	Outdoor[2]	Emergency[3]	Fire[4]	
2010	30,031	12	12.01	14.41	16.22	2.16	44.80
2015	33,986	13	13.59	16.31	18.35	2.34	50.60
2020	39,399	14	15.76	18.91	21.28	2.52	58.47
2030	52,949	15	21.18	25.42	28.59	2.70	77.89
2040	71,159	16	28.46	34.16	38.43	2.88	103.93

Indoor Stoarge:[1]	400 gallons per ERU
Outdoor Storage:[2]	480 gallons per ERU
Emer. Storage:[3]	540 gallons per ERU
Fire Storage:[4]	180,000 gallons per Zone

VIII. Water Distribution System Modeling and Analysis

A culinary water distribution system hydraulic model was developed in order to evaluate the existing distribution system as well as evaluate future improvements required to provide an adequate level of water service for the future development of the City.

The City of St. George culinary water distribution system consists of a network of pipelines ranging from 1 inch in diameter to 36 inches in diameter, various culinary water storage tanks, booster pump stations, and flow control valves. There are currently 650 miles of pipeline in the city's distribution system. Exhibit 8.1 shows an exhibit of the existing culinary water distribution system. The following table is a summary of the current culinary water distribution system.

Pipe Diameter (inches)	Total Pipe Length (feet)
Unknown or < 2"	70,495
2"	9,268
3"	4,575
4"	85,656
6"	884,534
8"	1,211,526
10"	261,171
12"	277,128
14"	45,230
16"	169,272
18"	121,868
20"	117,317
24"	56,151
30"	74,269
36"	41,880
TOTAL	3,430,340
TOTAL Miles	650

Table 8.1- Existing Pipe Sizes

There are a variety of different pipe materials in the distribution system. The majority of the newer pipe that has been installed (since 2000) is PVC pipe. The larger diameter pipe (>12" diameter) is generally ductile iron pipe or HDPE pipe. Much of the older pipe material is cast iron or asbestos cement pipe. The following table is a summary of the existing pipe materials found in the distribution system.

Pipe Material	Length (ft)
PVC	2,237,681
Ductile Iron	582,437
Cast Iron	147,054
Asbestos Cement	74,338
HDPE	68,777
Steel	154,540
Unknown	165,513
TOTAL	3,430,340
TOTAL Miles	650

Table 8.2- Existing Pipe Material

The existing water distribution system is broken into 32 different pressure zones. The pressure zones are supplied by 21 water storage tanks and are segregated into zones by 41 pressure reducing or pressure sustaining valves. Exhibit 8.1 differentiates each pressure zone by color. Pressure zone boundaries are bounded by pressure reducing valves (PRV), pressure sustaining valves (PSV), or pressure zone isolation valves. The hydraulic grade line of each pressure zone is established by either the elevation of the tank serving the pressure zone, or the downstream setting of the PRV creating the pressure zone.

Main Transmission System

The culinary water used within the City of St. George is supplied from seven different water sources. These sources include the Gunlock Well Field, the Snow Canyon Well Field, the Ledges Well Field, West City Springs, Mountain Springs, Mill Creek Well Field, and the Quail Lake / Sand Hollow Regional Supply (WCWCD).

The Gunlock Well Field is made up of 11 different groundwater wells located approximately 15 miles west of St. George directly downstream of the Gunlock Reservoir. The total pumping capacity of the well field is approximately 9,600 gpm. Currently, all but 2 of the wells have arsenic concentrations higher than the EPA's maximum contaminant level (MCL) of 10 µg/l or parts per billion (ppb). By combining the wells with the three lowest arsenic concentrations, the well field is able to supply approximately 1,500 gpm without exceeding the MCL. The water from the well field is conveyed through parallel pipelines that are 18-inch and 20-inch in diameter. These transmission lines enter the City from the west and northwest boundaries.

The Snow Canyon Well Field is comprised of five groundwater wells in the Snow Canyon area. This system is part of the Snow Canyon Compact, which is a compact between St. George, Ivins, and Santa Clara. The five wells in the Snow Canyon well field are also higher in arsenic concentration than is allowable. In order to meet the MCL for arsenic concentrations, the well field water is mixed with WCWCD Regional

water. A 24-inch diameter pipeline conveys the Snow Canyon Well Field water, mixed with WCWCD Regional Water to the City.

