

Smithfield Water Rights – 40 Year Plan

EXECUTIVE SUMMARY

Water is a vital resource to each community. In order for communities to grow, they must have sufficient water to meet current and future needs. Because of this, Smithfield asked J-U-B Engineers, Inc. to prepare a study to determine its existing and future water needs. Along with that, an evaluation on existing water rights and water rights needed for the next 40 years is included in this study.

Smithfield's population is expected to grow to 22,000 in the next 40 years. That is more than double the current population. During this time, water demand will more than double as well. Currently Smithfield is able to meet its water needs for culinary and secondary purposes based upon existing infrastructure and water rights. In order to continue to supply sufficient water to meet the needs of a growing community, it is important to understand when further development of the water supply should occur to ensure that the City has enough water to keep up with the estimated growth.

If the City continues to develop following the projected growth curve, approximately 84 equivalent residential connections will be added to the water system each year until the year 2050. At that time growth is expected to slow. Given these projections and including population growth contingencies, the source capacity (i.e. wells) should be increased as soon as possible by using your currently active water rights.

The City has observed that the canyon springs only produce 1,500 gallons per minute (gpm) during the summer months. This is significantly less than the 2,300 gpm the City has right to through the water right exchange. The need for source capacity increase now is because of this decrease in spring production.

By the year 2037 the peak summer day usage will exceed the total available water rights. By the year 2051, the City will have a deficit of 4.88 cubic feet per second (cfs) of flow on the peak summer days based on the water rights. Based upon source capacity, the deficit in the year 2051 will be 6.66 cfs because of the decreased spring production in summer months. The City should develop a plan now for obtaining the additional water source and rights needed.

In order to be able to supply the water needed during the hottest summer days, the City will have to acquire additional water rights or utilize its existing water rights in a different manner to extend their benefit. The City can acquire water rights through purchasing them on the open market, requiring developers to dedicate water rights/shares or equivalent funds to the City according to their increased demand or utilizing aquifer storage and recovery (ASR) to fully utilize their existing annual water rights. The City has also been obtaining water shares in local irrigation companies from development water dedications. These shares can be used to further develop the City pressurized irrigation systems or be used in existing pressure irrigation systems such as Smithfield Irrigation Company to alleviate demand on the culinary system.

It is our recommendation that the City maximize the use of their existing sources to meet future growth. This includes increasing capacity of the Birch Well. To build redundancy in the system and to keep ahead of the rising demand, it is recommended that the well be upgraded as soon as possible. Right number 25-3164 is currently filed as a “non-use” right. The water right already has the Birch Well listed as a point of diversion. The City will simply have to take the right out of non-use and begin utilizing it. We also suggest that the City continue to require that new developments dedicate water rights/shares, or pay fees in lieu of rights/shares according to the demand they place on the City culinary water system. This puts the cost of growth on those imposing demand on the water system. We recommend the City consider requiring new developments install secondary irrigation systems in areas of the City where connecting to a secondary irrigation system is possible. 1 Ac-ft or \$2,000 per ERC could be required from developments in areas where secondary irrigation is not possible.

In addition to improving infrastructure and continuing to bring water rights/shares or fees to the City, The City should explore the option of expanding the pressure irrigation system to use dedicated irrigation shares. Also, investigate the potential for using ASR to store surplus water from winter water rights in the aquifers for withdrawal during summer months. This will reduce the amount of water rights the City will need to acquire in the future. A cost analysis should be performed for the expansion of the pressure irrigation system as well as implementing the ASR option. The City will then be able to determine the cost share amount that should be assessed to future developments. The City may also desire to purchase shares using existing funds collected through water dedication from developers. Cache Valley Ranches currently holds water rights that could be purchased to bring water rights to Smithfield.

We also recommend that the City file for an additional right on the Smithfield Canyon Springs from 4/1 to 9/30. Currently, Smithfield City uses the springs year around. The City has a right from 10/1 to 3/31 to use the spring water during the winter months, and uses an exchange with the Logan Hyde Park, Smithfield Canal Company, and Smithfield Irrigation Company to continue using the springs throughout the summer. Legally, the exchange is not valid until the canals are filled each summer. This may not happen some years until May 15th. In order to have the paperwork support what has already been happening for years, the City should file for an additional right.

