



Municipal Water Efficiency Plan

Town of Carbondale, Colorado

MUNICIPAL WATER EFFICIENCY PLAN

Town of Carbondale, Colorado



PREPARED BY



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July 14, 2015

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	1
EXECUTIVE SUMMARY	2
Profile	2
Population	2
Water Demand Forecasts	2
Water Efficiency Planning Process and Goal Setting	3
Water Efficiency Program	4
Water Efficiency Plan Approval	5
Roaring Fork Regional Water Efficiency Plan.....	5
1. PROFILE OF EXISTING WATER SUPPLY SYSTEM	6
1.1 Overview.....	6
1.2 Regional Setting.....	7
1.3 Water Supply and Reliability	7
1.3.1 Potable Water Supply	8
1.3.2 Raw Water Supply.....	8
1.3.3 Water and Wastewater Treatment	9
1.3.4 Capacity and Reliability.....	9
1.3.5 Proposed Water Supply Projects	9
2. WATER DEMANDS AND HISTORICAL DEMAND MANAGEMENT	10
2.1 Demographics and Service Area Characteristics	11
2.2 Historical Water Demands	11
2.3 Seasonal and Peak Day Demands.....	17
2.4 System Water Losses.....	17
2.5 Past and Current Demand Management Activities.....	18
2.6 Demand Forecast	18
2.6.1 Population Planning Projections.....	19
2.6.2 Demand Forecasts	20
2.6.3 Estimated Cost of New Supply Options	25
3. SELECTION OF WATER EFFICIENCY ACTIVITIES	25
3.1 Summary of the Selection Process.....	26
3.2 Water Efficiency Activities.....	26
3.2.1 Foundational Activities	27
3.2.2 Targeted Technical Assistance and Incentives	30
3.2.3 Ordinances and Regulations	32
3.2.4 Public Education and Information	33
4. IMPLEMENTATION AND MONITORING PLAN.....	33
4.1 Monitoring and Evaluation.....	33
4.2 Revenue Stability.....	34
5. PUBLIC REVIEW, ADOPTION, AND APPROVAL OF WATER EFFICIENCY PLAN.....	34
5.1 Public Review.....	34

5.2	Water Efficiency Plan Adoption	34
5.3	Water Efficiency Plan Approval	34
6.	COMPLIANCE WITH STATE PLANNING REQUIREMENTS	34
6.1	Carbondale Water Efficiency Plan Compliance	35
7.	ROARING FORK REGIONAL WATER EFFICIENCY PLAN	38
8.	REFERENCES	39

LIST OF TABLES

Table 1.	Population and Annual Water Deliveries (AF/yr) from 2005 to 2012.	12
Table 2.	Residential Indoor and Outdoor Water Deliveries from 8/2010 – 7/2013.....	14
Table 3.	Metered Sectoral and Seasonal Water Deliveries from 8/2010 – 7/2013 (AF/yr).	14
Table 4.	Water Losses Based on Comparison of Production and Metered Data.	18
Table 5.	Population Growth Projections from 2015 through 2050.	19
Table 6.	New and Updated Water Efficiency Activities and Water Savings Estimates.	27
Table 7.	AWWA Water Audits and Loss Control Programs.	28
Table 8.	Treated Residential Water Rates and Rate Structure Effective January 1, 2014.	29
Table 9.	Treated Commercial Water Rates and Rate Structure Effective January 1, 2014.....	30
Table 10.	Bulk Water Rates.....	30

LIST OF FIGURES

Figure 1. Changes in Population and Annual Metered Water Deliveries from 2005 through 2012.....	13
Figure 2. Average Monthly Demands by Water Use Sector from 8/2010 to 7/2013.....	15
Figure 3. Distribution of Sectoral Demands from 8/2010 to 7/2013.	15
Figure 4. Distribution of Annual Water Use by Sector in 2012.	16
Figure 5. Distribution of Customer Connections in 2013.	17
Figure 6. Actual and Forecast Population from 2000 through 2050.	20
Figure 7. Baseline, Passive, and Active Demand Forecasts through 2050.	22
Figure 8. Water Providers Participating in the Roaring Fork Regional Water Efficiency Plan.....	39

LIST OF APPENDICES

Appendix A: Relevant Codes and Ordinances

Appendix B: Public Notice Announcement, Public Comments, and Official Plan Adoption

Appendix C: Board of Trustees Approval of Carbondale’s Municipal Water Efficiency Plan

LIST OF ABBREVIATIONS

AF	acre-feet (1 AF = 43,560 cubic feet or 325,851 gallons)
AF/yr	acre-feet per year
cfs	cubic feet per second (1 cfs = 449 gallons per minute or 646,317 gallons per day)
Carbondale	Town of Carbondale
CWCB	Colorado Water Conservation Board
F	Fahrenheit
fps	feet per second
GIS	Geographic Information System
gpcd	gallons per capita per day (gallons used per person per day)
gpd	gallons per day
gpm	gallons per minute
MG	million gallons (1 MG = 3.07 acre-feet)
MGD	million gallons per day
Town	Town of Carbondale

Report cover photograph of Town of Carbondale taken by Jonny Kloberdanz.

ACKNOWLEDGEMENTS

The development of the Town of Carbondale Water Efficiency Plan was a collaborative effort funded by a Colorado Water Conservation Board grant as part of the Roaring Fork Watershed Regional Water Efficiency Plan. The project has been supported through the financial and in-kind participation of the following stakeholders:

- City of Aspen;
- Town of Basalt;
- Town of Carbondale;
- City of Glenwood Springs;
- Snowmass Water and Sanitation District;
- Colorado Water Conservation Board;
- Ruedi Water & Power Authority;
- Roaring Fork Conservancy;
- Community Office for Resource Efficiency;
- Colorado River District.

Town of Carbondale staff provided access to detailed datasets and system information that facilitated the preparation of this Water Efficiency Plan. The consultant team would like to thank the following staff members for their time and input on this document:

- Mark O'Meara (Town of Carbondale)

EXECUTIVE SUMMARY

PROFILE

The Town of Carbondale (“Town” or “Carbondale”), Colorado, located in Garfield County along State Highway 133, which intersects Colorado State Highway 82 approximately 11 miles south of Glenwood Springs, is a municipality established in 1887. Carbondale adopted a Home Rule Charter in 2002, and operates under a manager-board governmental structure. Carbondale is located immediately upstream of the confluence between the Crystal and Roaring Fork Rivers at an elevation of approximately 6,200 feet. The Town provides treated water service to a 2.54 square mile area with a current population of approximately 6,600 residents.

Carbondale owns and operates its own water and wastewater utilities. Carbondale obtains its potable water supply from surface water sources in the Nettle Creek drainage, a tributary to the Crystal River, and from groundwater sources along the Crystal and Roaring Fork Rivers. The potable supply is supplemented by raw water diversions through various irrigation ditches under the Town’s water rights, and the Town provides raw water for irrigation purposes to a subset of its customers.

POPULATION

According to the 2010 Census, the population of Carbondale was 6,427 people, up from 5,069 residents as reported in the 2000 Census. This indicates the full-time population has been growing at an average rate of approximately 2.4% per year. The Town uses a growth rate of 2.5% per year for planning purposes, under which the population is forecasted to increase to approximately 11,100 people in 2035 and 16,100 in 2050.

WATER DEMAND FORECASTS

As part of the water efficiency planning process, three distinct water demand forecasts were prepared. First, a baseline demand forecast starting from 2015 and going out to 2050 was prepared. **This baseline forecast did not include the impact of water conservation of any kind, even passive water savings, and was developed only to assess the adequacy of future supplies under reasonable worst-case conditions and to demonstrate the impact of anticipated efficiency improvements.** Water demand in 2014 (including an estimate of raw water use for irrigation) was 1,208 acre-feet (AF¹), and under the baseline forecast is expected to increase by 1,731 AF to 2,939 AF in 2050. This represents a 143% increase in water demand over the next 36 years.

A second water demand forecast through 2050 includes the impact of passive efficiencies from Colorado legislation, and federal plumbing codes and standards. This forecast found that the

¹ One acre-foot of water is approximately 325,851 gallons.

Town water demands will increase to 2,395 AF in 2050 (including both potable and raw water demand), or 545 AF less than demands would be under the baseline forecast.

A third forecast was prepared that includes the anticipated impact from the Town's planned water efficiency program measures described in this plan. Under this forecast, potable demand increases to just 1,988 AF in 2050 and raw water use increases to 111 AF for a combined total of 2,099 AF in 2050. Compared with the baseline forecast, if the elements of this plan are fully realized, then it is estimated that water demand at 2050 will be reduced by 840 AF as a result of passive and active water conservation measures in Carbondale.

These forecasts form the core of the Water Efficiency Plan and are the forecasts upon which estimated conservation savings are based. The information reviewed as part of this Water Efficiency Plan indicates that the total capacity of the Town's water treatment plants is 4.0 million gallons per day (MGD); however, the current reliable production capacity ranges from approximately 2.5 to 3.0 MGD depending on the season. If production was limited to 2.5 MGD for the entire year, then the volumetric yield would be approximately 2,800 AF per year. Carbondale's future demand forecasts in the year 2050 range from 2,099 AF to a maximum of 2,939 AF (including both potable and raw water demand). Based on this analysis, additional wells may need to be drilled if conservation does not take place. Fortunately, the Town's water rights, including the supplemental supply from Ruedi Reservoir, are sufficient to meet all future forecasts.

Climate Change Impact on Water Use

Recent climate change forecasts indicate a warming trend in irrigation season temperatures in the Carbondale region. While it is becoming more common to consider potential climate change impacts on water supply planning, the likely impacts on water demands are less well understood. However, some impacts on water demands are already included in the forecasts provided in this plan, because recent water demands are utilized to project future water demand patterns and these recent demands reflect actual consumption patterns based on current climate conditions. Regular updates to these projections and this plan can assist in better understanding both demand-side and supply-side impacts from future climate change. Without conducting a more detailed investigation of potential climate change impacts on both supplies and demands, a sensible approach to water demand forecasting in a changing climate is to regularly update and refine demand projections based on actual current conditions.

WATER EFFICIENCY PLANNING PROCESS AND GOAL SETTING

The Town carefully developed this Water Efficiency Plan in accordance with the Colorado Water Conservation Act of 2004 so that it meets or exceeds all statutory requirements according to Colorado Revised Statute § 37-60-126. The Town utilized the Colorado Water Conservation Board's *Municipal Water Efficiency Plan Guidance Document* dated July 2012 to inform and guide the development of this conservation plan.

To fulfill Colorado's statutory water conservation planning requirements, a series of water conservation program scenarios were developed that incorporated a variety of indoor and outdoor efficiency measures that have been cost-effective when implemented in other Colorado utility service areas. For Carbondale, the following water efficiency measures have been identified as providing a reasonable cost savings for the utility or customers by reducing water demands:

- Metering,
- Water loss control,
- Conservation-oriented water rate structure,
- Codes and ordinances including the Residential Efficient Building Program (REBP) and the International Green Construction Code, and
- Mapping, inventory, and management of the raw water system.

The Town is committed to the efficient use of its water resources. The Town has established a water efficiency goal of 24 AF (2.0%) savings per year compared with a continuation of current demand.

Based on careful analysis of current demands and expected growth, the Town believes this level of savings to be reasonably achievable, assuming funding for raw water monitoring systems can be obtained. This goal will be re-evaluated on a regular basis, as Carbondale intends to update the Water Efficiency Plan every seven years. This means that four or more additional plan updates may be completed before 2050, affording ample opportunity to update and refine the Town's conservation program and goals as needed.

WATER EFFICIENCY PROGRAM

The Town does not have a dedicated conservation staff member and its conservation² program is implemented by the Utilities Director with assistance from other staff members. In addition, the Town periodically hires outside contractors to assist in implementing certain water efficiency program activities such as leak detection. The Town has demonstrated a commitment to water use efficiency, and even without a dedicated staff member, has implemented some of the most essential water conservation program measures including metering, a conservation-oriented water rate structure, utility water loss reduction, and public education and information about water efficiency.

This is the first Water Efficiency Plan that has been prepared by Carbondale, and is being completed as part of the Town's participation in the Roaring Fork Watershed Regional Water Efficiency Plan.

² The terms water efficiency and water conservation are used interchangeably throughout this document.

WATER EFFICIENCY PLAN APPROVAL

A 60 day public review period was conducted and to the extent possible, comments were incorporated in this plan. On March 31, 2015, the Town of Carbondale Board of Trustees reviewed this Water Efficiency Plan and adopted it with the updates included in this final version of the plan. On June 25, 2015, the Town received official notification that the plan was approved by the Colorado Water Conservation Board.

ROARING FORK REGIONAL WATER EFFICIENCY PLAN

The Town's Water Efficiency Plan has the potential to have a direct effect on flows in the Roaring Fork River as well as the Crystal River, although Carbondale cannot guarantee that water it saves through conservation efforts will benefit the entire downstream reach of the rivers to the extent that other downstream water users may divert that water out of the rivers. The Town is interested in regional partnerships to improve water efficiency.

1. PROFILE OF EXISTING WATER SUPPLY SYSTEM

1.1 OVERVIEW³

The Town of Carbondale (“Town” of “Carbondale”), located along Colorado State Highway 133, which intersects with Colorado State Highway 82 approximately 11 miles south of Glenwood Springs Colorado, is a municipality that was established in 1887. Carbondale adopted a Home Rule Charter in 2002, and operates under a manager-board governmental structure. Carbondale is located at the confluence between the Crystal and Roaring Fork Rivers at an elevation of approximately 6,200 feet.

As with the entire Roaring Fork Valley, initial development was driven by the influx of gold and silver mining prospectors laying claims to parcels near Aspen. Hunters and farmers relied on the fertile lands in the lower valley, including areas in and around Carbondale, to supply food to the booming mining towns. Carbondale became a depot of the newly developed railroad in 1887, and mining, railroad construction and farming attracted a steady stream of new residents. The Town was officially incorporated in 1888 and was named in honor of Carbondale, Pennsylvania, which was the original home of some early settlers.