The Ledges Well Field is comprised of three wells in the Ledges area in the northwest corner of the city. The three wells have a combined pumping capacity of approximately 1,700 gpm. The well field is intended to service the Ledges / Trails area of the city as this area is geographically separated from the rest of the city. There is a 12-inch diameter pipeline that can convey water from the Ledges Well Field to the northwest side of the city near the Entrada area.

The West City Spring is a small spring located adjacent to the Dixie Red Hills Golf Course. The spring currently produces approximately 300 gpm. The spring water is injected directly into the water distribution system by a small booster pump.

The Mountain Springs water supply is the oldest City water supply, dating back to the late 1800's. This water supply is located at the base of Pine Valley Mountain, and is comprised of 10 different springs. The spring capacities vary throughout the year, as well as annually. Generally, the mountain springs will supply about 4,000 gpm during their peak, and can drop off to as little as 700 gpm throughout the year.

The Mill Creek Well Field is comprised of 2 separate wells located northeast of the City. The combined capacity of the wells is 1,800 gpm. The water is conveyed to the city through a 12-inch diameter pipeline.

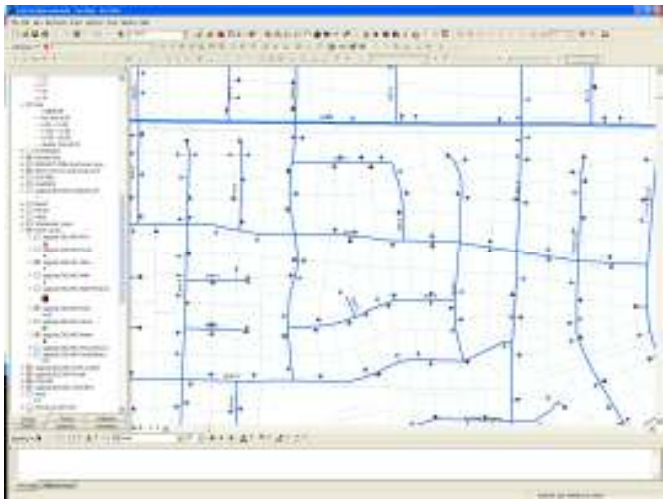
The majority of the water consumed in the city is purchased from the Washington County Water Conservancy District (WCWCD) through the Quail Creek Water Treatment Plant (QCWTP) and the Sand Hollow Well Field. This water is conveyed to the City of St. George, and surrounding communities through a large diameter transmission line ranging from 24-inch diameter to 72 inches in diameter.

In conjunction with the water transmission and distribution systems, the city relies on several booster pumping facilities to convey the water throughout the city. These booster pumping stations vary in size from 300 gpm to 11,000 gpm. The following table is a summary of the existing booster pumping facilities.

Pump Station Name	Pump Design Capacity (gpm)	# Pumps	Station Design Capacity (gpm)	Source	Pumped Zone
Little Valley Booster Pump Station	2600	3	7800	Quail Creek	BAT
Bloomington Hills Booster Pump Station	800	2	1600	Quail Creek	Bloomington Hills Upper
Tonaquint Booster Pump Station	1100	3*	2200	Quail Creek	GAP
Stone Cliffs Booster Pump Station #1	400	2	800	Quail Creek	Stone Cliff
Stone Cliffs Booster Pump and Fire Suppression Station #2	300	1	300	Quail Creek	Stone Cliff Upper
Southgate Booster Pump Station	500	2	1000	Quail Creek	Southgate
West City Springs Booster Pump Station	400	2*	400	West City Springs	Green
Eastridge Pump Station	1000	4	4000	Quail Creek	Gap
Airport Booster Pump	1500	2*	1500	Quail Creek	Airport
East Bloomington Booster Pump	1,500	2	1500	Quail Creek	Sun River
Ft. Pierce Industrial	200	3	500	Quail Creek	

Table 8.3- Existing Booster Pump Stations

Computer Model



A hydraulic computer model of the City of St. George water transmission and distribution system was developed and calibrated to reflect the existing condition of the system. The city's GIS data, as-built drawings, and previous computer models were used to develop the current model. The Infowater© software, developed by MWHSoft was used for the hydraulic modeling. This modeling software package runs as an extension of the GIS system. In order to evaluate the water distribution systems performance during it's highest demand, a 24-hour simulation was developed. An hourly curve was prepared to accurately distribute the peak day water use over a 24 hour period, with the peak hourly use occurring at 6:00 am, and being three times the average daily demand.