Throughout the City, there are several parks currently being watered with culinary water. We recommend the City convert as many parks as possible to irrigation water. If all of the parks were converted to irrigation water, the City could reduce water usage during the irrigation season by an estimated 0.5 cfs.

Outdoor use accounts for the majority of the water usage in the City. As trends in society change and smaller lot sizes are more acceptable, the City could reduce the amount of water used by allowing for smaller lot sizes in areas of the City.

Lastly, the City has done an excellent job maintaining paperwork required by the state for water rights. Smithfield should continue to file water right non-use applications and extensions as required by state

law. Non-use applications allow the City to hold a water right in reserve for up to 7 years. If at such time the water right is needed for use in an existing or new source, it can be transferred for use.

INTRODUCTION

Smithfield is a community of approximately 10,300 people located in Cache Valley. The City has a diverse make up of residential, commercial and industrial activities. Smithfield is also home to Birch Creek Golf Course and many other City parks. Located on the east side of Cache Valley, Smithfield has many water resources to serve its needs. These include springs located in Smithfield Canyon and two wells. Smithfield utilizes 10 springs in Smithfield Canyon as its primary source of drinking water. While Smithfield has water rights to the spring during the winter season, it uses an exchange agreement with the Smithfield Irrigation Company to use water from the springs during the irrigation season.

The Birch Well is located at the Birch Creek Golf Course on the East Bench. It supplements water supply on the east bench during summer months. The Forrester Acres Well is located on the west edge of the community at Forrester Acres. This well also supplies water to the community during summer months.

The City has acquired water rights from various places over its history. Many of the rights have come from the Del Monte Corporation. The City is also obtaining water rights/shares from developers as the City grows. Often times these are shares in the Logan and Northern and Logan Hyde Park Smithfield Canals.

With many different sources and water rights, Smithfield has created this plan to review their water system source needs now and in the future. This plan also summarizes the existing water rights and actions to follow to protect those rights. Lastly, recommendations with regard to sources, water rights and improvements are set forth in the conclusion of the plan.

SYSTEM DEMANDS

To determine future demands on the water system, we must first determine existing demands. Then water use is scaled according to future population. Total system demands were developed using the “Billing and Usage Summary” records from the City for two different time periods. The first being the summer months, July 1 – Sept. 1, and the second being the fall, winter and spring months, Nov. 1 – May 1. Currently there are 2,943 equivalent residential connections (ERCs) to the water system. Table 1 summarizes the metered water usage used to determine the total demand on the water system.

Table 1 - Metered 2011 Water Usage

Description	Irrigation Season	Fall, Winter, Spring
Total (gal)	197,292,000	115,680,000
<i>Begin Date:</i>	7/1/2011	11/1/2010
<i>End Date:</i>	9/1/2011	5/1/2011
Days:	62	181
Gpd	3,182,100	639,100
Gpm	2,209	444
Gpm/ERC (Averaged)	0.75	0.15

A significant amount of water is used for irrigating City parks during the summer months. These properties do not have water meters. Therefore estimates were made to account for the water used. Utah Administrative Code R309-510-7 states that for source sizing, a peak day demand of 3.39 gpm per irrigated acre should be used for the area including Smithfield. The City estimates that 80% of the water applied in the parks comes from the culinary water supply, and 20% comes from irrigation water. Since the City likely applies more water to the park landscaping than the average residential customer, it was conservatively assumed that 100% of the water used in the parks is from the culinary system.

R309-510-7 was also used to estimate the amount of water used in City owned buildings that do not have water meters. Table 2 summarizes the estimated water usage for these locations.

Table 2 - Estimated 2011 Unmetered Water Usage

<i>Name</i>	<i>Area (Ac)</i>	<i>Estimated Water Use (gpm)</i>	<i>Estimated Water Use (gpd)</i>
Mack Park	13.01	44.09	63,500
Central Park	7.06	23.94	34,500
Heritage Park	1.73	5.86	8,400
Cemetery	16.92	57.36	82,600
Forrester Acres	34.55	117.12	168,700
Gutke Park	0.56	1.90	2,700
Gutke Detention Pond	1.80	6.1	8,800
Kid's Corner	0.23	0.78	1,100
East Sky View Park	0.48	1.63	2,400
Elk Ridge Subdivision	0.56	1.90	2,700
Golf Course (Restaurant and Washing Carts)		0.69	1,000
City Offices (20 FTE)		0.21	300
Library (5 FTE)		0.05	75
Police Station (5 FTE)		0.14	200
Fire Station (5 FTE)		0.24	350
Total Estimated Irrigation Season Demand (2011)		259	373,000
Total (cfs)		0.58	

(FTE – Full Time Equivalents)

Table 3 below shows the total water usage combining the metered and unmetered data from Tables 1 & 2.