The growth of Aspen as a destination resort during the 1960's began to have a major effect on the lower Roaring Fork Valley and Carbondale. Tourism became the driving economic force in the region, and the population has steadily grown since that time. The early 1990's ushered in the most dramatic physical and socio-economic change to affect the Carbondale area since the decline of the mining and oil shale industries. Suddenly, the lower Roaring Fork Valley was feeling the development pressure not yet seen in the area, including Aspen Glen and River Valley Ranch.

Carbondale continues to expand and is planning for the population to grow at a rate of approximately 2.5% per year through the 2050 planning period. Based on this assumed rate of growth, the population of Carbondale is projected to increase from approximately 6,600 in 2013 to approximately 11,100 by 2035 and 16,100 by 2050.⁴ Regardless of whether these projections accurately reflect the forthcoming level of change, it is clear that some growth and change is inevitable. The challenge is how to respond to this inevitability and maintain the Town’s small-town character. The Comprehensive Plan addresses this challenge by offering guidance for how to manage future change in a way that maintains and enhances Carbondale’s small-town character (Carbondale, 2013).

³ Historical information was obtained from <http://www.carbondale.com/town/history>.

⁴ This assumes a growth rate of 2.5% per year through 2050.

1.2 REGIONAL SETTING

The Roaring Fork Watershed is located within the Colorado River Basin in central Colorado on the west side of the Continental Divide. The watershed includes the Sawatch, Collegiate and Elk Mountain Ranges and 8 peaks exceeding 14,000 feet in elevation. Snowmelt from the mountainous headwaters contributes to the streamflow in three primary rivers (Roaring Fork, Fryingpan, and Crystal) that eventually contribute to the flow in the Colorado River in the City of Glenwood Springs. The drainage area of the Roaring Fork watershed is approximately 1,450 square miles.

According to the State Water Supply Initiative (SWSI, 2010), the Colorado River Basin has a projected 2050 M&I water supply gap of 40% with respect to projected water demands. The Colorado River Basin supplies water to over 30 million people in the arid southwest, with the Roaring Fork Watershed contributing about 991,100 AF to the Colorado River per year (USGS, 2013).

The Roaring Fork Watershed experiences a wide range of climatic conditions from year-to-year as well as from season to season. Climatological records provide evidence of recurring major droughts in Colorado of various length and intensities. Water suppliers in the West accommodate this uncertainty through reservoir storage, consideration of "firm yields" in estimates of water availability, raw water supply development, and "demand side" strategies such as voluntary or mandatory restrictions on outdoor water usage. Plans to reduce usage are necessary to stretch the available water supply to help meet future demands and sustain periods of drought.

Water supply systems in the Roaring Fork Watershed are at risk from possible forest fire, floods, failure of dams/mains/wells, and contamination of all or part of the raw water supply. In order to respond to emergency or drought situations, contingency plans are typically designed for implementation of mandatory measures in stages that minimize impacts to the economy, lifestyles, and environment of the community.

1.3 WATER SUPPLY AND RELIABILITY

The Town has three water production facilities along with an extensive ditch system that is used for outdoor irrigation. The ditch system delivers raw water to the parks, golf course, and an estimated 15% to 20% of residential users. The water treatment plants provide treated well water and surface water to the service area. The total capacity of the water treatment plants is 4.0 million gallons per day (MGD); however, the current production ranges from approximately 2.5 to 3.0 MGD depending on the season. Supplemental water is available under a contract from Ruedi Reservoir, which is deliverable through release from the reservoir and then pumping of the well system along the Roaring Fork River as a drought reserve.

1.3.1 Potable Water Supply

Carbondale obtains its potable water supply from surface water sources in the Nettle Creek drainage, a tributary to the Crystal River, and from groundwater sources along the Crystal and Roaring Fork Rivers. The Town has a total of four wells, with three located in the Roaring Fork River alluvial aquifer and one located in the Crystal River alluvial aquifer. Additional details regarding the three water supplies are provided in the following sections.

1.3.1.1 Surface Water Supplies from Nettle Creek

Nettle Creek is the principal source of drinking water for the Town. The creek drains approximately five square miles and is a tributary of the Crystal River. A series of collection boxes capture flows ranging seasonally from 400 gallons per minute (gpm) or 0.58 MGD (approximate baseline) to 900 gpm or 1.30 MGD (representative runoff in a non-drought year), and convey flows to the water treatment plant. Diversions are sourced from high altitude glacial and snowmelt fed lakes, and Town staff report that water is of high quality.

1.3.1.2 Groundwater Supplies

The Crystal River Well is completed into the Crystal River alluvium and is capable of withdrawing up to 1.0 MGD. Diversions from the Crystal River Well are used to supplement deliveries from Nettle Creek. The well can be operated as needed on a year-round basis and utilizes chlorination for treatment. There is additional capacity which can be utilized, if necessary, by expanding the Crystal River well field and treatment plant. Expansion of these sources will be determined at the time of need, and pending the groundwater ruling by the Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE).

The Roaring Fork River well field consists of three developed shallow wells located on minimal use pasture on private property. The wells are used as a tertiary backup supply. Diversions from the Roaring Fork Wells are treated via membrane filtration and post chlorination, and the capacity of the treatment plant is currently 1.0 MGD. A total of 10 municipal Roaring Fork Wells have been decreed; the remaining seven wells are not completed at this time, and they will be installed downstream of the existing wells as dictated by the need for additional supplies. The Roaring Fork River well field treatment facility has a foundation for an additional 1.0 MGD of capacity.

1.3.2 Raw Water Supply

Carbondale's potable (treated) water system is supplemented heavily during the irrigation season by a network of irrigation ditches which are fed by a series of headgates located along the Crystal River. Raw ditch water is used for irrigation purposes by a subset of the residential customers, as well as in open space, park, school, and sports field areas. The primary ditches which the Town is solely responsible for operating include the Carbondale Ditch (Town Ditch), Bowels and Holland Ditch, and Weaver Leonardy Ditch. In addition, the Town is vested in water

delivery from the Ella Ditch, Lowlane Ditch, and Rockford Ditch. Water rights associated with the ditch system allow the Town to limit the effects of irrigation demands on the treatment plants and storage facilities during the irrigation season.

1.3.3 Water and Wastewater Treatment

The Town owns and operates a dedicated treatment facility for each of the water supply sources: Nettle Creek, Crystal River Well, and Roaring Fork River Wells. The plant that is used to treat the surface water diversions from Nettle Creek has a capacity of 2.0 MGD and uses gravity filtration through a mixed-media filtration system. The plant that is used to treat diversions from the Crystal River Well has a capacity of 1.0 MGD and utilizes chlorination treatment technology. The plant that treats diversions from the Roaring Fork River Wells also has a capacity of 1.0 MGD and uses membrane filtration and post chlorination. The combined treatment capacity from all three plants is 4.0 MGD; however, reliable production capacity is estimated to be around 2.5 to 3.0 MGD, depending on the season.

1.3.4 Capacity and Reliability

The Town is fortunate to have physically abundant, high quality water sources. The combination of surface water supplies from Nettle Creek and groundwater supplies from the Crystal River and Roaring Fork River alluvial aquifers provide source diversity and redundancy in the primary supply, with Ruedi Reservoir serving as a reliable backup. Demand forecasts for the 2050 planning horizon are provided in Section 2 below. Based on these projections, the Town's water rights are sufficient to meet the supply needs of the community beyond 2050, as is the water supply infrastructure including the water treatment plants, transmission mains, and storage facilities. The Town recognizes the potential for contamination of the source of its drinking water, and realizes that it is necessary to develop a protection plan to prevent the contamination of these valuable resources.

1.3.5 Proposed Water Supply Projects

The Town has drafted a capital improvement plan to prepare for necessary upgrades to the water supply system. Potential projects include: acquiring additional water rights in the Nettle Creek basin, primarily in the North Nettle Creek drainage; potential expansion of the Crystal River well field depending on future regulations; and expanding the Roaring Fork River well field along with increasing the filtration capacity at the Roaring Fork water treatment plant.

1.3.5.1 Crystal River Well Field

The Town is evaluating opportunities to increase the firm finished capacity of the water system by expanding the Crystal River well field. The feasibility of this project is dependent on future regulations.

1.3.5.2 Rehabilitation of Roaring Fork Well #2

The Town has been experiencing problems with sand being produced from Roaring Fork Well #2. The Town plans to attempt to remedy the situation by rehabilitating the well if the integrity of the casing is sufficient to withstand treatment.

1.3.5.3 Fire Flow Availability

Fire flow deficits currently exist at isolated locations within the Town. Development is expected to occur in the vicinity of each of these areas, which will further exacerbate deficits, so the Town has identified upgrades to provide sufficient flows for fire suppression.

1.3.5.4 Pipe Size Upgrades

The Town's distribution system has a combined length of approximately 28 miles and is composed of pipe diameters ranging from 4-inch to 16-inch. The Town has adopted a minimum 8-inch standard pipe size; however, there are currently 1.2 miles of 4-inch and 4.3 miles of 6-inch pipe throughout the Town that are sub-standard and needs replacement.

1.3.5.5 Pipe Velocities

Continuous high velocity in a pipeline is undesirable because it increases head loss and required energy consumption, adds stress and wear to fittings and connections, and increases the potential for leaks and main breaks. Under maximum daily demand conditions, the recommended maximum pipe velocity is 5 feet per second (fps). One location has been identified to have flow velocities higher than 5 fps and will be exacerbated by additional demand from development. The Town is currently evaluating options for resolving this issue through updating the Water Master Plan and development in the regions where these limitations exist. Future development within the boundaries of the Town service areas will trigger resolution strategies to alleviate these restrictions.

2. WATER DEMANDS AND HISTORICAL DEMAND MANAGEMENT

As part of the water efficiency planning process, three distinct water demand forecasts were prepared. The purpose of these forecasts was to present a range of reasonable estimates of water demand for Carbondale through the year 2050, given anticipated population growth, and to estimate the impact of the water conservation measures that occur both "passively" as a result of national and state plumbing codes and standards and "actively" as a result of specific programs and measures to be implemented by the Town. These forecasts were also used for the important purpose of evaluating the adequacy of Carbondale's water supply system to meet future demands.

The first step in the forecasting process was to gather data and information on the history of water demands and conservation in Carbondale. Through a careful review of these data and information, a baseline demand for Carbondale was established. Next, historical population

data were used to establish the baseline population, and the Town's planning data were used to forecast population growth out to 2050. This section of the Carbondale Water Efficiency Plan describes historical water demands and demand management efforts in the Town.

2.1 DEMOGRAPHICS AND SERVICE AREA CHARACTERISTICS

The Town provides potable and raw water service to a 2.54 square mile area with a current population of approximately 6,600 people and approximately 3,000 customer connections. The Town continues to grow, and long-term planning efforts are being based on an average growth rate of 2.5 percent per year through the 2050 planning period. It is estimated that the population of Carbondale will increase to approximately 11,100 by 2035 and 16,100 by 2050.⁵

To better understand water use among different categories of customers, Carbondale uses the following customer category assignments for its water service accounts and storing information in its billing system. Each account is assigned one of the category designations below.

- Residential
- Commercial, In-Town
- Commercial, Out-of-Town
- Commercial, Sprinkler (i.e., irrigation)

2.2 HISTORICAL WATER DEMANDS

Annual metered potable water use in Carbondale from 2005 to 2012 ranged from 857 AF/yr to 979 AF/yr (**Table 1**). However, there is additional raw water usage for irrigation purposes by a subset of the residential customers as well as in open space, park, school, and sports field areas. This raw water usage is not metered. In order to evaluate residential water usage in the Town, it was necessary to estimate the unmetered usage, as further described below.

The Town's Utilities Director estimates that 15% to 20% of residential connections likely utilize raw ditch water supplies for irrigation. Total monthly metered data and non-residential monthly metered data were available from August 2010 through July 2013. Monthly metered residential water usage was calculated as the difference between the total monthly metered use and the sum of the non-residential metered use (Table 1). Monthly indoor residential use was estimated on an annual basis as the average metered wintertime usage from December through February, and all additional usage from March through November was classified as outdoor use for the given year. The estimated metered outdoor residential use was then increased by 20% to approximate the unmetered outdoor usage that is supplied using raw ditch water (Table 1). The results of this analysis show that unmetered residential outdoor use represents only around 6% of total residential use and 4% of total system demands.

⁵ This assumes a constant growth rate of 2.5% per year.

Table 1. Population and Annual Water Deliveries (AF/yr) from 2005 to 2012.

Year	Metered (Treated)						Estimated Raw (Ditch) Residential	Total
	Population	Total Metered	Commercial, In-Town	Commercial, Out-of-Town	Commercial, Sprinkler	Residential		
2005	5,748	857	-	-	-	-		
2006	5,884	941	-	-	-	-		
2007	6,020	959	-	-	-	-		
2008	6,155	979	-	-	-	-		
2009	6,291	977	-	-	-	-		
2010	6,427	943	-	-	-	-		
2011	6,470	895	132	13	16	733	39	934
2012	6,514	914	146	12	19	738	45	959
Baseline for Demand Forecast	6,600	969	148	13	19	788	46	1,014

The population in Carbondale has increased each year; however, the metered water deliveries have generally declined since 2008 (**Figure 1**). These changes are typical of municipal demand trends across the United States, which have generally declined or held steady in recent years. Fluctuations in Carbondale’s water demand is normal for a municipality of this size and character, located in a region with variable weather conditions and irrigation requirements.