Physical Components

There are five basic physical components to a hydraulic model. These components are pipes, nodes, tanks, pumps, and valves. The purpose of a hydraulic computer model is evaluate the current condition of the transmission and distribution system, and to determine what improvements are required to accommodate any anticipated growth. The model is not intended to provide detailed information at each location of the system. As such, the water model is developed as a “skeleton” of the actual water system.

Existing Conditions Model

The existing water distribution system was developed by utilizing existing GIS data of the major components of the distribution system. Existing pipelines, pump stations, tanks, and valves were copied from the GIS database to the distribution system model. During this process, junction “nodes” were inserted throughout the piping system. Each of the “nodes” are assigned a water demand, which represents the amount of water used in that area. Generally, junction nodes are placed throughout the distribution system model in such a manner that the demands are fairly evenly distributed amount the nodes, and the nodes are geographically placed so as to accurately represent actual water demand on the distribution system.

Once the system component data is established and the demands are accurately allocated among the junction nodes, the extended period hydraulic computer model is run. The computer model calculates pipeline friction losses, pipeline velocities, junction pressures, pump status and tank levels for each hour over a 24 hour time period. After several “runs” and model adjustments, the computer model is calibrated to match the actual system conditions. Calibration is accomplished by adjusting pump control settings, pipeline friction coefficients, node elevations, and flow control settings.

Future Conditions Model

With a calibrated model depicting the existing distribution system conditions, the water model is expanded to cover the future growth and expansion of the system. For this study, rather than try to predict the timeline and progression of future growth, the water model concentrated on the distribution system condition at “build-out”.

Using the planning data collected for each of the Special Planning Areas, the distribution system network was expanded throughout each SPA. Where master planned development information was available, the distribution system followed the development layout. In areas where no master planned information is available, the distribution system followed a “best guess” layout. The intent of the distribution system model is not to identify the exact location of the required infrastructure, but rather provide conceptual information for the development of the area. Exact location and details of the infrastructure will be determined at the development platting and construction level in the future.

IX. RECOMMENDED SYSTEM IMPROVEMENTS

By modeling the future conditions of the distribution system, it is obvious that a substantial amount of infrastructure will be required to provide adequate water service to the future population in the City of St. George. While development is expected to occur in most parts of the city, the south and southeastern portions of the city will experience the majority of the future growth. The South Block area, currently owned by SITLA, is expected to reach a population of over 37,000 persons. With the Desert Canyons development expecting a population of over 17,000, and the Little Valley area adding an additional 25,500 to the population, it is apparent that the southeast portion of the city will experience the majority of the future growth with an estimated population of 79,500 people.

Working with the WCWCD in updating their capital facilities plan, City of St. George is expecting to provide water service to the southeast area of the city via a pipeline that will convey water from the Sand Hollow Well Field and a future water treatment plant located near the Sand Hollow Reservoir to the City of St. George near the new airport facility. This line will also provide a substantial amount of water to Washington City to service it's Washington Fields area. Preliminary plans are underway for the construction of said pipeline, and to secure the rights-of-way. It is anticipated that the new pipeline will follow the extension of the Southern Parkway corridor.

Another area of the city that will require a substantial amount of infrastructure is the Tonaquint / Lakes area. This area is expected to add over 16,000 people to the current population.

Exhibit 9.1 shows the Future System Improvements that are required at build-out. The pipeline size, general location, tanks, and pump stations are identified on the exhibit. Approximately 465,000 lineal feet of pipeline ranging from 8-inch in diameter to 36-inch diameter will be required to provide services to the future population. This amount of pipeline only reflects the transmission and major distribution pipelines. The amount of pipeline required for the entire distribution system will be significantly more. However, typically the distribution level pipelines (ie. pipelines within subdivisions and master planned developments) are installed by the development, and are not included in the as part of the Capital Facilities Plan.

Currently, there is approximately 58 million gallons of storage available to the City of St. George. At build-out, over 104 million gallons of culinary water storage will be required to provide the current level of service to the future population. As additional 46 million gallons of storage are required beyond what is currently in place.

In addition to pipelines and storage tanks, additional booster pump stations, pressure reducing/sustaining valves, and flow control facilities will be required. A summary of the required infrastructure is shown in Tables 9.1 to 9.4, along with their respective estimated costs.