Table 3 – Estimated 2011 Total Water Usage (Includes both metered and unmetered usage)

Irrigation Season (June 1 – September 1)		Fall, Winter, Spring (September 1 – June 1)	
<i>Usage (gpd):</i>	3,555,000	<i>Usage (gpd):</i>	641,000
<i>Usage (gpm):</i>	2,470	<i>Usage (gpm):</i>	445
<i>Usage (cfs):</i>	5.50	<i>Usage (cfs):</i>	0.99

From the table we find that existing irrigation season water usage is over five times that of fall, winter and spring.

GROWTH AND DEMAND PROJECTIONS

For the next 40 years, Smithfield City’s growth projection curve indicates a growth rate that is nearly linear. After this growth period, it is estimated that the City will approach build out and the growth will decrease significantly. The estimated growth over the next 40 years is approximately 84 additional ERC’s per year. This results in a total of 6,303 ERC’s in 40 years.

Using data provided by the City for the 2011 water model update, it was determined that the average summer use for years 2011-2051 per ERC for indoor and outdoor use will be 1.52 gpm.

Fall/winter/spring indoor and outdoor use totaled to 0.17 gpm from the culinary water model update performed in early 2012. The estimated 2051 residential water usage is shown below in Table 4. The 2,943 existing ERCs are assumed to continue using an average of 0.75 gpm during the irrigation season, and 0.15 gpm during the fall/winter/spring. It is assumed that 25% of the additional 3,360 ERCs (future 40 years) will use irrigation water for outdoor use, and will use 0.17 gpm year round. The remaining 75% are assumed to use 1.52 gpm during the irrigation season and 0.17 gpm during the fall/winter/spring.

Table 4 – Estimated 2051 Residential Water Usage

Description	Irrigation Season	Fall, Winter, Spring
gpd	8,874,400	1,457,500
gpm	6,200	1,000

There are also two future parks planned in the next 40 years. The estimated irrigation demands for these parks are shown in Table 5.

Table 5 – Estimated 2051 Park Water Usage

<i>Name</i>	<i>Area (Ac)</i>	<i>Estimated Water Use (gpm)</i>	<i>Estimated Water Use (gpd)</i>
Total Existing Irrigation Use	-	259	373,000
<i>Sunset Park (Future)</i>	2.00	6.78	9,800
<i>Detention Ponds (Future)</i>	8.00	27.12	39,000
Total Estimated Irrigation Season Demand (2051)		292	420,925

Table 6 shows the combined demands of future ERCs and future irrigation water usage in the year 2051.

Table 6 – Estimated 2051 Total Water Usage

Irrigation Season (June 1 – September 1)		Fall, Winter, Spring (September 1 – June 1)	
<i>Usage (gpd):</i>	9,296,000	<i>Usage (gpd):</i>	1,458,400
<i>Usage (gpm):</i>	6,500	<i>Usage (gpm):</i>	1,000
<i>Usage (cfs):</i>	14.40	<i>Usage (cfs):</i>	2.30

PEAKING FACTOR

The flows provided in the tables above for the irrigation season are averages over 2 months. Since there are specific days during the irrigation season that are especially hot, water use peaks on those days. Water sources of the City must meet that peak demand. If it does not, there will be a water shortage in the City. In order to determine the highest water demand during the summer, a peaking factor is calculated. To determine the peaking factor, chlorination records from 2010 were used. They included flow measurements during the hottest days of the year. The flow from the hottest days of the year was divided by the average flow in the summer to determine a peaking factor. This factor is used to forecast the highest flow needed to prevent water shortages during hot summer days. The peaking factor was determined to be 31% greater than the average summer day.

CURRENT WATER RIGHTS

In order to meet the source requirements of the City, there must be sufficient legal water rights to use the water. Smithfield City currently has 5.13 cfs in water rights year round from the springs in Smithfield Canyon as summarized in Table 7.