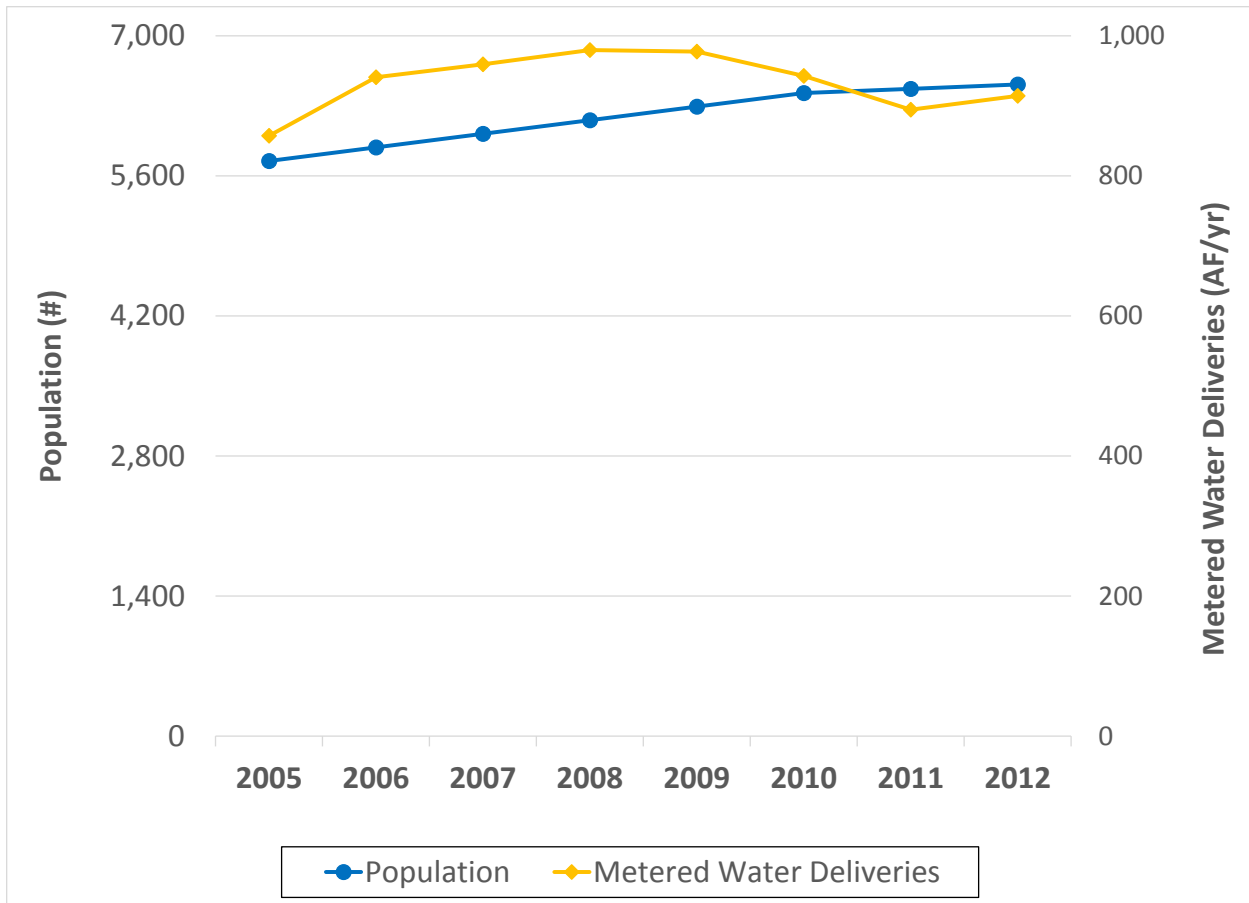


Figure 1. Changes in Population and Annual Metered Water Deliveries from 2005 through 2012.

The baseline population and demand shown in Table 1 were selected based on recent demands and the best available understanding of water use in Carbondale moving forward into the future. The baseline demands are an important element of the three demand forecasts developed in this plan. In some cases, baseline demands that exceeded the actual demands in 2012 were chosen because 2012 water use in those categories was less than in other recent years. In particular for the Residential customer category, a baseline metered (potable) demand of 788 AF was selected based on 2008 and 2009 demands. To assess the adequacy of water supplies in the future, it is essential to include a full level of potential future demands that are not biased by the normal fluctuations in demand observed in any individual year.

An estimated breakdown of indoor and outdoor historical demands in Carbondale based on the periodic consumption (metered delivery) data provided by the Town are shown in **Table 2**. Typically, about 70% of the annual water demand in Carbondale is for indoor purposes and 30% is for outdoor irrigation.

Table 2. Residential Indoor and Outdoor Water Deliveries from 8/2010 – 7/2013.

Year	Indoor (AF/yr)	Outdoor (AF/yr)	% Indoor	% Outdoor	Apr to Oct Temp (deg F)*
2010-11	534.3	204.2	72.3%	27.7%	58.7
2011-12	551.0	237.1	69.9%	30.1%	60.5
2012-13	510.3	190.3	72.8%	27.2%	60.0
Baseline	551.0	237.1	69.9%	30.1%	59.7

*Based on Glenwood Springs #2 Weather Station (No. 53359).

Carbondale’s consumption data were further disaggregated by water use sector as shown in **Table 3**. Indoor and outdoor demands for each category were estimated using a standard average winter consumption (AWC) approach where indoor use from the winter months (January, February, and December), when there is typically no outdoor irrigation occurring, is used to estimate indoor use for the entire year. Indoor use is then deducted from the total to estimate outdoor use.

Table 3. Metered Sectoral and Seasonal Water Deliveries from 8/2010 – 7/2013 (AF/yr).

Year	Residential		Commercial – In Town		Commercial – Out of Town		Irrigation Only		Total
	Indoor	Outdoor	Indoor	Outdoor	Indoor	Outdoor	Indoor	Outdoor	
2010-11	534.3	204.2	94.9	29.8	13.2	0.0	0.0	16	892
2011-12	551.0	237.1	101.8	46.2	13.4	0.0	0.0	18	968
2012-13	510.3	190.3	107.3	34.8	12.3	0.0	0.0	19	874
Baseline	551.0	237.1	101.8	46.2	13.4	0.0	0.0	19	969

As with most municipalities in Colorado, Carbondale’s demands are higher during summer months due to outdoor water use. **Figure 2** shows the average monthly demands over the past 3 years from August 2010 to July 2013 by water use sector. As expected due to outdoor water use, most water use sector demands increase during summer months from June through October, and the residential pattern correlates particularly well with temperature during summer months. The distribution of sectoral demands in Carbondale are also very consistent between years, as shown in **Figure 3**.

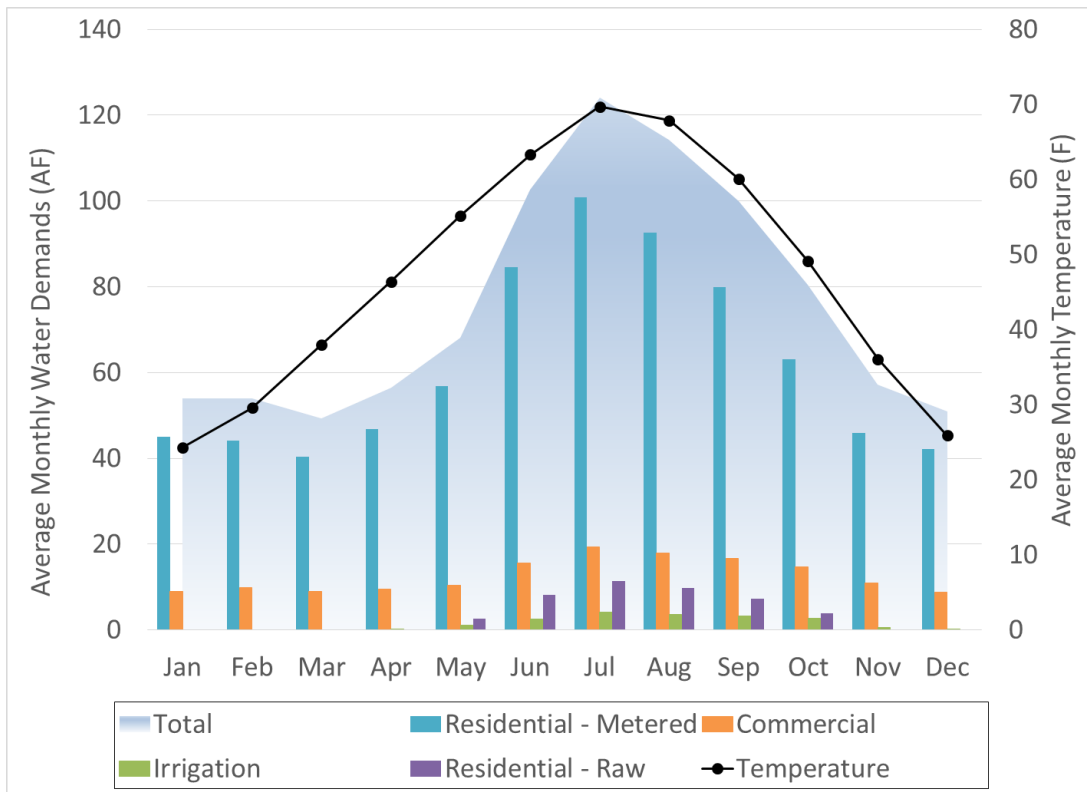


Figure 2. Average Monthly Demands by Water Use Sector from 8/2010 to 7/2013.

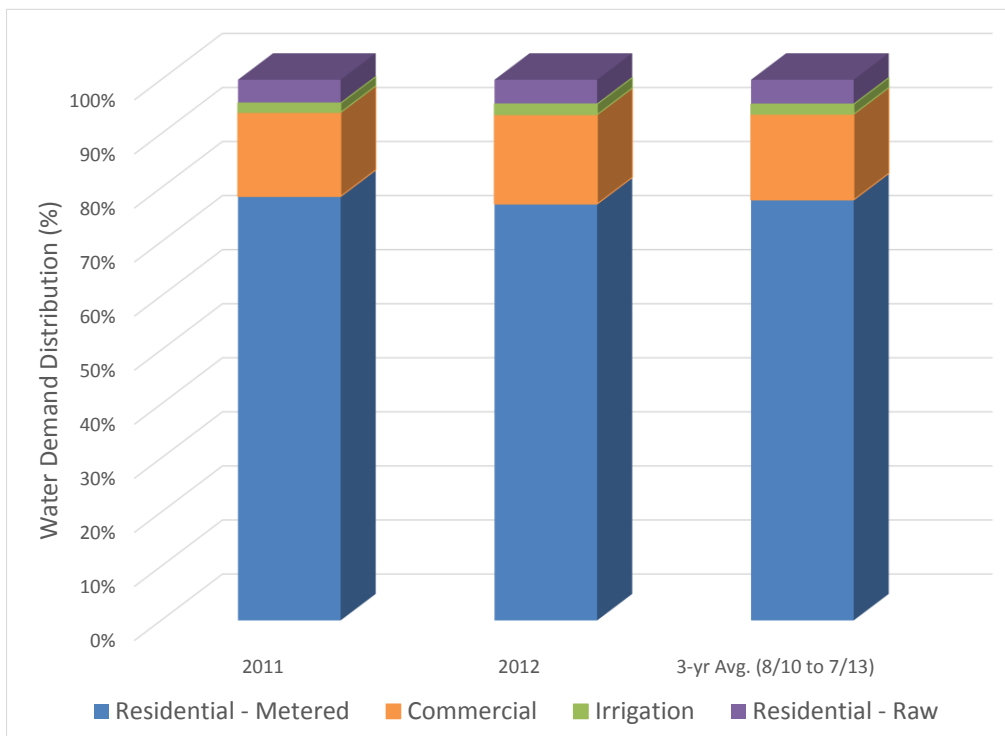


Figure 3. Distribution of Sectoral Demands from 8/2010 to 7/2013.

In 2012, residential demand (metered and estimated raw ditch usage) accounted for 81.5% of the total demand in Carbondale, commercial (in-Town and out-of-Town) accounted for 16.5%, and commercial sprinkler (i.e., irrigation) accounted for the remaining 1.9%. A pie chart showing the components of the 2012 water usage in Carbondale is presented in **Figure 4**.

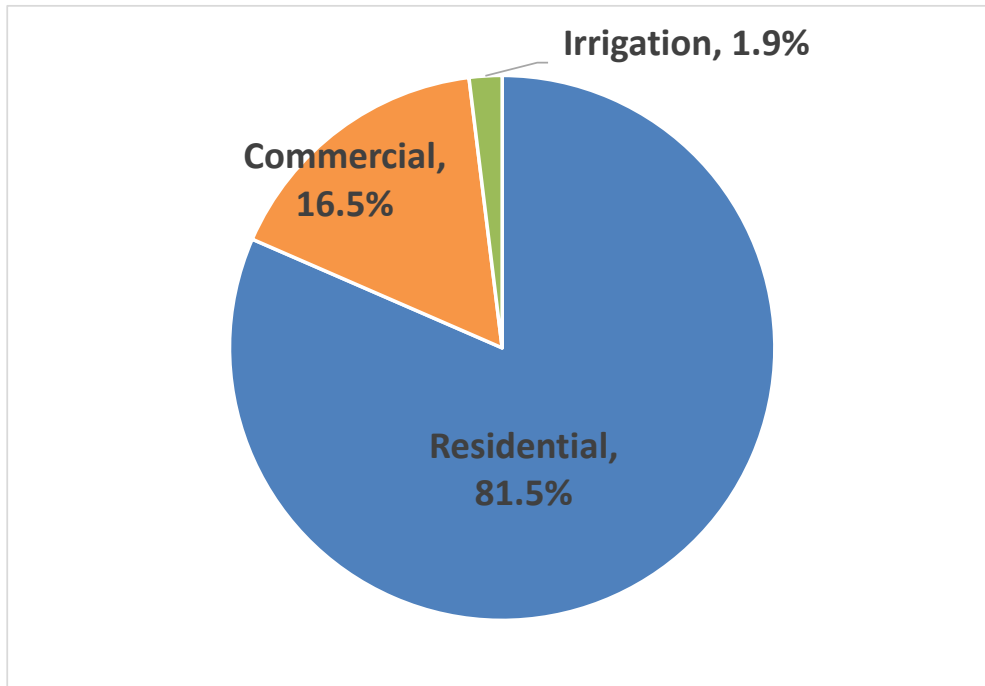


Figure 4. Distribution of Annual Water Use by Sector in 2012.

A pie chart showing the percentage of customer connections in 2013 by water use sector in Carbondale is provided in **Figure 5**. There are a total of approximately 3,000 service connections in Town. Residential customers are most prevalent in Carbondale, accounting for 2,726, or 90.9%, of all service connections. Commercial connections account for 8.5% of all connections and are broken down as follows: 253 in-Town (including 5 municipal), and 2 out-of-Town. Additionally, there are 19 dedicated commercial irrigation accounts that represent 0.6% of the connections.

Although residential customers make up approximately 90.9% of the customer connections, they comprise only 81.5% of the total annual demand. Commercial customers (8.5% of connections) account for 16.5% of the annual demand. Dedicated irrigation accounts make up 0.6% of the connections but account for 1.9% of the annual demand.

