TOWN OF HUNTSVILLE
CULINARY WATER MASTER PLAN 2011

INCLUDES:

POPULATION AND GROWTH PROJECTIONS
40 YEAR WATER RIGHTS PLAN
WATER SYSTEM ANALYSIS
RECOMMENDED SYSTEM IMPROVEMENTS
RECOMMENDED RATE STRUCTURE

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1 INTRODUCTION

This Culinary Water Master Plan has been prepared for the Town of Huntsville, Utah. The Town of Huntsville is located in Weber County, Utah, just east of Pineview Reservoir. The Town's water system provides service to approximately 300 residential connections both within the Huntsville Town boundary as well as some residents living in the unincorporated county. The system also serves culinary water to approximately 18 commercial connections, for a total combined Equivalent Residential Connection's (ERC's) of 336. Huntsville is exploring the possibilities of annexing property into the town and is analyzing the availability of providing culinary water service to those areas being considered for annexation.

This Master Plan is based on an analysis of Huntsville's water right, source capacity, storage capacity, and distribution system in accordance with the State of Utah Rules for Public Drinking Water Systems (Rules). User rate structures are reviewed in the formulation of this Master Plan (Plan). In addition Huntsville is currently under advisement that their culinary water treatment process does not meet all the requirements for treatment of surface water for drinking water use. Huntsville has requested the assistance of Water Works Engineers in evaluating current treatment processes and providing recommendations. This Plan will coordinate with the recommendations provided by Water Works Engineers.

In addition to evaluating the Town of Huntsville's water system service area, the necessary improvements needed to serve Huntsville and the known annexation area will also be evaluated with recommendations provided. The Town of Huntsville recognizes that their current water system has leaks, and at times during the summer months barely meets the demands for service. Huntsville also recognizes the need to accurately meter the water usage. Opinions of probable cost for the recommended water system improvements and a proposed financing plan are included.

This Plan demonstrates that the monthly culinary water rates charged to all existing and future culinary water users, are fair and based upon a reasonable plan. These fees allow Huntsville to maintain the level of service required of a public water system as defined by the Utah Division of Drinking Water.

3 WATER RIGHT ANALYSIS

3.1 Existing Water Right

A key component of a culinary water master plan is an analysis of water rights. It is important that public water utilities have the legal rights to the water that they produce and sell. Also, per Utah Division of Drinking Water Rule R309-510-7 (1) every water system is required to have enough water rights to, "provide one year's supply of water, the average yearly demand." This section provides a review and analysis of the existing water rights in the Town of Huntsville.

Existing Town water rights used for culinary water are identified in Table 3.0 below.

Table 3.0- Huntsville Water Rights

WR #	CFS	AC-FT	USE	STATUS	PRIORITY	SOURCE
E1659	0.041	30	Municipal	App	1980	Underground Water Well
35-4759	0.65	470.59	Municipal	Cert	1864	Upper and Lower Bennett Springs
35-7399	0.5	361.98	Municipal	Cert	1938	Upper and Lower Bennett Springs
35-7431	0.14	101.35	Municipal	Dec	1867	Hawkins Spring
Total	**1.33**	**963.92**				

3.2 Existing Required Water Right

Required water right is divided into two categories, indoor and outdoor. The State of Utah Public Drinking Water Rules, Section 5, states that a community should have adequate water right to supply each culinary connection with 400 gallons per day for indoor water use.

The Town of Huntsville's water system provides water for indoor use for each connection on the system and outdoor use for approximately 10% of the connections. The residential lot sizes of those using culinary water for outdoor use varies quite substantially. The outdoor water use is approximated by estimating how much of each lot will be irrigated land. Since each residential lot in the county area varies so significantly, the amount of irrigated area will need to be estimated. Therefore, water right, source, storage, and distribution calculations will include these assumptions.

According to the State of Utah Rules for Public Drinking Water Systems, Utah has 6 climate zones (excluding non-arable lands), which correspond with consumptive use and annual precipitation. In the northern mountains, outside watering requirements are quite low (Zone 1), compared with the southern part of the state where the climate is usually very warm (Zone 6). As a result these zones have different outside watering requirements. Rule R309-203 provides minimum recommended requirements for outside consumptive use for each zone.

The Town of Huntsville is in Zone 3, which is listed as moderate for consumptive use. According to the Rule, the Town requires 1.66 acre-ft per irrigated acre as the demand to be used in calculations to determine required water right for residential irrigation. Through the use of aerial photography, in consulting with the Town of Huntsville, and other means, it will be assumed that those using culinary water for outdoor irrigation purposes water ¾ acre average for each residence.

Since the number of residents using culinary water for outdoor uses is quite small, this assumption does not appear to have a significant impact on the overall result.