Table 7 –Certificated Water Rights from Springs

<i>Point of Diversion</i>	<i>Water Right Number</i>	<i>Dates</i>	<i>gpm</i>	<i>cfs</i>
Smithfield Canyon Springs	25-7884	10/1-3/31	2,244	5.00
Exchange*	E1401	4/1-9/30	2,244	5.00
Petersen Springs	25-6623	1/1-12/31	56	0.125
Total		1/1 - 12/31	2,300	5.13*

** During the summer months, the total spring production decreases to 1500 gpm, or 3.34 cfs*

Petersen Springs is one of the 10 springs included in 25-7884 and the exchange. Smithfield also has another right for Petersen Springs for an additional 0.125 cfs. As seen from Table 7, Smithfield relies on an exchange in order to meet drinking water demands during irrigation season. This exchange occurs with shares Smithfield has in the Logan Hyde Park Smithfield Canal. The water from these shares is used to replace water in Summit Creek that is typically supplied by the springs in Smithfield Canyon so that water can be used for culinary supply. These water rights are currently used to meet the baseline demand year round.

Smithfield also has year round water rights in the Birch Well and Forrester Acres Well as summarized in Table 8.

Table 8 -Certificated Water Rights from Wells

<i>Point of Diversion</i>	<i>Water Right Number</i>	<i>Dates</i>	<i>gpm*</i>	<i>cfs*</i>	<i>Ac-ft limit</i>
Birch Well	25-3212	1/1-12/31	996	2.22	830
Forrester Acres Well	25-4791, 25-6373	1/1-12/31	1,562	3.48	NA
Total		1/1 - 12/31	2,558	5.70	

**Over a 3 month period*

The water rights shown above in Table 8 are used during summer months to meet the peak demands during the irrigation season.

There are several rights that the City has filed “non-use” for at the present time. These rights and their current flow limits are shown in Table 9 below. As demands increase, and the City is able to prove beneficial use on these rights, they may be used to help meet the summer time demands.

Table 9 –Existing Smithfield City Water Rights to Increase Summer Time Usage

<i>Point of Diversion</i>	<i>Water Right Number</i>	<i>Dates</i>	<i>cfs</i>	<i>Acre Feet</i>	<i>Max flow over 3 Months (cfs)</i>
Birch Well	25-3164 (a17630a)	5/1-10/31	1.67	500	1.67
Delmonte	25-6177	5/1-10/31	1.45	202.8	1.45
Hopkins Springs & Slough	25-6512	4/1-10/31	6.0	32.16	0.24
Subdivision by Sky View	25-8264	4/1-10/31	1	47.87	0.35
Total			11.79	630.73	5.38

Along with these rights, Smithfield City is listed as a potential right owner for 25-10407. This is the Cache Valley Ranches Right. By being a potential right owner, the City has the opportunity to purchase and segregate rights out of the 25-10407 right. Currently Smithfield City has not purchased any rights from this source.

CURRENT WATER SHARES:

Smithfield City currently owns shares in the following irrigation companies: Logan and Northern Irrigation Company, Smithfield Irrigation Company, and Logan Hyde Park Smithfield Canal Company. Table 10 shows the quantity and distribution of these shares.

Table 10 –Existing Smithfield City Water Shares

<i>Canal Company</i>	<i>Shares</i>	<i>Acre-Feet/Share</i>	<i>Total Acre Feet</i>
Logan and Northern	79.4		
Logan Hyde Park Smithfield	418.4		
North Bench Ditch	16		
Smithfield Irrigation type A	116.3		
Smithfield Irrigation type E (Distribution Shares)	9		
Smithfield Irrigation type C (Distribution Shares)	13.3		
Total	652.4		

Shares from the Logan Hyde Park Smithfield Canal are used as part of an agreement with Smithfield Irrigation that allow the exchange. Excess shares are being used to supply water for a city owned and operated irrigation system in the southeast section of the city. Further development in this portion of the city should include an expansion of the system to accommodate the outside watering needs of the area. This would decrease demand on the culinary water system, and as a result would give the City more time before needing to expand the water sources and rights as described in this report.

WATER USAGE:

Figure 1 below shows the existing water usage conditions throughout the year. The red line represents the combined flow capacity from the springs running constantly (note the reduction in spring flow during the summer months), and the wells operating 75% of the time. The dashed green line represents the peak water usage on the hottest summer days.