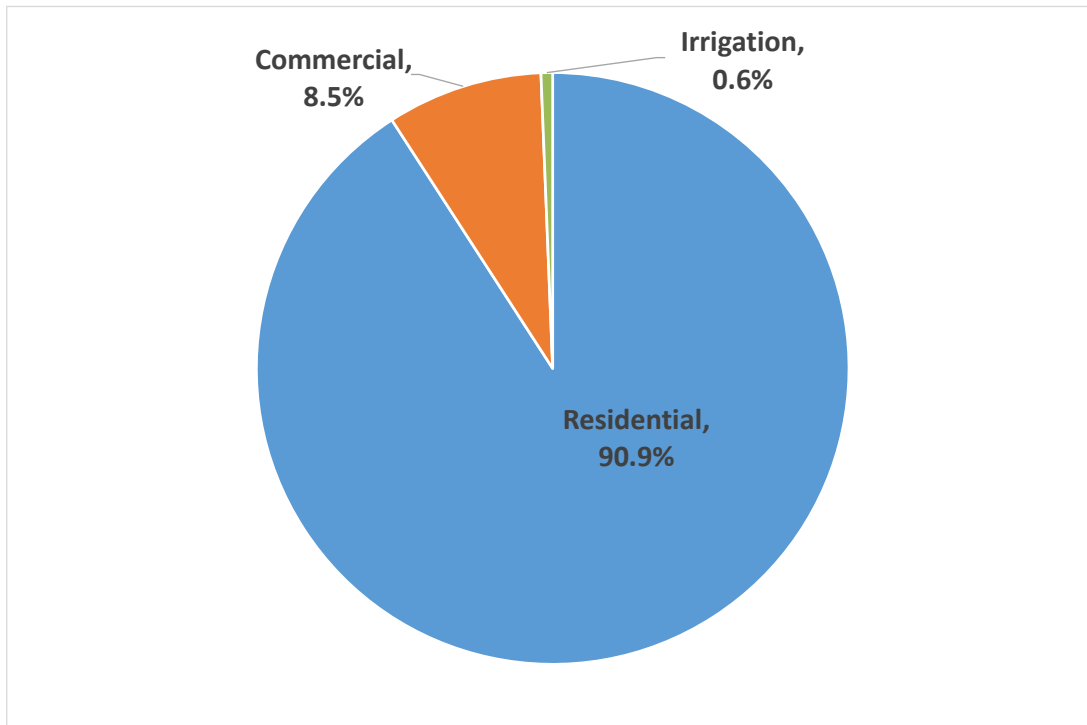


Figure 5. Distribution of Customer Connections in 2013.

2.3 SEASONAL AND PEAK DAY DEMANDS

The metered consumption data indicated that the average daily demand ranged from approximately 0.76 MGD to 0.86 MGD. The Town’s Utilities Director has indicated that the maximum daily demand is approximately 2.0 MGD. This indicates a peaking factor in the range of 2.3 to 2.6 is reasonable for Carbondale, and a value of 2.6 was selected for the demand forecasts to provide a conservative projection of peak demands. Carbondale has sufficient treatment capacity to meet foreseeable peak day demands. The Town currently has the ability to treat up to 4.0 MGD which provides sufficient treatment capacity for the next 20 years under the highest (and least likely) potential demand forecast.

2.4 SYSTEM WATER LOSSES

The Town periodically contracts with a professional leak detection firm that utilizes sophisticated listening equipment to locate leaks. The Town also evaluates losses on an ongoing basis by comparing monthly metered account summaries to the combined water treatment plant deliveries. A comparison of the volume of water produced from Nettle Creek, the Crystal Well, and the Roaring Fork wells versus the total metered consumption suggests that the Town’s losses exceed 20% (**Table 4**). However, the Town has recently addressed some known leakage issues and uses an “honor system” for the bulk water filling station at the Public Works facility. Given the recent improvements and the unmetered bulk use, Town staff estimate that a more realistic loss value is approximately 10%.

Table 4. Water Losses Based on Comparison of Production and Metered Data.

Year	Production (AF/yr)	Metered Consumption (AF/yr)	Loss (%)
2011	1,222	895	27%
2012	1,218	914	25%
2013	664	506	24%

2.5 PAST AND CURRENT DEMAND MANAGEMENT ACTIVITIES

The Town Water and Sewer Department currently employs around twelve people including the Utilities Director. Carbondale does not have a dedicated conservation staff member and its conservation program is implemented by the Town’s Utilities Director with assistance from other staff members. The Town promotes the efficient use of water, and even without a staff member dedicated to water conservation, has implemented some of the most essential water efficiency and conservation program measures.

While this is Carbondale’s first water efficiency plan, they have already implemented the following initiatives to reduce water use:

- Water loss reduction and infrastructure upgrade program;
- Tiered water rate structure;
- Residential Efficient Building Program; and
- Public outreach and education regarding outdoor water use, with more focused promotion during drought periods:
 - Landscape and irrigation recommendations published in newspaper and played on radio;
 - Recommended watering schedules;
 - Recommended landscaping maintenance practices to conserve water, such as mulching and mowing height; and
 - Promoting the use of rain shutoff devices with automatic irrigation systems.

2.6 DEMAND FORECAST

As part of the preparation of the Water Efficiency Plan, three separate demand forecasts were prepared:

1. Baseline Forecast (without conservation)
2. Passive Savings Forecast
3. Passive and Active Savings Forecast

The baseline forecasting method used historical demand patterns to establish baseline per capita demand, and then increased these demands with population out to 2050 as if the 2014 per capita water use patterns continue without change to 2050. This is a standard approach to

demand forecasting, but it does not take into consideration the expected impacts of water efficiency.

The second and third forecasts were developed using a more robust approach, where demands were separated out by water use sector or customer category (e.g. residential, commercial, irrigation, municipal, etc.), with seasonal and non-seasonal demands (outdoor and indoor) disaggregated for each category. Then a separate demand forecast out to 2050 was prepared for indoor and outdoor demand in each of Carbondale’s customer sectors. This allowed the impacts of specific water efficiency measures like high-efficiency toilets and clothes washers to be considered.

2.6.1 Population Planning Projections

For water demand forecasting, it is important to consider a reasonably high growth population forecast to ensure that sufficient water supply and infrastructure are in place when needed by the local citizens. The population forecast used in this conservation plan is intended to represent a reasonable “high growth” scenario for Carbondale in which the population grows at an annual 2.5% rate over the next 36 years.

The Town estimates that the population of the service area was approximately 6,600 residents in 2013, and anticipates that portion of the population to grow at a rate of approximately 2.5% per year. **Table 5** shows the population forecast from 2015 to 2050. These data are shown as a graph in **Figure 6**. Under this forecast, it is estimated that the population of the Town’s service area will increase to approximately 11,100 by 2035 and 16,100 by 2050.

Table 5. Population Growth Projections from 2015 through 2050.

Year	Population
2015	6,765
2016	6,934
2017	7,107
2018	7,285
2019	7,467
2020	7,654
2025	8,660
2030	9,798
2035	11,085
2040	12,542
2045	14,190
2050	16,055

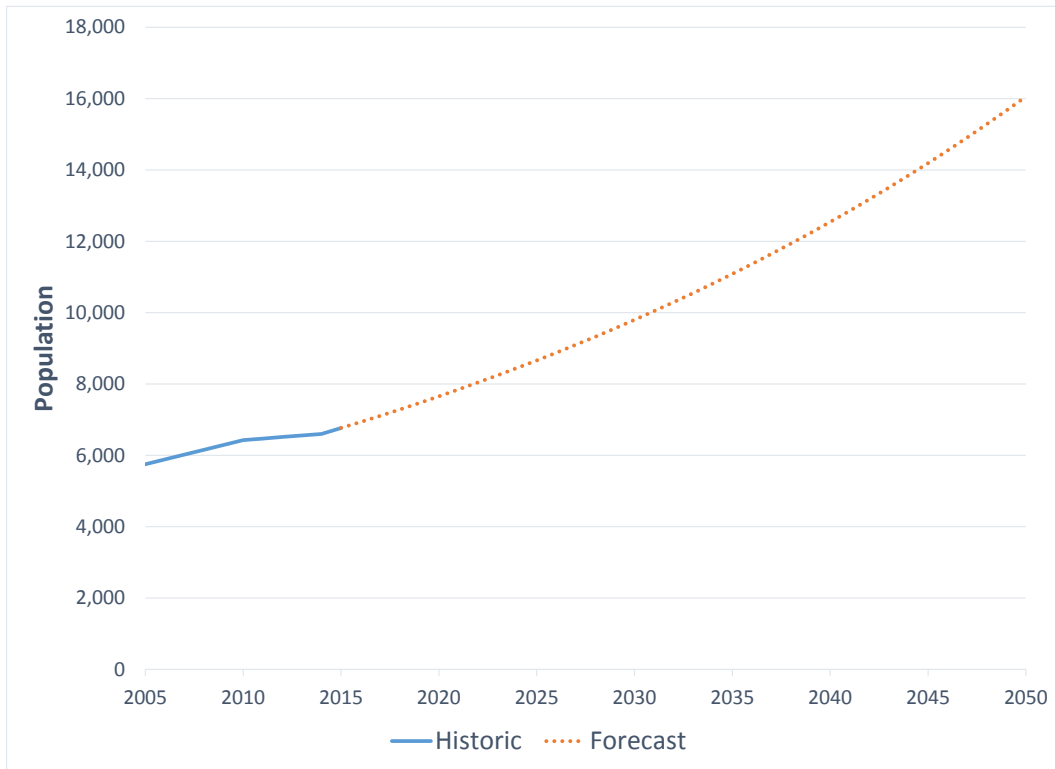


Figure 6. Actual and Forecast Population from 2000 through 2050.

Carbondale does not currently have a build-out population planning projection. In the forecasts shown here, a 2.5% annual growth rate is anticipated. The actual growth rate over the past few years has been closer to 0.7% per year. For water and conservation planning purposes, the projections used by the Town and presented here are responsible and appropriate for assessing water supply adequacy. Furthermore, since this plan is scheduled to be updated every seven years, there is ample opportunity to refine these forecasts to better match actual growth trends in Carbondale.

2.6.2 Demand Forecasts

As part of the water efficiency planning process, three distinct water demand forecasts were prepared. A description of each scenario and the forecasting methodology is presented below. The costs and benefits associated with these scenarios are considered in the next section of this plan document.

2.6.2.1 Forecast Methodology

First, a baseline demand forecast starting from 2015 and going out to 2050 was prepared. This baseline forecast did not include the impact of water conservation of any kind, even future passive water savings, and was developed only to assess the adequacy of future supplies under reasonable worst-case conditions, and to demonstrate the impact of anticipated efficiency improvements. The baseline forecast is based on a combination of anticipated demographic

and land use changes in Carbondale. In the baseline forecast, all demands (indoor and outdoor) increase proportionally with the population at the current rate of usage. A second water demand forecast to 2050 was developed that includes the impact of passive efficiencies from Colorado legislation, and federal plumbing codes and standards. A third forecast was prepared that includes the anticipated impact of the Town's planned water efficiency program measures described in this plan.

The second and third forecasts include the impacts of water efficiency and were developed using a more robust approach that considers anticipated changes in each customer sector in Carbondale. To develop these forecasts, demands were separated out by water use sector (e.g. residential, commercial, municipal, etc.), with seasonal and non-seasonal demands (outdoor and indoor) disaggregated for each category as shown in Table 3. Then a separate demand forecast out to 2050 was prepared for indoor and outdoor demand in each of Carbondale's customer sectors. This allowed the impacts of specific water efficiency measures like high-efficiency toilets and clothes washers to be considered.

These three forecasts form the core of the water efficiency plan and are the forecasts upon which estimated conservation savings are based. Each forecast shows demand starting in 2015 and going through the planning horizon of 2050 (36 years). The results are provided in **Figure 7** and further described in the sections below. Historical and forecasted raw water demands from the Town's ditch system are also shown in Figure 7. The raw water forecast escalates with population in the same proportion as the baseline forecast, but because it is relatively low to begin with, the increase over time appears less significant.

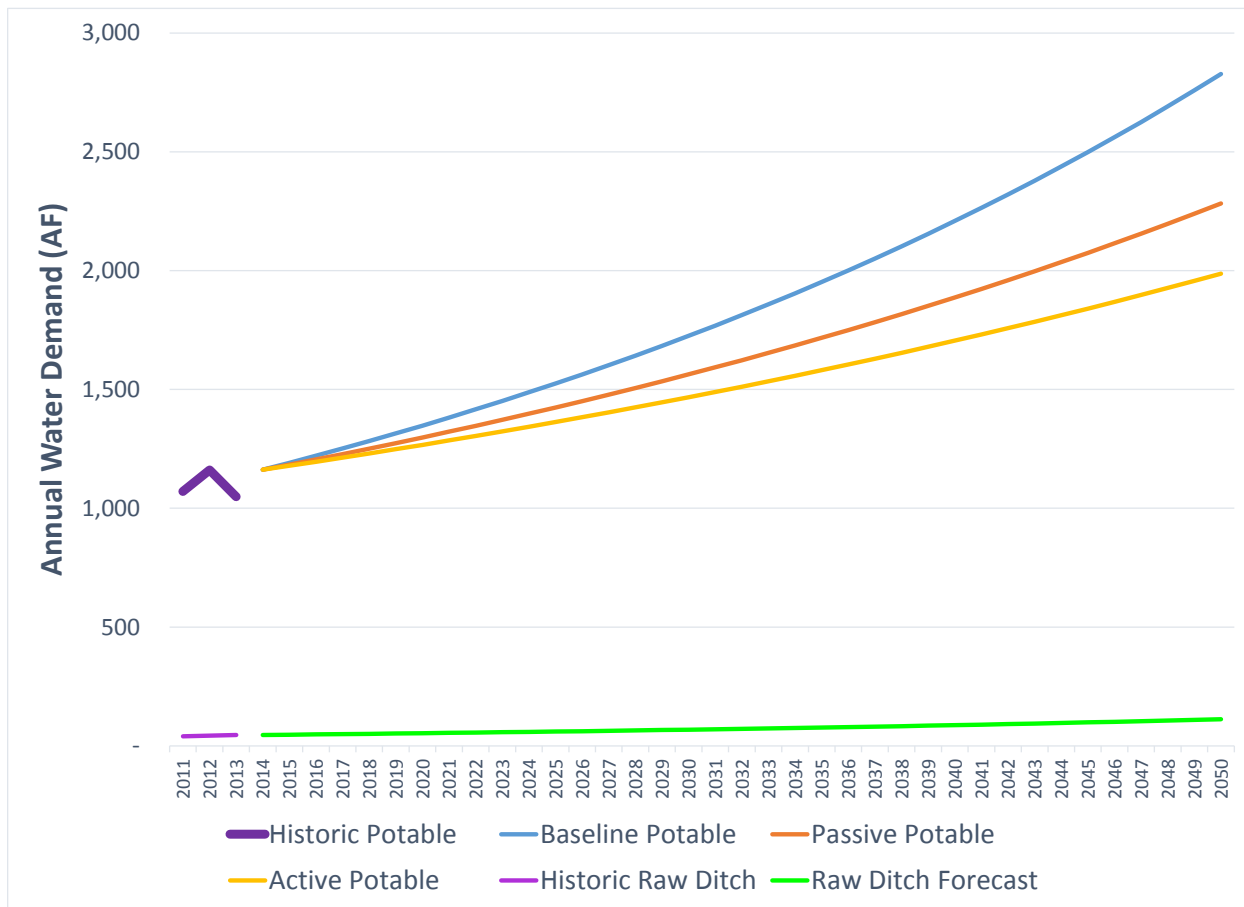


Figure 7. Baseline, Passive, and Active Demand Forecasts through 2050.