Booster Pump Stations

PS #	Name/Location	Flow (gpm)	Pumping Head (ft)	Size (hp)	Unit Cost ($/hp)	Cost
1	Sand Hollow Feed- East Side	11,000	100	327	$1,550	$507,304
2	Desert Canyons Upper Zones	1,500	150	67	$3,350	$224,270
3	Ft. Pierce Upper Zones	1,800	240	129	$2,500	$321,342
4	South Block Upper Zones	3,000	200	179	$1,550	$276,711
5	Tonaquint Upper Zones	1,500	150	67	$3,350	$224,270
6	Ledges Upper Zones	1,500	100	45	$3,350	$149,513
					SUB-TOTAL	$1,703,410
					15% Engineering / Legal	$255,512
					10% Land Acquisition	$170,341
					TOTAL	**$2,129,263**

Table 9.1- Estimated Costs of Future Pump Stations

Storage Facilities

Tank #	Name/Location	Size (MG)	Unit Cost ($/Gal)	Cost
1	Sand Hollow Feed- East Side	5	$0.55	$2,750,000
2	Desert Canyons Upper	3	$0.55	$1,650,000
3	Desert Canyons Lower	5	$0.55	$2,750,000
4	White Dome	5	$0.55	$2,750,000
5	Ft. Pierce Upper	2	$0.55	$1,100,000
6	South Block Upper Zones	4	$0.55	$2,200,000
7	Tonaquint Upper Zones	4	$0.55	$2,200,000
8	Gap #2	5	$0.55	$2,750,000
9	Ledges Upper Zones	1	$0.55	$550,000
10	Additional	24	$0.55	$13,200,000
	TOTAL	58		
			SUB-TOTAL	$31,900,000
			15% Engineering / Legal	$4,785,000
			10% Land Acquisition	$3,190,000
			TOTAL	**$39,875,000**

Table 9.2- Estimated Costs of Future Storage Facilities

Flow Control Valves (PRV, PSV, ALT, etc.)

Valve #	Name/Location	Size (inch)	Cost
1	Sand Hollow Feed PRV- 2000 South	20	$58,000
2	Sand Hollow Airport PRV	14	$38,000
3	Desert Canyons	18	$45,000
4	White Dome	24	$75,000
5	Ft. Pierce	8	$30,000
6	Little Valley- Ft. Pierce	10	$32,000
7	South Block	20	$58,000
8	Tonaquint Upper	12	$34,000
9	Ledges / Trails	12	$34,000
10	Sun River #1	8	$30,000
11	Sun River #2	8	$30,000
		SUB TOTAL	$464,000
		15% Engineering / Legal	$69,600
		10% Property Acquisition	$46,400
		TOTAL	**$580,000**

Table 9.3- Estimated Costs of Future Flow Control Valves

Pipelines

Pipe Diameter (in.)	Unit Cost ($/ft)	Length (ft)	Cost
8	$44	5,435	$239,140
10	$55	27,940	$1,536,700
12	$66	193,370	$12,762,420
14	$77	47,960	$3,692,920
16	$88	48,600	$4,276,800
18	$99	32,450	$3,212,550
20	$110	23,060	$2,536,600
24	$132	31,990	$4,222,680
27	$149	12,775	$1,897,088
30	$165	39,910	$6,585,150
36	$198	1,820	$360,360
		SUB TOTAL	$41,322,408
		15% Engineering / Legal	$6,198,361
		10% Land Acquisition	$4,132,241
			$51,653,009

Table 9.4- Estimated Costs of Future Pipelines

As shown in the above tables, the total estimated costs for future infrastructure required to provide culinary water services for the future population is $93,388,832. The costs of this required infrastructure is divided equally among each of the future connections, or future ERU's. With an additional 41,128 ERUs expected by the year 2040, the cost per ERU is $2,222.

It is difficult to determine the phasing and timing of future development, especially in times of economic recession or economic downturn. Based on the current development environment, it appears that there are three areas that are most likely to experience development within the next 5 year. These areas are Little Valley, Desert Canyons, and the South Block.

The South Block is owned by SITLA. During the construction of the initial phase of the Southern Parkway, SITLA prepared a substantial area for development along the parkway. There are nearly 300 acres of land that has been mass excavated and graded in anticipation of near future development.