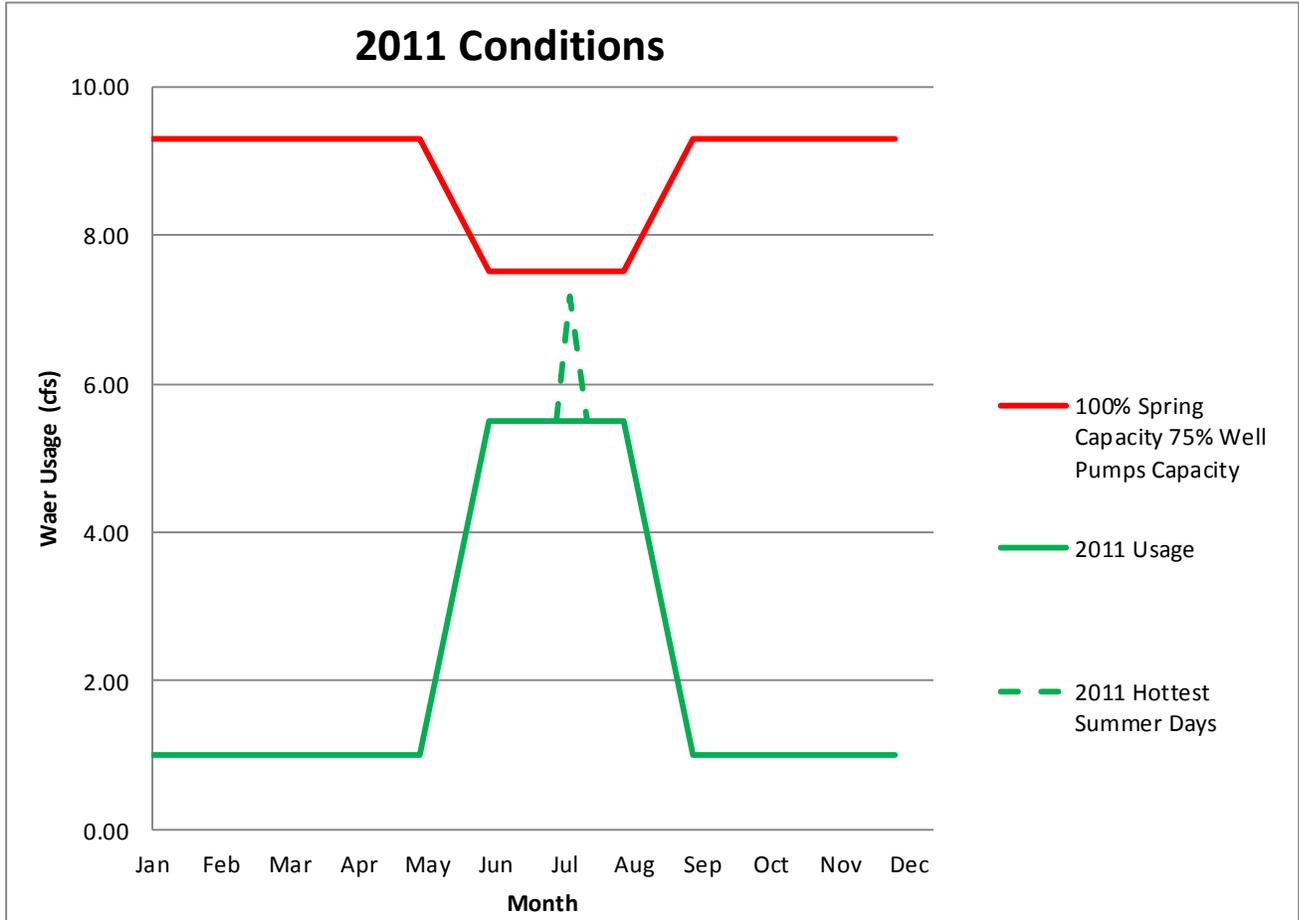


Figure 1 - Existing Water Usage and Capacity

As we look to the future, we have added a 20% population contingency to account for surges in population growth through the planning window. The first improvement Smithfield City will need to make is to increase the source capacity to meet the increased water usage in the City. Following Smithfield City's growth curve, the well pumps will need to be upsized as soon as possible. This is shown in Figure 2. Again note the decrease in source capacity during the summer months shown below in Figure 2 is due to spring production decreasing during the summer.