Baseline Forecast

The concept of the baseline forecast is to exclude conservation of any kind and to simply assume that typical baseline demand patterns (i.e. the water use patterns of 2010-2013) are continued into the future without change. It is also assumed that typical water demands for the Town will change proportionally with increases in population. This assumes new customers joining the system use water identically to the current customer base. The fundamental purposes of the baseline forecast are to assess the adequacy of future supplies under reasonable “worst case” conditions (i.e. no water efficiency gains), and to demonstrate the anticipated impact of water efficiency in Carbondale from both passive and active conservation programs. The baseline forecast is presented in Figure 7.

Key assumptions in the baseline forecast include:

- Baseline water use patterns for Carbondale (Table 1).
- Population forecast for Carbondale (Table 5).
- Water use in all sectors, both seasonal and non-seasonal, changes proportionally with the population.

- Outdoor water use impacts from temperature and precipitation in 2050 are similar to 2015.

Baseline water demand in 2014 (including raw water ditches) was 1,208 acre-feet (AF) and under the baseline forecast is expected to increase by 1,731 AF to 2,939 AF in 2050. This represents a 143% increase in water demand over the next 36 years.

Passive Conservation Forecast

A second water demand forecast to 2050 that includes the impact of anticipated passive efficiencies from Colorado legislation and federal plumbing codes and standards on a sector-by-sector basis for both indoor and outdoor use was prepared. Colorado Senate Bill 2014-103, which was passed in 2014 and phases out the sale of low-efficiency lavatory faucets, showerheads, flushing urinals, and tank-type toilets, is an example of local legislation that is accounted for in the forecast of passive conservation between 2015 and 2050. This forecast found that Town water demands (potable and raw water ditches) will increase to 2,395 AF in 2050. The passive forecast is presented in Figure 7.

Key assumptions in the passive conservation forecast include:

- Baseline water use patterns for Carbondale (Table 1).
- Population forecast for Carbondale (Table 5).
- Outdoor water use in all sectors increases proportionally with the population.
- Outdoor water use impacts from temperature and precipitation in 2050 are similar to 2015.
- 1% per year decrease in residential indoor per capita water use (from 74.5 gallons per capita per day (gpcd) in 2014 to 51.9 gpcd in 2050), continuing trends of the past 15 years⁶.
- 0.5% per year decrease in per capita commercial indoor use (both in- and out-of- town) from ongoing replacement of fixtures, appliances and equipment and new Colorado legislation (Senate Bill 14-103) assuring high-efficiency plumbing in new construction.

The passive conservation forecast hypothesizes a 98.2% increase in water demand over the next 36 years and suggests that more efficient fixtures and appliances could help reduce future demands in Carbondale by 545 AF compared with the baseline.

Active Conservation Forecast

A third forecast was prepared that includes the anticipated impact of the Town's planned water efficiency program measures described in this plan. Under this forecast, potable and raw water demand increases to just 2,099 AF in 2050. Compared with the baseline forecast, if the

⁶ Based on results from the Water Research Foundation *Residential End Uses of Water Update* (to be published in 2015).

elements of this plan are fully realized, then it is estimated that water demand at 2050 will be reduced by 840 AF as a result of passive and active water conservation measures in Carbondale. The active conservation forecast is presented in Figure 7.

Key assumptions in the active conservation forecast include:

- Baseline water use patterns for Carbondale (Table 1).
- Population forecast for Carbondale (Table 5).
- Outdoor water use in all sectors increases proportionally with the population, but is reduced by 0.5% per year due to a combination of factors including: Carbondale's conservation-oriented rate structure which charges higher rates for outdoor use, densification as the Town grows, anticipated smaller lot sizes in future developments, irrigation efficiency improvements, ongoing landscape transformation from traditional turf to water wise plants, and the Town's ongoing education and information efforts.
- Outdoor water use impacts from temperature and precipitation in 2050 are similar to 2015.
- Water loss remains constant at approximately 200 AF per year over the next 36 years. As demand increases in Carbondale, water loss does not increase proportionally. This will require some diligence for Carbondale starting with implementation of the AWWA M36 water loss control audit.
- 1.0% per year decrease in residential indoor per capita water use (from 74.5 gpcd in 2014 to 51.9 gpcd in 2050), to reflect recent changes to Colorado law under (Senate Bill 14-103), that phases in the sale of only high-efficiency WaterSense labeled fixtures starting in 2016.
- 0.5% per year decrease in per capita commercial indoor use from ongoing replacement of fixtures, appliances and equipment and new Colorado legislation assuring high-efficiency plumbing in new construction.

The active conservation forecast hypothesizes a 73.8% increase in water demand over the next 36 years and suggests that more efficient fixtures and appliances could help reduce future demands in Carbondale by 840 AF compared with the baseline.

2.6.2.2 Limited Financial Benefits of Conservation

Carbondale has an ample raw water supply to meet current demands, and has the water rights available to address projected future demands over the next 36 years. Carbondale has a total water treatment capacity of 4.0 MGD, with the current production ranging from approximately 2.5 to 3.0 MGD depending on the season. Under the baseline forecast, this peak will be exceeded by 2035. Under the active conservation forecast, Carbondale's peak capacity will not be exceeded until 2046, providing the Town an additional 11 years to expand capacity if necessary. There are no infrastructure projects that could be delayed or eliminated if the Town were to adopt a more aggressive water conservation program. Because of the Town's fortunate position regarding its water supply and delivery system, the financial benefits of

increased water efficiency in Carbondale are essentially non-existent. Some small cost savings might be achieved through reduced chemical costs associated with water treatment, but these would most certainly be offset by the decrease in revenue associated with demand reductions. In Carbondale, there is not a significant financial benefit (from the Town's perspective) to increased water use efficiency at this time.

2.6.2.3 Climate Change Impact on Water Use

Recent climate change forecasts indicate a warming trend in irrigation season temperatures in the Roaring Fork region. For example, one report indicates temperatures for the 2035 to 2064 time period are forecast to increase by an average of approximately *4 degrees F* as compared to 1971 to 2000 (CIRES, 2014). More frequent and severe heat waves, droughts, and wildfires are projected. While this may increase the uncertainty in outdoor water demand projections, the net effect depends on numerous factors such as the amount and type of landscaping material, irrigation management practices, etc. Furthermore, some of the impacts on water demands are already included in the forecasts provided in this plan, because recent water demand data are utilized to project future water demand patterns. It is important to consider both demand-side, as well as supply-side impacts of future climate change on overall water supply conditions. The forecast methodology provided in this plan, along with regular updates to the demand projections, will assist in this process.

2.6.3 Estimated Cost of New Supply Options

Given that Carbondale's water supply is ample to meet anticipated future demands, and since the Town has no pending water supply infrastructure projects beyond normal maintenance, there are no calculable avoided costs for new supply associated with demand reduction. Consequently, it is not possible to calculate a benefit/cost ratio for any of the conservation activities developed in this plan. For this plan, all required elements were considered, but ultimately the current conservation program, with some additions, was selected as the best option for Carbondale.

In spite of the lack of a real financial incentive for water efficiency, the Town of Carbondale remains committed to its current conservation efforts, which include many of the most important and effective measures such as metering and conservation pricing.

3. SELECTION OF WATER EFFICIENCY ACTIVITIES

Carbondale considered a variety of water efficiency programs and measures before selecting the final components for inclusion in this plan. Efficiency measures were screened using a variety of criteria including:

- Feasibility and practicality,
- Water savings and estimated cost per AF, and
- Watershed benefits.

The Town utilized the Colorado Water Conservation Board's *Municipal Water Efficiency Plan Guidance Document* (CWCB, 2012) to inform and guide the development of this conservation plan.

3.1 SUMMARY OF THE SELECTION PROCESS

The Town implemented a tiered screening and selection process for evaluating potential water efficiency activities. Existing activities were included in the list of measures and unless duplicative, existing activities are expected to continue as part of the ongoing water efficiency program.

Cost was a key factor for Carbondale when considering what efficiency program measures to implement. As noted above, the financial benefits of increased water efficiency in the Town are essentially non-existent. A traditional cost-benefit analysis could not be performed because no financial benefit could be quantified. Conservation program measures were selected with the knowledge and understanding that the Town does not have a designated water conservation budget or dedicated program staff. At the same time, the Town has developed an effective demand management program over time by including core foundational elements like rates and ordinances that are part of the Town's regular management activities.

Initial Screening. An initial screening was conducted by the consultant team, using the CWCB screening and evaluation worksheets (CWCB, 2012) and the *Guidebook of Best Practices Guidebook for Municipal Water Conservation in Colorado* (CWW, 2010) as the key technical resources, along with professional experience. Activities that made it through the initial screening were assembled and passed along to Town staff for screening.

Final Screening. The final level of screening and selection of water efficiency activities was made by the Town's Utilities Director. During the final screening, care was taken to select a suite of activities capable of achieving the level of water savings needed by Carbondale to achieve the stated water efficiency goals.

3.2 WATER EFFICIENCY ACTIVITIES

Table 6 presents the new and ongoing water efficiency activities selected for inclusion in this plan. Each measure is described in more detail in the sections below.

Table 6. New and Updated Water Efficiency Activities and Water Savings Estimates.

Water Efficiency Activities	Sectors Impacted	Ongoing Activity?	Implementation Period of New Activities	Projected Water Savings 2015 - 2050 (AF/yr)
FOUNDATIONAL ACTIVITIES				
Automatic/Remote Meter Reading Installation and Operation	All	YES	2015-18	50
Enhanced Water Loss Control	All	YES	annual	264
Conservation-Oriented Rates	All	YES	ongoing	100
TARGETED TECHNICAL ASSISTANCE AND INCENTIVES, AND NATURAL REPLACEMENT OF FIXTURES AND APPLIANCES				
Fixtures, Appliances, (natural replacement and Incentives)	All, indoor	YES	ongoing/as needed	143
Outdoor Water Efficiency	All, outdoor	YES	ongoing	50
Commercial, Institutional, and Industrial Water Efficiency	CII	YES	2015-2020	25
ORDINANCES AND REGULATIONS				
Regulatory Measures	All	YES		75
Raw Water Use in Place of Potable	Irrigation	YES	ongoing	33
Waste of Water Ordinance and Future Update	All	YES	ongoing	10
Update landscape development regulations for new construction to place emphasis on water efficiency in residential development	SF & MF residential	YES	ongoing	50
EDUCATIONAL ACTIVITIES				
Public Information and Education	All	YES	ongoing/as needed	30
K-12 Education	All	YES	ongoing/as needed	10
TOTAL SAVINGS THROUGH 2050 (AF/yr)				840

3.2.1 Foundational Activities

3.2.1.1 Metering

A good metering program is fundamental to the success of water conservation efforts. Colorado statute requires all water providers to meter the water use of their customers and to bill based on metered consumption. In Carbondale, 100% of the potable connections (including all municipal facilities) are metered. Staff read meters on a monthly basis (mid-month) and the Town is in the process of expanding meter reading capabilities from hand-held to remote radio readers.

3.2.1.2 *Enhanced Water Loss Control*

Leak detection and water loss control are also fundamental water efficiency practices for all water utilities. As discussed above in Section 2.4, system leakage in Carbondale is currently estimated to be greater than 20%, which exceeds the 10% threshold that is often estimated as the national average. However, the Town has recently addressed some known leakage issues and uses an “honor system” for the bulk water filling station at the Public Works facility. Given the recent improvements and the unmetered bulk use, Town staff estimate that a more realistic loss value is approximately 10%.

The Town budgets for ongoing system leak detection, approximate every 3 years, focusing on older segments of the pipe network and areas of vulnerability to leaks. Conducting an annual system water audit, using the AWWA Water Audits and Loss Control Programs software, will further assist the Town in interpreting available data and managing its water by categorizing all water uses and identifying real losses that directly impact revenue, as shown in **Table 7** below.

Table 7. AWWA Water Audits and Loss Control Programs.

Billed Authorized Consumption	Billed Water Exported	Revenue Water
	Billed Metered Consumption (including water exported)	
	Billed Unmetered Consumption	
Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-Revenue Water
	Unbilled Unmetered Consumption	
Real Losses	Unauthorized Consumption	
	Systematic Data Handling Errors	
	Leakage and Overflows at Utility's Storage Tanks	
	Leakage on Service Connections	

As described in Section 3.2.2 below, Carbondale is also considering implementing a number of technological improvements to the distribution system for both raw and treated water that could enhance understanding of water loss and assist in reducing real and apparent losses.