Based on the information above and the total number of existing connections, the existing required water right is calculated as follows:

Indoor use:

$$336\ ERC's \times \frac{400\ gpd}{ERC} \times \frac{365\ days}{year} \times \frac{ft^3}{7.48\ gal.} \times \frac{1\ ac-ft}{43{,}560\ ft^3} = 150\ ac-ft$$

Outdoor Use:

$$30\ ERC's \times \frac{.75\ irr.-ac.}{ERC} \times \frac{1.66\ ac-ft}{irr.-ac} = 40\ ac-ft$$

TOTAL EXISTING WATER RIGHT ACQUIRED..... = 964 ac-ft
TOTAL CURRENT REQUIRED WATER RIGHT..... = 190 ac-ft
ESTIMATED EXISTING WATER RIGHT SURPLUS..... = 774 ac-ft

The calculations above are based upon State of Utah Rules for Public Drinking Water Systems and the assumptions made for outdoor water usage. These calculations are normally conservative and estimate the actual need slightly higher than what a system may actually use. However, based on the Annual Usage recorded by the Town of Huntsville, the Town's average annual water right used is 190 ac-ft.

3.3 Projected Required Water Right

The State Division of Water Rights requires a 40 year period be used when projecting for the amount of required water right. The number of projected connections in the Town of Huntsville, at the end of the 40 year planning period is 410 ERC's, as calculated in Section 2.3.2. As stated above, all connections use the system for indoor use and in 2051 an estimated 37 ERC's will use the system for outdoor watering.

Based on the information above and the total number of connections, the 40 year projected required water right is calculated as follows:

Indoor use:

$$410\ ERC's \times \frac{400\ gpd}{ERC} \times \frac{365\ days}{year} \times \frac{ft^3}{7.48\ gal.} \times \frac{1\ ac-ft}{43{,}560\ ft^3} = 184\ ac-ft$$

Outdoor Use:

$$37\ ERC's \times \frac{.75\ irr.-ac.}{ERC} \times \frac{1.66\ ac-ft}{irr.-ac} = 46\ ac-ft$$

TOTAL EXISTING WATER RIGHT ACQUIRED..... = 964 ac-ft
TOTAL PROJECTED REQUIRED WATER RIGHT..... = 230 ac-ft
ESTIMATED PROJECTED WATER RIGHT SURPLUS..... = 734 ac-ft

4 SOURCE CAPACITY ANALYSIS

4.1 Existing Water Source Capacity

At the time of this Plan, the Town of Huntsville has mainly one functional drinking water source. The functional source is the Upper and Lower Bennett Springs and Peterson Spring. The Upper Bennett Spring is shared with the Monastery in the valley. The Town of Huntsville diverts 40% of the total Upper Bennett spring flow up to the allotted water right amount. The other 60% is diverted to the Monastery. The Bennett Springs and Peterson Spring currently have a combined water right of 832.57 acre-ft/year, which equates to 516.13 gpm as shown in Table 3.0. The Town also has available the use of Hawkins Spring, but is currently not being utilized. Hawkins Spring has a water right of 101.35 acre-ft/yr, which equates to 63 gpm as shown in Table 3.0. It is important to note that these flow rates are only what the Town of Huntsville has the right to use, not necessarily what the sources produce in capacity to the Town. Current flow data from any of the sources is unknown, since the metering devices for the springs have quit functioning properly after the year 2007.

The Town of Huntsville did have metered spring data between the years 2003-2007. A town water system operator would read the meter multiple times a year and then interpolate the amount of water collected throughout the year. Table 4.0 below shows the amount of water that was collected from the Bennett and Peterson Springs each month between the years of 2003-2007. The average and lowest amount of flow recorded for each month during the years 2003-2007 was calculated and is also shown in Table 4.0.

Table 4.0- Recorded Flow Data from 2003-2007 (Bennett and Peterson Springs)

	GPM						
Month	2003	2004	2005	2006	2007	**Average**	**Lowest**
Jan.	257	200	379	447	312	**319**	**200**
Feb	247	201	447	489	356	**348**	**201**
Mar	383	204	450	490	535	**412**	**204**
Apr	515	211	560	404	560	**450**	**211**
May	531	278	578	388	578	**471**	**278**
Jun	430	229	527	374	455	**403**	**229**
Jul	290	224	398	374	183	**294**	**183**
Aug	209	224	411	368	217	**286**	**209**
Sep	177	198	411	368	217	**274**	**177**
Oct	179	198	308	364	206	**251**	**179**
Nov	184	235	296	285	203	**241**	**184**
Dec	201	377	292	327	202	**280**	**201**

The data shown in Table 4.0 shows that the Town's springs produce most of the water collected during the high run-off months of January-June, and the least amount of water during the months of July-December. This is a typical pattern of springs as a water source. As expected, the least amount of water collected from any spring typically coincides with the peak demand on a water system. Peak demands on a system typically occur in the months of July-August. The lowest amount of flow recorded during these months occurred in July of 2007, which produced a flow 183 gpm. The Division of Drinking Water Rule R309-510-7 (4) states,

- *The design engineer shall consider whether flow from the source(s) may vary. Where flow varies, as is the case for most springs, the minimum flow rate shall be used in determining the number of connections which may be supported by the source(s). Where historical records are sufficient, and where peak flows from the source(s) correspond with peak demand periods, the Executive Secretary may grant an exception to this requirement.*

According to this rule the lowest recorded flow will be used to determine if Huntsville has adequate capacity during peak day demand. The July 2007 flow is considered as "worst case" during a peak day demand scenario, and will be compared to the existing and proposed required water source capacity as calculated in section 4.2 and section 4.3.