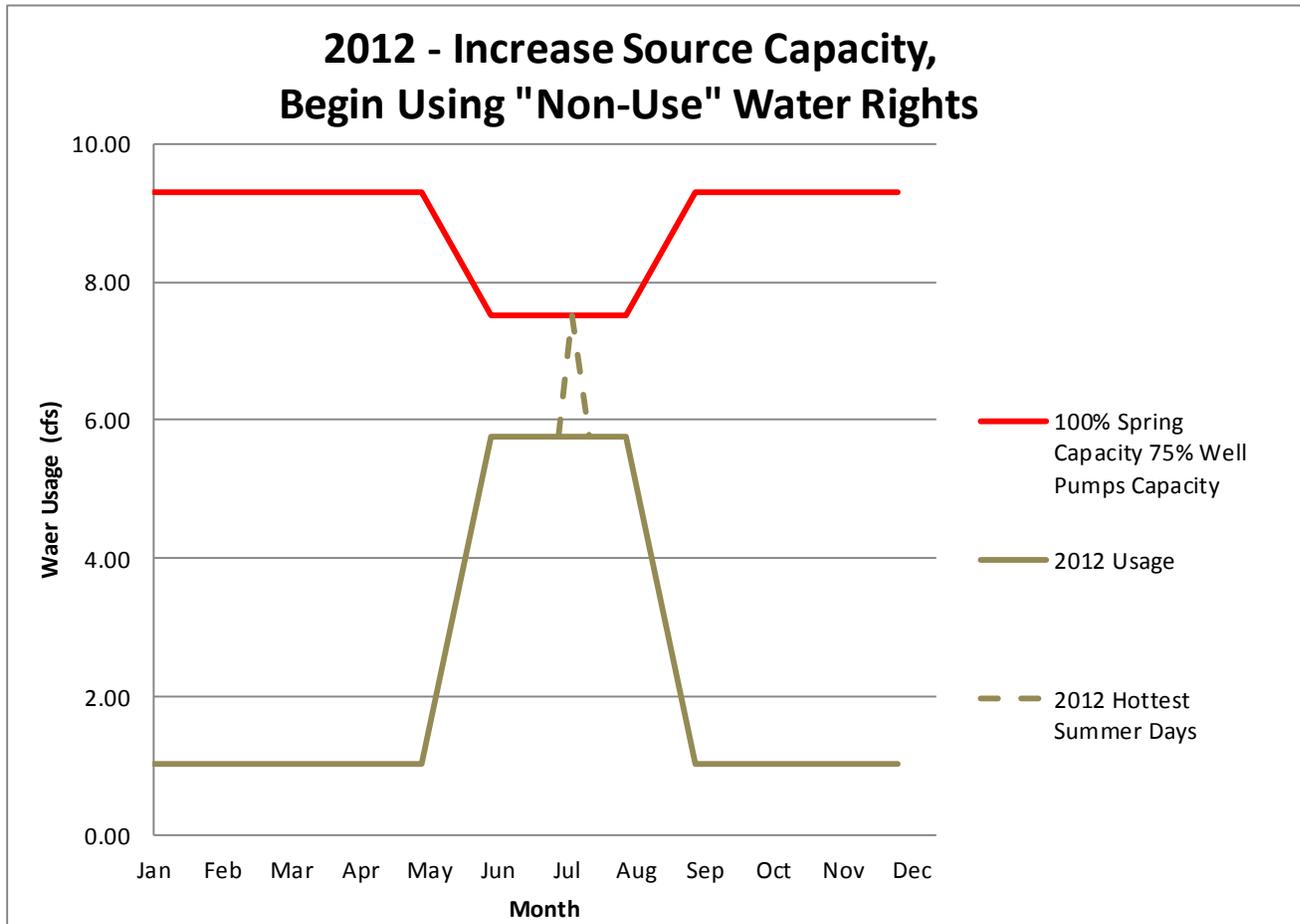


Figure 2 - Water Usage in 2017 – Increase Source Capacity

This can be done by increasing the pumping capacity of the Birch Well, utilizing and putting to use water rights currently in non-use status. See Table 9. Due to the comparable small diameter of the Forrester Acres Well there is question whether or not the capacity of that well can be increased. Where there have been no test pumps performed on the well for over 40 years, it is recommended that such a test be performed before any attempt to increase its capacity is made.