3.2.1.3 *Conservation-Oriented Water Rate Structure and Billing System*

Carbondale fully meters all potable water use and currently bills its customers on a monthly basis. The Town’s computerized billing system includes a residential category, but does not distinguish between single-family and multi-family residential customers. Similarly, it does not distinguish between sub-categories of commercial and institutional end users. These additional billing categories, while not essential, would be useful in identifying above-normal water uses,

forecasting changes in demand, and in targeting specific conservation programs. Such an effort could be most efficiently undertaken when upgrading the Town’s computerized billing system and the Town plans to revisit the idea of expanding customer categorization at that time.

The Town uses a four-tier inclining block rate structure for residential water customers as shown in **Table 8**. In this rate structure, tier 2 represents a 38% increase over tier 1, tier 3 is a 27% increase over tier 2, and tier 4 represents a 21% increase over tier 3. The fixed monthly base charge and the variable usage charges for all tiers are approximately 50% higher for out-of-Town customers (Table 8). The 6,000 gallon/month allotment for tier 1 represents a reasonable, if slightly generous, amount of indoor water use for residential sector (the largest customer class in the Town). This sets up tiers 2, 3, 4 as the charges for outdoor use, primarily. Tier 2 is from 6,001 – 15,000 gallons per month and it is anticipated that most normal residential outdoor use will be billed in this tier.

Carbondale’s rate structure meets the definition of a “conservation-oriented rate structure” from both the *Colorado Best Practices Guide for Municipal Water Conservation* and the *AWWA/ANSI G480 Water Conservation Program and Management Standard*. Carbondale can easily increase the conservation impact of this rate structure at any time by raising the rates, particularly in tiers 3 and 4. Carbondale is also considering the use of landscape water budgets as an informational tool to assist irrigators. While it was determined that tying the current water rate structure to customer-specific water budget is not practical at this time, Carbondale understands the utility of landscape water budgets and may consider using them as part of future rate structure updates.

Table 8. Treated Residential Water Rates and Rate Structure Effective January 1, 2014.

Rate Tier	Water Rate Per 1,000 gallons (In Town)	Water Rate Per 1,000 gallons (Outside Town)
Tier 1 – up to 6,000 gallons/month	\$1.59	\$2.40
Tier 2 – from 6,001 – 15,000 gallons/month	\$2.20	\$3.32
Tier 3 – from 15,001 to 40,000 gallons/month	\$2.79	\$4.18
Tier 4 – over 40,000 gallons/month	\$3.37	\$5.04
Fixed monthly base charge	\$17.35	\$26.00

The standard schedule of rates and charges for commercial water customers in Carbondale is shown in **Table 9**. Unlike residential customers, commercial customers are not billed according to an inclining block rate structure. The fixed monthly base charge is 50% higher for out-of-Town commercial customers; however, its usage rate is only 39% higher as compared to in-Town customers. To strengthen the conservation signal of the commercial rate structure, Carbondale may consider some form of an inclining block rate or water budget rate for commercial customers.

Table 9. Treated Commercial Water Rates and Rate Structure Effective January 1, 2014.

Rate Tier	Water Rate Per 1,000 gallons (In Town)	Water Rate Per 1,000 gallons (Outside Town)
NA	\$2.58	\$3.58
Fixed monthly base charge	\$17.35	\$26.00

The schedule of rates for bulk water customers is shown in **Table 10**. Both potable and non-potable (raw) water is available for bulk purchase. The rate for potable water is approximately five times higher than for non-potable water; however, the fixed monthly base charge is the same for both supply categories.

Table 10. Bulk Water Rates.

Rate Tier	Potable Water	Non-Potable Water
Water Rate per 1,000 gallons/month	\$12.76	\$2.57
Fixed monthly base charge	\$30.97	\$30.97

The Town does not currently charge for use of raw water from the ditch system, but acknowledges that there are real costs associated with maintaining and improving the ditches. For example, the Town is interested in lining some ditches to reduce water loss, but funding for this effort is needed. In the future, the Town may consider a fixed service fee for raw water access based on customer category, similar to the way it currently charges for storm water. Establishing a raw water usage fee could be beneficial in helping customers recognize the value of the raw water system, thus improving efficiency while providing operational capital for necessary upgrades and maintenance. The Town will consider options for billing for raw water service in future rate structure updates.

3.2.2 Targeted Technical Assistance and Incentives

3.2.2.1 Fixtures, Appliances, and Incentives

As demands increase, Carbondale will continue to face the combination of water supply limitations that occur during periods of peak demand. This means that for Carbondale, there is a substantial value in reducing its non-seasonal, or indoor, water uses. The gradual replacement of inefficient fixtures and appliances and other water using devices is an excellent way to accomplish this objective.

In 2007, the Town adopted the Residential Efficient Building Program (REBP) to encourage cost-effective and sustainable building methods. The REBP was subsequently updated in 2011 and incorporated in Chapter 15.30 of the Carbondale Municipal Code. The REBP applies to all new construction (single-family, duplex, townhouse, and accessory dwelling units), and the REBP Checklist is used as part of building code enforcement. The REBP requires new construction to

achieve a minimum number of “innovation points,” determined based on dwelling size, which can be obtained through the use of various sustainable measures. Innovation points are available for implemented water conservation standards related to high-efficiency fixtures and appliances, hot water recirculation systems, landscape mulching, turf area limitations, irrigation systems including drip irrigation and rain sensors, and resident education regarding outdoor water use.

3.2.2.2 Outdoor Water Efficiency

Carbondale experiences high summer peak water demands due in part to the tourism industry, but largely due to irrigation demands from customers. While not a long-term water conservation measure, in the event of a climatological drought that affects the Town’s supply, Carbondale is prepared to implement outdoor watering restrictions to reduce demands pursuant to the “water shortage” and “water crisis” designations as outlined in Chapter 13.28 of the Town Code.

The Town has taken a number of steps to help reduce irrigation demands, including the REBP program described above and other customer education initiatives. Outdoor water efficiency education measures include the recommendations developed by the Town’s Board of Trustees, Utilities Department, and Environmental Board that are posted in the newspaper and on the radio as well as an informational water conservation pamphlet that was developed in cooperation with the Community Office for Resource Efficiency (CORE).

Carbondale’s staff work to extend available water supplies by using raw ditch water to irrigate parks and other municipal facilities whenever possible. All Town parks, medians, and other irrigated areas that use potable supplies are metered and billed based on their actual consumption. In the future, Carbondale hopes to expand ditch laterals to increase customers/access and ability to irrigate with raw water. This could result in significant reductions in the use of treated potable water for irrigation and could result in substantial cost savings to Carbondale and its rate-paying customers by reducing or eliminating the need to expand water treatment capacity.

Carbondale is investigating a number of technological improvements to the raw water distribution system that could assist in optimizing operations. The river headgates are the only locations currently measured on a routine basis; however the Town is aware that a significant amount of tail water can result from current operations used to maintain pressure head throughout the ditch system. Better data and more operational control could reduce the amount of flow necessary to push water through the ditch system. Some of the improvements Carbondale is considering include:

- Mapping delineation (GIS) and analysis of irrigated area and raw water demands,
- Metering of tail water in Carbondale ditches to provide improved measurements of customer usage, and

- Telemetry and additional metering to monitor the raw water ditch system.

The estimated cost for these improvements is on the order of \$300,000. The Town is considering options to pilot these concepts, starting with a single ditch system as a demonstration of potential raw water management improvements. Other options to reduce conveyance losses, such as ditch lining, are also being considered.

3.2.2.3 Commercial, Institutional, and Industrial Water Efficiency

Without a formal water conservation program and accompanying staff, Carbondale seeks to encourage commercial, institutional, and industrial (CII) water efficiency through education and pricing mechanisms. Pricing water services appropriately has been shown to be an effective method for reducing water demands (Mayer et. al., 2008), (Mayer et. al., 2004), (Howe, 1982). In Carbondale, CII customers are currently billed for all water usage at the same rate tier. Billing this customer class on an inclining block rate structure, similar to the approach used for billing the residential customer class, would provide a price signal to commercial, institutional, and industrial users. The Town may consider this modification in the future.

3.2.3 Ordinances and Regulations

3.2.3.1 Regulatory Measures

The Town regularly reviews local codes and regulations for opportunities to specify water conservation requirements. A summary of relevant codes and ordinances is provided in Appendix A. The Town has enacted a couple of conservation-oriented regulatory measures including waste of water and water use restrictions as outlined in Chapter 13.28 of the Town Code. The waste of water regulation requires that all water outlets be closed when not in use. The Town Manager has the authority to require water conservation measures when it is determined that a “water shortage” exists. Water shortage restrictions include no watering of impervious areas, no filling of pools and hot tubs, no car washing unless from a bucket, and the implementation of a public awareness program. A “water crisis” may be declared by the Town’s Board of Trustees, and allows for the following more stringent water use reduction measures: requiring the use of hand-held containers for landscape watering, requiring restaurants to serve patrons with disposable materials and utensils, and no filling or refilling of swimming pools. The Town Code also provides mechanisms for the discontinuance of service for premises where water is being wasted.

As previously discussed, Carbondale has adopted the REBP for new construction, which includes a strong emphasis on water efficiency. The intent of the REBP is to promote sustainability measures while providing functional, yet efficient landscapes. Landscaping improves air quality, complements the appearance of buildings, buffers potentially incompatible neighboring land uses, mitigates the environmental and visual impacts of surface parking areas, and conserves residential and commercial property values.

The Town has adopted the 2012 International Green Construction Code (IGCC) and the 2009 International Plumbing Code (IPC) as a requirement for new construction, which include a number of standard efficiency measures. All new construction requires backflow prevention and a pressure reducing valve (PRV).

3.2.3.2 Raw Water, Water Reuse, and Recycling

As previously discussed, the Town has an extensive raw water delivery system that is used to meet a significant component of the Town's irrigation demand. The Town actively seeks ways to expand use of raw water and making it available to more residents.

The Town does not currently have a water reuse or recycling system. While water reuse and recycling may be further considered in the future, it is currently not financially viable and would impede the ability to focus on the raw water system, which is currently a high priority for Carbondale.

3.2.4 Public Education and Information

A key component of Carbondale's water conservation efforts is public education and information. Outdoor water efficiency education measures include the recommendations developed by the Town's Board of Trustees, Utilities Department, and Environmental Board that are posted in the newspaper and on the radio as well as the informational water conservation pamphlet that was developed in cooperation with the Community Office for Resource Efficiency (CORE). Education efforts focus on both indoor and outdoor water demands.

4. IMPLEMENTATION AND MONITORING PLAN

The Town does not have a dedicated conservation staff member or a formal, stand-alone water conservation program. However, the Town is committed to water use efficiency, and even without a formal program has implemented some of the most essential water conservation program measures. The elements of this program are described in detail in this plan document.

4.1 MONITORING AND EVALUATION

Carbondale plans to review and update this water conservation plan at least every seven years, or as needed. The Town monitors water use on a regular basis and will maintain consumption records. Progress towards meeting the conservation goal can be evaluated when the conservation plan is next updated and into the future using empirical data. This tracking analysis will help determine what (if any) additional conservation program measures are necessary to help Carbondale meet its stated goal by 2050. As the plan is updated, new forecasts will be developed and the adequacy of the Town's water supplies will be compared

against forecasted future demand. If necessary, the Town will adopt additional demand management measures.

The Town produces monthly and annual demand reports for each customer sector and the system as a whole and keeps close track of demand. Unexpected or abnormal water usage by a customer or sector is quickly identified and investigated.

4.2 REVENUE STABILITY

The Town's water rate structure includes a significant fixed charge component and tier sizes designed to promote efficiency and revenue stability. Carbondale does anticipate a growth in water demand over time as the Town's population grows. Water efficiency as practiced by Carbondale helps ensure water rates remain as low as practical for customers, because efficiency is being achieved at a lower cost than procuring new supplies or constructing new infrastructure.

5. PUBLIC REVIEW, ADOPTION, AND APPROVAL OF WATER EFFICIENCY PLAN

5.1 PUBLIC REVIEW

The public review process is described in Appendix B. A total of one set of comments were received during the 60 day comment period. To the extent possible, comments were addressed in this updated plan.

5.2 WATER EFFICIENCY PLAN ADOPTION

The Town of Carbondale Board of Trustees reviewed the draft Water Efficiency Plan after it was updated in response to public comments. On March 31, 2015, the Board adopted the plan with the updates included in this final version. A copy of the Board meeting minutes and adoption is included in Appendix C.

5.3 WATER EFFICIENCY PLAN APPROVAL

The draft plan was submitted to the CWCB Office of Water Conservation and Drought Planning on January 27, 2015 during the public review period. CWCB comments were addressed in this updated final version. On June 25, 2015, the Town received official notification that the plan was approved by the CWCB.

6. COMPLIANCE WITH STATE PLANNING REQUIREMENTS

Colorado Revised Statute § 37-60-126 requires a covered entity to develop, adopt, make publicly available, and implement a water conservation (efficiency) plan that will encourage its domestic, commercial, industrial, and public facility customers to use water more efficiently.

According to the statute, a “covered entity” means a municipality, agency, utility, or other publicly owned entity with a legal obligation to supply, distribute, or otherwise provide water at retail to domestic, commercial, industrial, or public facility customers, and that has a total annual demand for such customers of two thousand acre-feet or more. Even though the water demand forecasting provided under this plan shows that the Town will not reach the covered entity threshold until at least 2046, the Town is committed to implementing a water efficiency plan that meets the statutory plan requirements.

Key elements that must be fully evaluated in development of the plan are listed as follows:

- A. Water-saving measures and programs including:
 - I. water-efficient fixtures and appliances;
 - II. low water use landscapes, drought-resistant vegetation, removal of phreatophytes, and efficient irrigation;
 - III. water-efficient industrial and commercial water-using processes;
 - IV. water reuse systems;
 - V. distribution system leak identification and repair;
 - VI. information and education;
 - VII. conservation-oriented rate structures and billing systems;
 - VIII. regulatory measures designed to encourage water conservation;
 - IX. incentives to implement water conservation techniques including rebates.
- B. Role of conservation in the entity’s supply planning.
- C. Plan implementation, monitoring, review, and revision.
- D. Future review of plan within seven years.
- E. Estimated savings from previous conservation efforts as well as estimates from implementation of current plan and new plan.
- F. A 60-day minimum public comment period (or other time period based on local ordinance).

The following section of the plan details Carbondale’s compliance with this statute.