With the development of the new airport in the southeast corner of the City, there has been some planning and development by adjacent land owners, mainly in the Desert Canyons development. Roadways and utilities are being extended to the Desert Canyons development, with anticipation of development in the near future.

Within the last year or two, there have been some residential development occur in the Little Valley area. This area has sustained development during a period of time when very little development was occurring in the rest of the City.

The WCWCD is currently acquiring right-of-way, and will soon be constructing a main transmission waterline from it's Sand Hollow Well Field. This pipeline will parallel the Southern Parkway Corridor, and will supply culinary water to Washington City and the City of St. George. Since this waterline will be supplying water to multiply municipalities that are members of the WCWCD Regional Pooling Agreement, the project will be funded by the WCWCD up to the point where the pipeline leaves Washington City. At that point, the pipeline becomes a City pipeline, rather than a regional pipeline.

Based on current development conditions and known development master plans, there are some system improvements that need to be constructed within the next 5 years. It is anticipated that with the construction of the WCWCD Sand Hollow Well Field feed line, the line will need to be extended and connected to the existing City infrastructure in at least three locations near the Little Valley, Airport, and Desert Canyons areas. An additional two water storage reservoirs will be required in the Ft. Pierce Industrial Park areas, as well as additional piping. Additional piping will be required in the Southern Block area, as well as the Tonaquint / Lakes area. The anticipated system improvements that will be required are shown on Exhibit 9.2. Their associated costs are summarized in Table 9.5.

Item #	Description / Location	# Units	Units	Unit Cost	Cost
1	8" Pipeline and Appurtenances	5,434	L.F.	$44	$239,096
2	10" Pipeline and Appurtenances	18,427	L.F.	$55	$1,013,485
3	12" Pipeline and Appurtenances	18,810	L.F.	$66	$1,241,460
4	14" Pipeline and Appurtenances	24,669	L.F.	$77	$1,899,513
5	16" Pipeline and Appurtenances	4,438	L.F.	$88	$390,544
6	18" Pipeline and Appurtenances	13,426	L.F.	$99	$1,329,174
7	20" Pipeline and Appurtenances	1,505	L.F.	$110	$165,550
8	24" Pipeline and Appurtenances	3,500	L.F.	$132	$462,000
9	30" Pipeline and Appurtenances	15,500	L.F.	$165	$2,557,500
10	36" Pipeline and Appurtenances	1,816	L.F.	$198	$359,568
11	Ft. Pierce Upper Zone Pump Station	1	L.S.	$321,342	$321,342
12	White Dome Tank	5	M.G.	$0.55	$2,750,000
13	Ft. Pierce Upper Tank	2	M.G.	$0.55	$1,100,000
14	Sand Hollow Feed PRV- 2000 South	1	L.S.	$58,000	$58,000
15	Sand Hollow Airport PRV	1	L.S.	$38,000	$38,000
				SUB TOTAL	$13,925,232
				15% Engineering / Legal	$2,088,785
				10% Property Acquisition	$1,392,523
				TOTAL	**$17,406,540**

Table 9.5- 2011-2016 System Improvements Costs

The above table shows that the estimates cost of system improvements over the next 5 years is over $17M. It is anticipated that during that same period of time (2011-2016), 3,956 ERU's will be added to the system. Assuming that the costs of the system improvements are paid by the ERU's that are added to the system (new development), the total cost per ERU is calculated to be $4,400.

As it was mentioned earlier, it is difficult to determine the timing and location of new development. This is especially true when trying to forecast new development past a five year period. The following Table 9.6 and Table 9.7 estimate the system improvement costs for the 2016-2025 and 2025-2040 time periods.

Item #	Description / Location	# Units	Units	Unit Cost	Cost
1	10" Pipeline and Appurtenances	6,511	L.F.	$55	$358,105
2	12" Pipeline and Appurtenances	135,161	L.F.	$66	$8,920,626
3	14" Pipeline and Appurtenances	3,509	L.F.	$77	$270,193
4	16" Pipeline and Appurtenances	44,173	L.F.	$88	$3,887,224
5	18" Pipeline and Appurtenances	19,038	L.F.	$99	$1,884,762
6	20" Pipeline and Appurtenances	21,555	L.F.	$110	$2,371,050
7	24" Pipeline and Appurtenances	14,221	L.F.	$132	$1,877,172
8	27" Pipeline and Appurtenances	12,775	L.F.	$149	$1,897,088
9	30" Pipeline and Appurtenances	24,000	L.F.	$165	$3,960,000
10	Ft. Pierce PRV	1	L.S.	$30,000	$30,000
11	Desert Canyons PRV	1	L.S.	$45,000	$45,000
12	Little Valley- Ft. Pierce PRV	1	L.S.	$32,000	$32,000
13	Desert Canyons Lower Tank	5	M.G.	$0.55	$2,750,000
14	Additional Storage	10	M.G.	$0.55	$5,500,000
				SUB TOTAL	$33,783,220
				15% Engineering / Legal	$5,067,483
				10% Property Acquisition	$3,378,322
				TOTAL	**$42,229,024**