In 2037, the peak summer day demand will exceed the total available water rights. Based on the growth projections, the spring, fall, winter, and even average summer day usage are less than the total available rights in 2051. However, on the hottest days of the summer, the estimated flow required is 4.88 cfs above the amount of water the City has rights to. Assuming these peak summer days only occur 14 days of the year, this is an additional 136 Ac-ft of water. This is shown in Figure 3 below. Possible options for dealing with this peak demand will be discussed in the conclusions and recommendations section of this report. Figure 3 illustrates the “Total Water Rights Available,” assuming that the City will have the capacity to utilize the water rights they own, and collect all of the spring flow allowed by the exchange agreement.

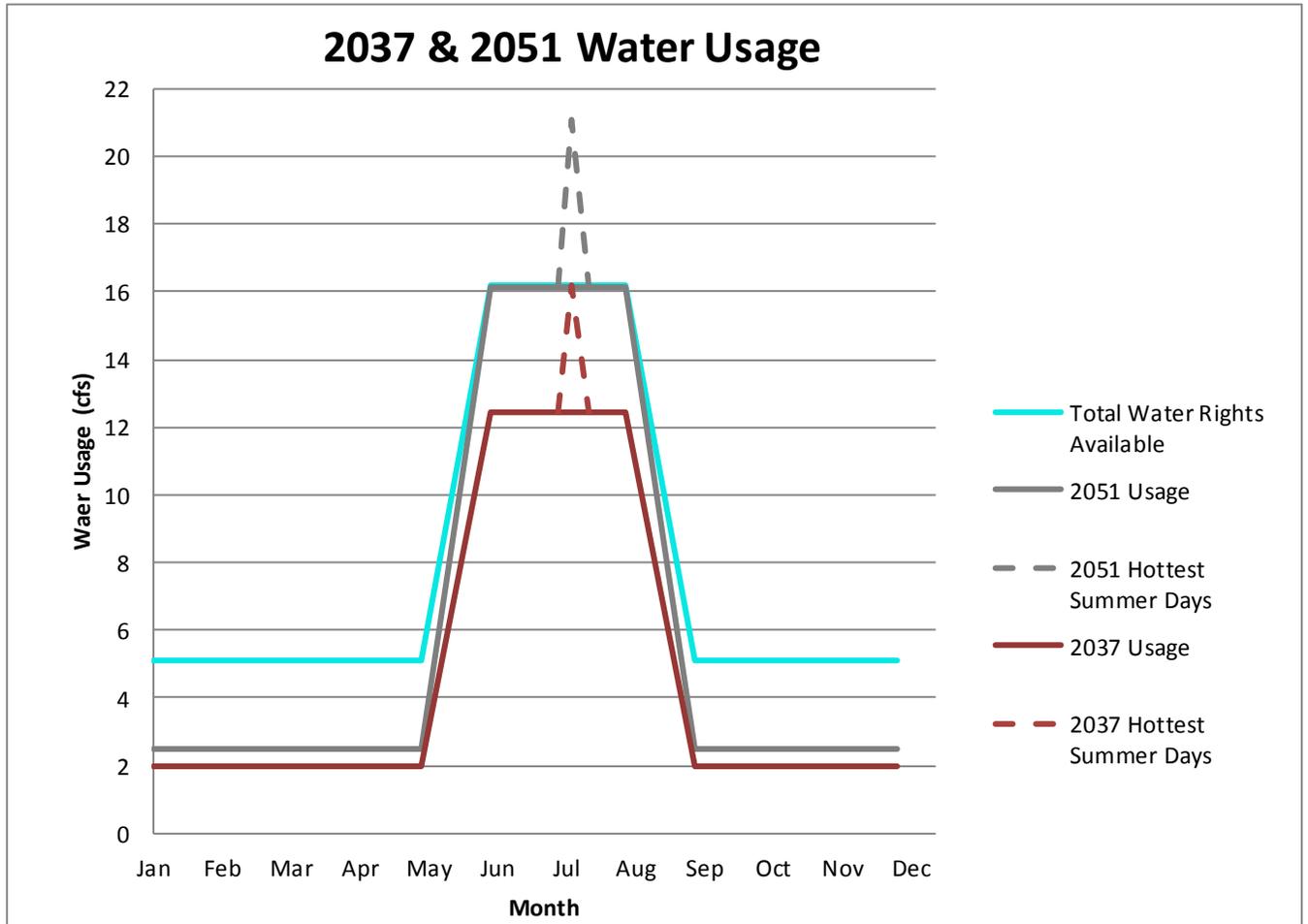


Figure 3 - Water Usage in 2037 & 2051

CONCLUSION & RECOMMENDATIONS:

During the summer months, assuming the wells are running 75% of the time, and the springs are producing a combined 1500 gpm, the hottest summer day demand is reaching the system capacity now. Therefore the City should begin work to further develop one of the existing wells, or drill an additional well. If the Forrester Acres Well is considered for further development, a test pumping should occur before any work is began.