6.1 CARBONDALE WATER EFFICIENCY PLAN COMPLIANCE

The Town developed this conservation plan in order to comply with C.R.S. § 37-60-126 even though it falls below the threshold that would obligate it to comply with this statute. Each element of compliance is documented below.

A. Consideration of specific conservation measures.

(I) Fixture and appliances – The Town actively promotes the installation of water efficient fixtures and appliances through its conservation education efforts, through its adoption of the International Plumbing Code, and starting in 2016 from the State of

Colorado's new WaterSense fixture legislation. The Town has carefully considered and evaluated the costs and benefits associated with giveaways, rebates, and incentives to encourage more rapid adoption of efficient technology, but no additional expenditures are economically justified at this time because of the ample raw water supply available and the resulting benefit-cost relationship.

(II) Low water use landscaping – The Town actively promotes water wise landscaping practices through its regular conservation education efforts and conservation-oriented rate structure, and demonstration of Xeriscape principals in public spaces and trail systems throughout the Town. The Town encourages the installation of water wise landscapes through landscape development ordinances. A significant number of properties in Carbondale are irrigated using raw water and the Town continues to seek new opportunities for raw water irrigation. The Town has carefully considered and evaluated the costs and benefits associated with rebates and incentives to encourage more efficient irrigation and water wise landscaping, but no additional program expenditures are economically justified at this time because of the ample raw water supply available and the resulting benefit-cost relationship.

(III) Commercial, Industrial and Institutional (CII) measures – The Town actively promotes CII water conservation through its regular conservation education efforts and conservation-oriented rate structure. The hospitality industry – the biggest CII water users in Carbondale – has voluntarily adopted a variety of water efficiency measures and practices. The Town has carefully considered and evaluated the costs and benefits associated with rebates and incentives to encourage CII retrofits and efficiency, but no additional program expenditures are economically justified at this time because of the ample raw water supply available and the resulting benefit-cost relationship.

(IV) Water reuse systems – The Town does not currently have a water reuse or recycling system. While water reuse and recycling may be further considered in the future, it is currently not financially viable and would impede the ability to focus on the raw water system, which is currently a high priority for Carbondale.

(V) Water loss and system leakage reduction – The current program includes an active utility water loss and leak detection program that includes contracting with a leak detection firm every three years. The Town plans to start implementing an annual AWWA M36 water loss control audit in the future. The Town strives to replace aging water mains and reduce water loss wherever possible and will continue to do so.

(VI) Information and public education – A key component of Carbondale's water conservation efforts is public education and information. Outdoor water efficiency education measures include the recommendations developed by the Town's Board of Trustees, Utilities Department, and Environmental Board that are posted in the newspaper and on the radio as well as the informational water conservation pamphlet

that was developed in cooperation with the Community Office for Resource Efficiency (CORE). Education efforts focus on both indoor and outdoor water demands.

(VII) Water rate structure – Carbondale currently bills its customers on a monthly basis using a four-tier inclining block rate structure.

(VIII) Regulatory measures – Carbondale has regulatory measures in place that encourage the use of raw water and mandate the inclusion of a pressure-reducing valve (PRV) and a backflow preventer. The Town has enacted a couple of conservation-oriented regulatory measures including waste of water and water use restrictions as outlined in Chapter 13.28 of the Town Code. Carbondale has adopted the Residential Efficient Building Program (REBP) for new construction, which includes a strong emphasis on water efficiency. The Town has adopted the 2012 International Green Construction Code (IGCC) and the 2009 International Plumbing Code (IPC) as a requirement for new construction, which include a number of standard efficiency measures. The Town regularly reviews local codes and regulations for opportunities to specify water conservation requirements.

(IX) Incentives – Carbondale promotes the replacement of old and inefficient toilets, showerheads, faucets, and clothes washers through its regular education efforts.

- B. Role of conservation in Carbondale’s supply planning.** This water conservation plan represents Carbondale’s most comprehensive effort to-date to integrate water conservation into water supply planning. Through this plan, the Town has clearly established that its raw water supply is sufficient to meet future growth under all current planning scenarios.
- C. Plan implementation, monitoring, review, and revision.** The Town monitors water use on a regular basis and will continue to do so. The Town produces monthly and annual demand reports for each customer sector and the system as a whole, and keeps close track of demand.
- D. Future review of plan within seven years.** Carbondale plans to review and update this water conservation plan every seven years, or as needed. During this review, progress towards achieving the stated conservation goal will be evaluated.
- E. Estimated savings from previous conservation efforts and current plan.** Since 2011, it is estimated that Carbondale has conserved 48 AF of water (1.3% per year). The active conservation forecast prepared for this 2014 plan includes the anticipated impact of the Town’s planned water efficiency program measures as well as passive reductions that are likely to occur. Under this forecast, potable and raw water demand increases to 2,099 AF in 2050. Compared with the baseline forecast, if the elements of this plan are fully realized, then it is estimated that water demand at 2050 will be reduced by 840 AF

(28% total reduction, 0.82%/year) as a result of passive and active water conservation measures in Carbondale.

- F. Public comment period.** A 60-day public review process was held from December 22, 2014 through February 23, 2015. During this period, one person submitted written comments. The comments and responses from the Town of Carbondale are provided in Appendix B. To the extent possible, comments were addressed in this updated plan but did not result in any major changes.

7. ROARING FORK REGIONAL WATER EFFICIENCY PLAN

The development of the Town of Carbondale Water Efficiency Plan was a collaborative effort funded by a Colorado Water Conservation Board grant as part of the Roaring Fork Watershed Regional Water Efficiency Plan. The Regional Water Efficiency Plan is published under separate cover and focuses on regional opportunities to increase municipal water efficiency. The Town's Water Efficiency Plan has potential to directly impact flows in the Roaring Fork River as well as the Crystal River, although Carbondale cannot guarantee that water it saves through conservation efforts will benefit the entire downstream reach of these rivers to the extent that other downstream water users may divert that water out of the rivers. The Town is interested in regional partnerships to improve water efficiency.

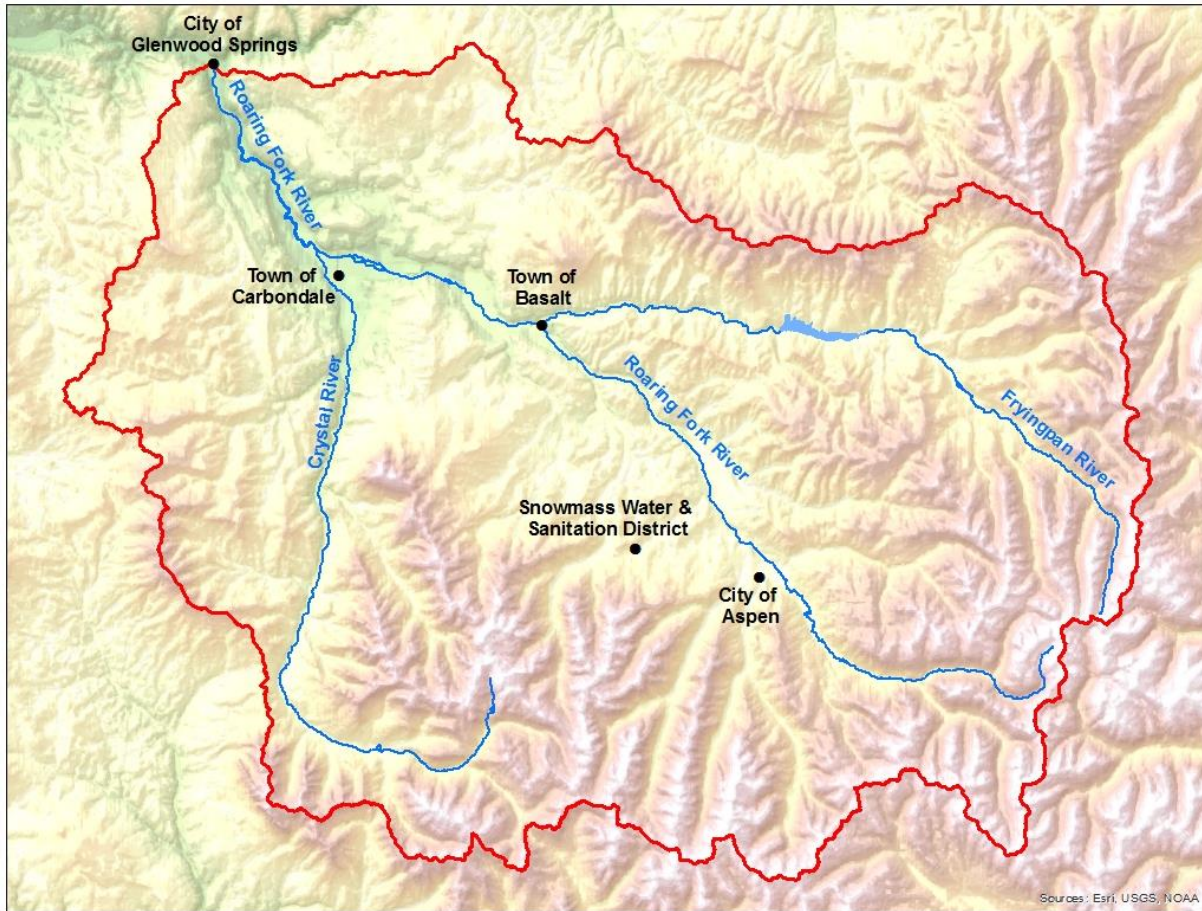


Figure 8. Water Providers Participating in the Roaring Fork Regional Water Efficiency Plan.

8. REFERENCES

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APPENDICES

APPENDIX A

TOWN OF CARBONDALE MUNICIPAL WATER EFFICIENCY PLAN RELEVANT CODES AND ORDINANCES

A1. WATER CONSERVATION AND WASTE

The following text is from Chapter 13.28 of the Carbondale Municipal Code regarding water conservation and waste.

13.28.010 Waste of water prohibited.

Each user of the town water or wastewater systems shall prevent waste of water and shall keep all water outlets closed when not in actual use unless otherwise authorized by the town in writing. Hydrants, stock troughs, urinals, water closets, bathtubs, and other openings shall not be left running for any purpose other than for the immediate use for which they were intended.

(Ord. 11-1991 (part)).

13.28.020 Water shut off in event of waste.

The town may shut off water service at the curb box to any premises where water is being wasted, or water sprinkling or irrigation is taking place during hours other than those authorized. The town shall give notice pursuant to [Section 13.12.040](#) prior to termination of water service for waste if the waste of water does not constitute an immediate threat to public health or safety, and the user shall have review rights set forth in [Section 13.12.050](#). A reinstatement fee of twenty-five dollars shall be charged when water service is reinstated. Water may be shut off to any premises without notice in the event of waste that, in the opinion of the town, constitutes an immediate threat to public health or safety pursuant to [Section 13.12.030](#).

(Ord. 11-1991 (part)).

13.28.030 Restriction on use.

The town manager shall implement reasonably practicable water conservation measures during those times when water supplies are limited, after the town manager determines that a water shortage exists. Thereupon, the following plan shall be implemented. The duration of each stage shall be determined by the town manager, according to the exigent circumstances of the particular situation.

(Ord. 11-1991 (part)).

13.28.040 Water shortage.

During the designated water shortage period:

- A. There shall be no washing of sidewalks, driveways, parking areas, tennis courts, patios, or other paved areas;
- B. There shall be no draining and refilling of swimming pools, hot tubs, spas, or the like;

- C. There shall be no washing of privately owned cars, other motor vehicles, trailers, or boats, except from a bucket; a hose equipped with a positive shut-off nozzle may be used for a quick rinse;
- D. There shall be lawn watering and irrigation only to the extent determined to be permissible by the town;
- E. Water shall not be used for dust control, except for construction projects when authorized by the town manager;
- F. Restaurants shall provide drinking water to customers only upon request;
- G. A public awareness program shall be initiated for education as to the types of practices which a successful temporary program will require. The town shall distribute printed material emphasizing the need to schedule water use during off-peak hours, as well as suggested life style changes.
(Ord. 11-1991 (part)).

13.28.050 Water crisis.

The board of trustees may declare a period known as a water crisis. During a water crisis, all restrictions under a water shortage shall remain in effect. In addition, the following measures shall also be in effect:

- A. Except for firefighting, there shall be no use of water from a fire hydrant;
- B. Watering of any lawn, garden, landscaped area, tree, shrub, or other plant with treated water from the municipal domestic water system shall be prohibited except from a hand-held container and only at designated times;
- C. Restaurants will be required to serve patrons with disposable plates, glasses, knives, forks and spoons and to use such other disposable utensils as is reasonable;
- D. There shall be no replenishment of water in swimming pools, whether for normal operating replacement water or otherwise.
(Ord. 11-1991 (part)).

13.28.060 Water conservation restrictions.

To insure the proper functioning of the town water system during periods of peak demand, the town manager may establish restrictions on irrigation and use as are appropriate. Due to high flow demands through the town water distribution system during summer irrigation months, the following irrigation restrictions may apply each year:

- A. Restriction Period. The irrigation restrictions shall be in effect yearly commencing at twelve a.m. on May 15th and continuing until twelve p.m. on October 15th.
- B. No Use Period. No irrigation may be permitted between ten a.m. and three p.m. daily.
- C. Even Day Irrigation. Irrigation may be allowed on even numbered days of each month during the irrigation restriction period and on the 31st day of each month for those users with addresses ending in even numbers.
- D. Odd Day Irrigation. Irrigation may be allowed on odd numbered days of each month during the irrigation restriction period for those users with addresses ending in odd numbers.

- E. Exemption Permit. The town manager may issue not more than one exemption permit to a customer for the purpose of irrigation of newly installed landscaping, lawns and trees, provided that the total area of irrigation is not in excess of four hundred square feet. The customer shall prominently display a copy of the exemption permit in the area to be irrigated. The exemption permit may authorize the customer to irrigate on an even or odd numbered day which is not authorized, but shall not entitle the customer to irrigate during any period when irrigation usage is entirely prohibited. The exemption permit shall be in effect for the restriction period of the year of issuance only, unless sooner terminated by the town manager due to the establishment of further restrictions on irrigation and use.

(Ord. 11-1991 (part)).