Table 9.6- 2016-2025 System Improvements Costs

Item #	Description / Location	# Units	Units	Unit Cost	Cost
1	12" Pipeline and Appurtenances	41,500	L.F.	$55	$2,282,500
2	14" Pipeline and Appurtenances	19,782	L.F.	$66	$1,305,612
3	24" Pipeline and Appurtenances	5,160	L.F.	$110	$567,600
4	Sand Hollow Feed Pump Station	1	L.S.	$507,304	$507,304
6	Desert Canyons Upper Pump Station	1	L.S.	$224,270	$224,270
7	South Block Upper Pump Station	1	L.S.	$276,711	$276,711
8	Tonaquint Upper Pump Station	1	L.S.	$224,270	$224,270
9	Ledges Upper Pump Station	1	L.S.	$149,513	$149,513
10	Sun River PRV	2	Each	$30,000	$60,000
11	Sand Hollow East Side Tank	5	M.G.	$0.55	$2,750,000
12	Ledges Upper Zone Tank	1	M.G.	$0.55	$550,000
13	GAP #2 Tank	5	M.G.	$0.55	$2,750,000
14	Tonaquint Upper Tank	4	M.G.	$0.55	$2,200,000
15	Desert Canyons Upper Tank	3	M.G.	$0.55	$1,650,000
16	South Block Upper Tank	4	M.G.	$0.55	$2,200,000
17	Additional Storage	14	M.G.	$0.55	$7,700,000
				SUB TOTAL	$25,397,780
				15% Engineering / Legal	$3,809,667
				10% Property Acquisition	$2,539,778
				TOTAL	**$31,747,225**