4.2 Existing Required Water Source Capacity

Existing source capacity requirements are separated into indoor and outdoor use. The Division of Drinking Water Rule R309-510-7 (1) states

- *Sources shall legally and physically meet water demands under two separate conditions. First, they shall meet the anticipated water demand on the day of highest water consumption. This is referred to as the peak day demand. Second, they shall also be able to provide one year's supply of water, the average yearly demand.*

The Division of Drinking Water Rule R309-510-7 (2) states that a community should have an adequate water source capacity to supply a peak demand of 800 gallons per day per connection for indoor and an average yearly demand of 146,000 gallons per ERC which is equivalent to 400 gallons per day per ERC. This rule also requires the source to be capable of meeting peak irrigation demands and an average yearly irrigated demand, where no secondary source of irrigation water is available.

As mentioned, the Town does not provide a separate source for outdoor watering for approximately 10% of the system, or 30 users. It has been estimated that the average acreage that is irrigated per lot is ¾ acres for those using culinary water for outdoor watering. Source capacity calculations will include these assumptions.

As indicated in Section 3.2, the State of Utah Rules for Public Drinking Water Systems, Utah has 6 climate zones (excluding non-arable lands), which correspond with consumptive use and annual precipitation. Rule R309-203 provides minimum recommended requirements for outside consumptive use for each zone.

The land area served by the Huntsville water system is in Zone 3, which is listed as moderate for consumptive use. According to the rule, the State requires 3.39 gpm per irrigated acre as the peak day demand and an average yearly irrigated demand of 1.03 gpm per irrigated acre to be used in calculations to determine required source capacity for residential irrigation. It is assumed that the water is applied by sprinkler irrigation.

Based on the information above the existing required average yearly source capacity is calculated as follows:

Yearly Average Indoor Use:

$$336\ ERC's \times \frac{400\ gpd}{ERC} \times \frac{1\ day}{1440\ min.} = 93\ gpm$$

Yearly Average Outdoor Use:

$$30\ ERC's \times \frac{.75\ irr.-ac.}{ERC} \times \frac{1.03\ gpm}{irr.-ac} = 23\ gpm$$

TOTAL EXISTING 2003-2007 "WORST CASE" SOURCE CAPACITY = 183 gpm*
TOTAL CURRENT REQUIRED YEARLY AVE. SOURCE CAPACITY = 116 gpm
EXISTING YEARLY AVERAGE SOURCE CAPACITY <u>SURPLUS</u> = 67 gpm

*Existing Source Capacity is based on the "worst case" source capacity recorded by the Town of Huntsville from the years 2003-2007

Based on the information above the existing required peak day source capacity is calculated as follows:

Peak Day Indoor Use:

$$336\ ERC's \times \frac{800\ gpd}{ERC} \times \frac{1\ day}{1440\ min.} = 187\ gpm$$

Peak Day Outdoor Use:

$$30\ ERC's \times \frac{.75\ irr.-ac.}{ERC} \times \frac{3.39\ gpm}{irr.-ac} = 76\ gpm$$

TOTAL EXISTING 2003-2007 "WORST CASE" SOURCE CAPACITY = 183 gpm*
TOTAL CURRENT REQUIRED PEAK DAY SOURCE CAPACITY = 263 gpm
EXISTING PEAK DAY SOURCE CAPACITY <u>DEFICIT</u> = (80) gpm

*Existing Source Capacity is based on the "worst case" source capacity recorded by the Town of Huntsville from the years 2003-2007

As shown in the calculations above, the Town's existing culinary water source capacity has a <u>surplus</u> of 67 gpm for the yearly average demand and a <u>deficit</u> of 80 gpm for the peak day demand. It is important to note that this is dependent on the amount of water that the spring produces each year. The water system capacity of 183 gpm was the lowest amount of flow recorded for the peak demand months of July-August in the years 2003-2007 shown in Table 4.0.

4.3 Projected Required Water Source Capacity

As noted in Section 2.3.2, the total number of equivalent residential connections projected at the end of the 20 year planning period is 371. The projected ERC's using culinary water for irrigation purposes at the end of the 20 year planning period is 33. The calculation of projected yearly average required source capacity is provided below.

2031 Projected Yearly Average Indoor Use:

$$371\ ERC's \times \frac{400\ gpd}{ERC} \times \frac{1\ day}{1440\ min.} = 103\ gpm$$