When the City has developed additional well capacity, we recommend the City begin to use the water rights that currently are in non-use status. By utilizing these water rights during the summer months, the City should be able to use approximately 16.21 cfs for a three month period.

Based on the current growth projections, the peak summer day usage will exceed the total available water rights in 2037, as shown in Figure 3.

At the conclusion of the 40 year growth period (2051), the City should still have sufficient water rights during the spring, fall, winter, and even the average summer day. During the peak summer day however, the City will need an estimated 4.88 cfs of additional flow. Assuming these peak summer days only occur 14 days of the year, this is an additional 136 Ac-ft of water. As an alternative to acquiring a right with 4.88 cfs of diversion, the City should consider investigating Aquifer Storage Recovery (ASR) or expanding irrigation systems to reduce the peak usage during summer months.

The concept of ASR is to store unused water rights in the ground (aquifer) to be extracted during times of high demand. For example, the City has rights to 5.125 cfs during the spring, fall, and winter, but currently only uses 20% of that right. This extra 80% could be pumped into an injection well, and later used to meet peak summer demands. The City may be able to use a portion of the fees for water rights to further investigate the option of using ASR since it is an option to more fully utilize existing rights.

If the City chooses to pursue the ASR route, rather than requiring water rights from developers, money should be continued to be collected to help fund the ASR development, or expand the infrastructure for the irrigation system.

If the City chooses to pursue the expansion of the irrigation system, we recommend the City use funds already collected from developers to purchase water rights from Cache Valley Ranches. As time goes on, the water will never be less expensive, or more available. It would also be beneficial for the City to work with Smithfield Irrigation Company to make connection to their system more appealing, including incentives to developers to expand the company's system into their developments and establish an affordable connection fee schedule for those wishing to use the system.

A cost analysis should be performed to estimate how much it would cost for the City to expand the irrigation system to areas currently not being served by an irrigation system in the City. This cost can

then be divided by the number of additional ERC's the City estimates having over the next 40 years. A possible incentive the City could implement is require developers to install a secondary irrigation system and pay \$500 per lot in new developments for connection fees to the secondary system. The City would subsidize the rest of the fees through the other water dedication fees. The City could also require a secondary irrigation system be installed in all new developments that lie within 750 feet of the City's secondary irrigation system.

In areas of the City where secondary irrigation systems are not currently installed, we recommend the City require 1 Ac-ft or \$2,000 per ERC for new developments.

Throughout the City, there are several parks currently being watered with culinary water. We recommend the City convert as many parks as possible to irrigation water. If all of the parks were converted to irrigation water, the City could reduce culinary water usage during the irrigation season by an estimated 0.5 cfs.

Outdoor use accounts for the majority of the water usage in the City. As trends in society change and smaller lot sizes are more acceptable, the City could reduce the amount of water used by allowing for smaller lot sizes in areas of the City.

We also recommend that the City file for a right on the Smithfield Canyon Springs from April 1st to September 30. Legally, the exchange is not valid until the canals are filled each summer. This may not happen until May 15th. In order to have the paperwork support what has already been happening for years, the City should file for this right. The priority date will be behind the canal company, but it will allow the City to legally use the 5 cfs from April 1st to the time the exchange is fulfilled.

Smithfield will need to continue to maintain the existing non-use status on water rights until they are needed. These applications must be filed every seven years. Extensions of time and beneficial use applications will also need to be prepared until all of the City's rights are certified.

It should be noted that this study analyzed a 40 year time frame, not a buildout scenario. It is estimated that in 2051, the City will continue to experience growth, and additional water rights will be needed at that time.

By implementing the recommendations in this plan, Smithfield will be able to protect their existing water rights, utilize them to their fullest extent and have sufficient water to provide for growth in the future.