Table 9.7- 2025-2040 System Improvements Costs

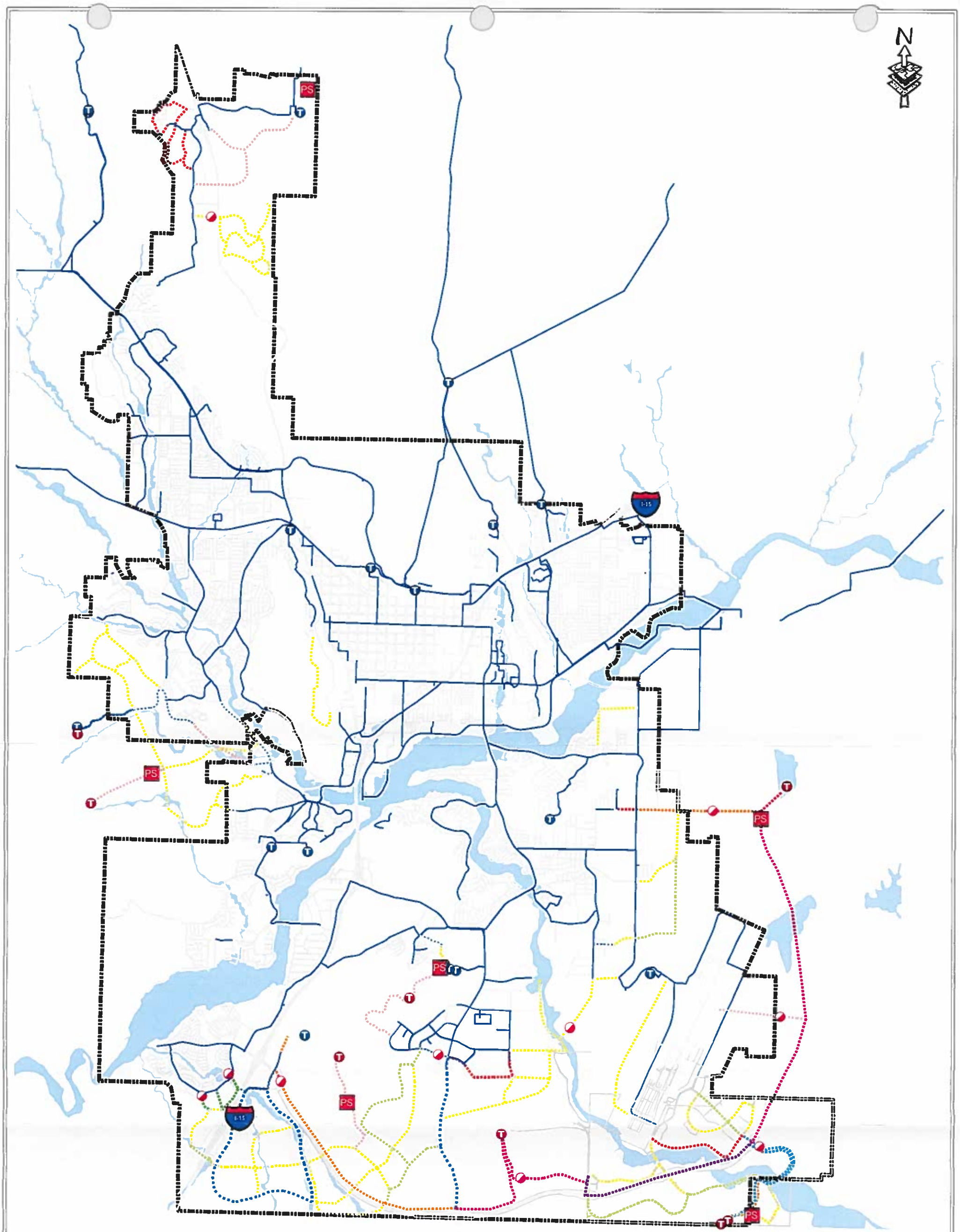
Table 9.8 is a summary of the total improvement costs and the number of ERU's that are added in each of the time periods from 2011-2040. The result is a lower cost per ERU for system improvements for the later time periods than the initial 2011-2016 time period. The overall average cost per ERU is $2,222.

	Total Improvement Costs	Added ERU's	Total ERU's	Cost per ERU
2011-2016	$17,406,540	3,956	33,986	$4,400
2016-2025	$42,229,024	11,688	45,674	$3,613
2025-2040	$31,747,225	25,485	71,159	$1,246
TOTAL	**$91,382,789**	**41,129**	**AVG.**	**$2,222**

Table 9.8- System Improvements Cost Summary

It is important to recognize the reason that the 2011-2016 system improvement Cost per ERU ($4,400) is higher than the 2016-2025 or 2025-2040 system improvements Cost per ERU ($3,613 and $1,246 respectively). Due to the location of the future development, especially in the case of the South Block area, main water transmission lines are required to be installed for the new development. These main transmission lines convey water from the "source" to the new development. The transmission lines are sized not only to convey water to the immediate new development that will occur between 2011-2016, but also all future development that will occur through 2040. As such, much of the cost of the main transmission lines is "fronted" by the development which will occur within the next five years. For the purpose of calculating development impact fees, it may be more equitable to average the total cost of system improvements and distribute the costs by the number of ERU's that will be added to the system over the entire 2011-2040 time period. This would result in an average cost per ERU of $2,222.

It is also important to understand that the total improvement costs identified in this Capital Facilities Plan, as well as the associated Cost per ERU are not necessarily the cost that the development impact fee are based on. Several of the improvements that are deemed necessary in the Capital Facilities Plan are expected to be funded, or at least partially funded, by the developer. Improvements that are required to accommodate future growth, but only benefit a single development are included in the total improvements costs, but are expected to be funded by the development. There are also various projects that are identified as system improvement projects that are not 100% attributable to new growth. These projects not only provide additional capacity to the system to accommodate new growth, but also provide redundancy, reliability, and overall improvements to the system. Only a portion of these projects are funded through impact fees.



Legend

Future Pipe DIAMETER

- 8
- 10
- 12
- 14
- 16
- 18
- 20
- 24
- 27
- 30
- 36

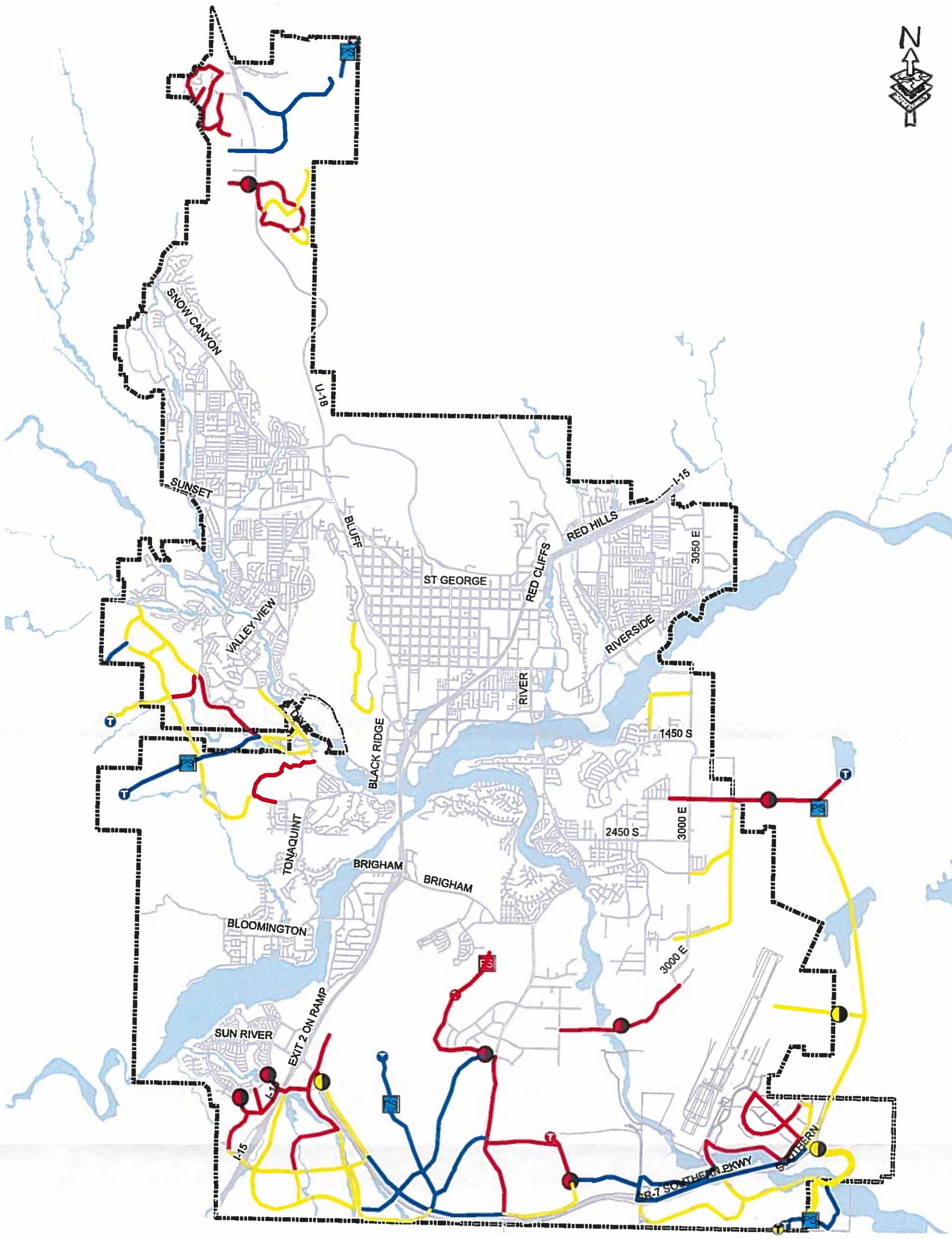
Tanks-Future

- Existing
- Future
- Pump Station- Future
- Valves-Future

0 3,000 6,000 12,000 Feet

2011 WATER MASTER PLAN UPDATE

Future System Improvements
Water Distribution System
Figure 9.1



0 3,100 6,200 12,400 Feet

Legend

Pipeline	Pump Stations	Tanks	Valves
2011-2016	2011-2016	2011-2016	2011-2016
2016-2025	2016-2025	2016-2025	2016-2025
2025-2035	2025-2035	2025-2035	

2011 WATER MASTER PLAN UPDATE

Future System Improvements- PHASING
Water Distribution System
Figure 9.2