A2. RESIDENTIAL EFFICIENT BUILDING CODE

Attached is Chapter 15.30 of the Carbondale Municipal Code regarding the Residential Efficient Building Code. Subsection 15.30.080 specifically relates to Site/Water Conservation.

**ORDINANCE NO. 8
SERIES OF 2011**

**AN ORDINANCE OF THE BOARD OF TRUSTEES OF THE TOWN OF
CARBONDALE, COLORADO, AMENDING CHAPTER 15.30 OF THE
MUNICIPAL CODE REGARDING THE CARBONDALE EFFICIENT
BUILDING PROGRAM**

WHEREAS, by Ordinance No. 12, Series of 2007, the Town of Carbondale adopted a residential efficient building program that provides for education of the community, promotes the use of environmentally friendly construction methods and renewable energy technologies, and fosters economic development of “green” businesses; and

WHEREAS, after approximately three years of operation, the Board of Trustees finds and determines that certain amendments to the residential efficient building program are in the interest of public health, safety and welfare;

NOW THEREFORE, BE IT ORDAINED BY THE BOARD OF TRUSTEES OF THE TOWN OF CARBONDALE, COLORADO, that the following amendments to the Town of Carbondale Municipal Code are hereby approved and adopted.

Chapter 15.30 of the Carbondale Municipal Code, entitled Efficient Building Program Residential” is renamed “Residential Efficient Building Program” and is amended to read as follows:

Chapter 15.30

Residential Efficient Building Program

- 15.30.010 Purpose
- 15.30.020 Applicability
- 15.30.030 Exemptions
- 15.30.040 Point Requirements
- 15.30.050 Renewable and Efficiency Fund
- 15.30.060 Inspection and Compliance
- 15.30.070 Definitions
- 15.30.080 Section 1: Site/Water Conservation
- 15.30.090 Section 2: Recycling and Reuse
- 15.30.100 Section 3: Framing and Materials
- 15.30.110 Section 4: Indoor Air Quality
- 15.30.120 Section 5: Energy Compliance
- 15.30.025 Section 6: Manufactured Housing
- 15.30.130 Section 7: Solar Energy

- 15.30.140 Section 8: Innovation Points
- 15.30.150 Section 9: Alternative Points
- 15.30.160 Section 10: On-site Renewable Energy and Exterior Use
- 15.30.170 Carbondale Residential Efficient Building Checklist

15.30.010 PURPOSE

The intent of the Carbondale Residential Efficient Building Program (REBP) is to encourage cost-effective and sustainable building methods to create durable, energy efficient structures that conserve natural resources, promote the efficient use of building materials, and improve indoor air quality. Depending on the house size and use of exterior energy, there are requirements for on-site renewable energy mitigation in order to promote a local self-sufficient energy economy as per the Carbondale Energy Plan.

15.30.020 APPLICABILITY

Carbondale’s Residential Efficient Building Program (REBP) applies to all new residential (single-family, duplex, townhouse, accessory dwelling unit) construction per the currently adopted building codes, as well as multifamily and residential sections of multi-use projects, and additions/reconstruction (remodel) projects as defined by the International Building Code or as specified in definitions.

The Carbondale Residential Efficient Building Program Checklist (REBP Checklist) and this code document are used for code enforcement. A resource guide will be provided for additional guidance and background references.

15.30.025 MANUFACTURED HOUSING

All manufactured homes must come from plants certified to produce ENERGY STAR qualified manufactured homes on an ongoing basis. This process includes utilizing home designs that meet ENERGY STAR design guidelines.

15.30.030 EXEMPTIONS

Houses or mixed use structures applying for historical designation may request the Community Development Department to exempt the structure from any requirements set forth in this chapter. The Community Development Department shall refer any such request to the Community Office for Resources Efficiency (CORE) and/or the building department for comments before processing any such exemption request.

Mobile home units that are approved by Colorado Department of Housing are exempt.

In the event of any conflict between this Chapter 15.30 and any provision set forth in Title 18 of this Code (Zoning), Title 18 shall govern.

Additions less than 500 square feet are exempt from the Carbondale Residential Efficient Building Program, but shall abide by the requirements of the currently adopted version of the International Energy Conservation Code (IECC).

15.30.040 INNOVATION POINTS

A. General Description. The points to be scored or minimum required points are based on total square footage or total square footage per unit (or an “average”) for multifamily and residential portions of multi-use projects. See definitions for appropriate total square footage calculations. In multi-use and mixed use residential projects, points that are common to all units are gained for each unit and can be scored in each REBP checklist, i.e., recycled content siding, roof insulation.

B. Examples--Point Requirements. The number of points required is on a graduated scale and can be calculated directly in the REBP checklist. Examples of points required for various new residential housing or other residential type construction are included below:

NEW CONSTRUCTION & ADDITIONS 2000 Square Feet and Over

CATEGORY	Tier 1	Tier 2	Tier 3	Tier 4
House Size	<3000 SF	3000-4999	5000-7999	>8000
Points	110	110-180	230-330	430-550

ADDITIONS 2000 Square Feet and Under

ADDITIONS				
Size (sf)	500	1000	1500	2000
Points	40	60	80	110

If the construction permit is only for a detached garage, the point requirements shall follow the Additions point schedule above.

Residential units in the multifamily and multi-use categories calculate total square footage as an “average” unit size as per the definitions. The points required are based on this “average” size. Multifamily and multi-use projects receive credit against the points required for the “average” size for building efficiency as follows:

1. Credit of 10 points for efficiency of common walls.
2. Credit of 10 points if heating and hot water system is common to all units.

C. Alternative Points - Cash In Lieu. Permit applicants may pay a cash fee in lieu of meeting some of the points required (see Section 15.30.150). Cash in lieu points are limited to 25% of the points required.

D. On-Site Requirements. Houses over five thousand square feet must supply part of the energy use in the home on-site or elect to provide off-site mitigation through a fee payment option (see Section 15.30.160). Also the code considers exterior energy uses over a nominal amount in Section 15.30.160.9.2. In order to offset the exterior use of energy, the use must be mitigated with renewable energy on-site or the applicant has an option to pay a fee.

15.30.050 RENEWABLE AND EFFICIENCY FUND

A. General Description. The town will establish the renewable and efficiency fund separate from the general fund to support the installation of renewable energy and energy efficient technologies in the town of Carbondale or in locations as approved by the trustees.

B. Fees. Fees collected from items as per 15.30.150: Alternative cash in lieu of points and Section 15.30.160: On-site renewable energy and exterior use will be deposited to the Renewable and Efficiency Fund (REF).

Fees from Section 15.30.150: Alternative Cash in Lieu of points may be collected at time of permit or paid prior to Final Inspection and Certificate of Occupancy (C.O.). Fees from 15.30.160: On-site Renewable Energy and Exterior Use are paid at time of permit. All fees may be reviewed prior to Certificate of Occupancy for applicability and accuracy. Refunds or additional fees may be assessed prior to Certificate of Occupancy.

C. Budget Requests. The Environmental Board will meet periodically with the Community Office for Resource Efficiency (CORE) to recommend funding requests at least 2 times per year for review and approval by the Town Trustees.

D. Criteria for Authorizations. Funds generated will be used to assist existing structures or new projects to achieve improved energy efficiency or renewable power generation in Town of Carbondale or for locations on a case-by-case basis as approved by the Trustees. It is suggested that such recommendations be based upon the following criteria:

1. Meets Intent: The extent to which the proposed project meets the intent of the fund which is to encourage and promote energy efficiency and renewable energy in the Town of Carbondale. This intent should be met by assisting in the incremental upgrade of a project, and shall not be utilized for construction costs required for code compliance.
2. Cost/Benefit: The extent to which the proposed project provides an economic return on appropriations invested.
3. Public Benefit: The extent to which the proposed project offers a public benefit to the Carbondale community.

4. Affordable Housing: Special consideration is given to projects that positively affect occupants of local affordable housing in the Town of Carbondale. Funding may assist in the incremental upgrade of a project, and shall not be utilized for construction costs required for code compliance.

Other items that may be considered for funding:

1. Focused education for the Carbondale Efficient Building Program. Educational materials and events including but not necessarily limited to, printed process guides, resource reference guides, efficient building educational events to assist participants in code compliance, a webpage with available resources, links, and information.
2. Residences applying for Historical Preservation may apply for design assistance for mechanical and electrical renovations.
3. Activities related to implementing recommendations and conservation efforts as per the Town of Carbondale's Energy Plan.

15.30.060 INSPECTION AND COMPLIANCE

A. General Description. These regulations identify the specific requirements for complying with the Carbondale Residential Efficient Building Program (REBP) code. The sections and numbers in these regulations correspond to the sections and numbers on the REBP checklist. The REBP checklist is most easily handled via an electronic spreadsheet, but can be filled in by hand. The REBP checklist and other related documents are available at the building department or at www.carbondalegov.org

B. Permit Application. Two copies of a completed REBP checklist, scoring the required points, must be submitted with the building permit application.

In addition, permit applications must contain two copies of Energy Compliance Documents (REScheck, HERS rating or letter advising on use of prescriptive requirements of the latest adopted version of the Energy Codes—see 15.30.120 – Section 5: Energy Compliance for details). The permit application will not be processed without the completed REBP checklists and the Energy Compliance Documents.

C. Inspections. Items selected on the Carbondale Residential Efficient Building Program Checklist will be scored and submitted for plan review and in field inspections accordingly. Field inspections are noted on the right column of the REBP checklist.

Compliance methods for each REBP checklist item described herein will be demonstrated by “Inspection” and/or “Documented.” If compliance is “Inspected,” town staff will inspect these measures during their typical inspections. Inspections are listed as PC: Plan Check, 1: Foundation, 2: Framing, 3: Insulation, 4: Rough-in, 5: Final. (Please read the “Compliance” section of the specific measure to see which type of inspection is required.)

D. Documented Items. Items selected that are “Documented” shall require the submission of appropriate documentation to establish compliance at time of inspection. If documentation is required for an item, this documentation should be kept in the inspection container at the site. The Town of Carbondale reserves the right to conduct a documentation and inspection review after the 4th inspection to determine if “Cash in Lieu of Points” are needed to meet point requirements.

E. Failed Inspections or Compliance Audits. In addition, the town may conduct follow-up inspections or compliance audits of “documented” measures prior to issuing a C.O. If a compliance audit is conducted, the contractor must provide documentation for these items. If for any reason an inspection fails and the checklist has to be revised for compliance, then a revised REBP checklist must be resubmitted to the building department within 30 days of the failed inspection and/or prior to final certificate of occupancy.

Prior to final inspection, fees and checklist may be reviewed to revise the fee schedule if necessary.

15.30.070 DEFINITIONS

A. General. Definitions included herein are for interpretation of this chapter 15.30 of code only.

B. ASHRAE. The American Society of Heating, Refrigerating and Air-Conditioning is a technical society organized to advance sciences of heating, ventilation, air-conditioning and refrigeration. Some ASHRAE standards are referenced or required in REBP code.

C. ACCA. Air Conditioning Contractors of America. This organization produces manual J which is referenced by this code.

D. AFUE. Annual Fuel Utilization Efficiency. The AFUE is the most widely used measure of a furnace's heating efficiency. It measures the amount of heat actually delivered to your house compared to the amount of fuel that you must supply to the furnace. Thus, a furnace that has an 80% AFUE rating converts 80% of the fuel that you supply to heat -- the other 20% is lost.

E. AHRI. Air Condition Heating and Refrigeration Institute. AHRI administers the heating, ventilation, air conditioning and commercial refrigeration industry's performance certification programs for heating and cooling equipment and components.

F. Basement. A basement is that portion of a building that is partly or completely below grade per the International Residential Code.

G. COP. Coefficient of performance. (Sometimes CP) The ratio of the change in heat of the output of a heat pump to the supplied work.

- H. Community Office for Resource Efficiency (CORE). Local nonprofit 501c(3) energy office that is working with the Town of Carbondale to implement a clean energy future in the Roaring Fork Valley.
- I. ENERGY STAR. ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy that manages and promotes energy efficient products and practices.
- J. EPA. Environmental Protection Agency. This agency's standards are referenced in this code for indoor air quality points.
- K. Floor Area. The floor area gross is defined as the sum of the horizontal areas of floors of a building measured from the exterior face of exterior walls or, if appropriate, from the center line of dividing walls.
- L. GREENGUARD. An environmental institute with the mission of improving human health and quality of life by enhancing indoor air quality and reducing people's exposure to chemicals and other pollutants. GREENGUARD certifies products and materials for low chemical emissions.
- M. HERS. Home Energy Rating System. A HERS rating is a performance audit of a home. It consists of the evaluation, diagnostic testing, cost-effective recommendations and a computerized simulation analysis utilizing Resnet Accredited Rating Software to calculate a rating score on the HERS Index
- N. Multifamily. Multifamily projects are as per the International Residential Code or International Building Code: buildings or portion thereof designed for occupancy by three or more families living independently, including apartment houses, in which they may or may not share common entrances and/or other spaces. Individual dwelling units may be owned as condominiums, or offered for rent.
- O. Multi-Use. Multi-use projects may include different occupancies including residential type, commercial and industrial. This code applies only to the residential portions of these projects.
- P. REScheck. A tool developed by the Department of Energy that compares a residential structure to a number of energy code standards.
- Q. Resnet. Residential Energy Services Network. The company that certifies energy raters and audits for the HERS program as well as other energy audit programs.
- R. SEER. Seasonal energy efficiency ratio. A ratio used to rate the efficiency of air conditioners.
- S. Sone. A unit of perceived loudness.
- T. Total Square Footage. For the purposes of this program, the total square footage is calculated as follows: The floor area within the inside perimeter of the exterior walls of home, exclusive of basements and garages, without deduction for corridors, stairways, closets, the thickness of interior walls, columns or other features.

Basement and garage floor areas shall be added to the above totals by adding fifty percent of the total basement and garage floor areas.

Each unit of a duplex or row of townhouses shall calculate the total square footage of each unit.

Multifamily projects will calculate the total square footage and the points required by dividing the total square footage as per above (including halls and common areas) by the number of units, to obtain the “average” square footage per unit. Points required for each unit are based on this “average” square footage.

Mixed residential/commercial multi-use projects will calculate the floor area as per above for each unit by dividing the square footage of all the residential sections (including halls and common areas) of the buildings and dividing by the number of units to obtain the “average” floor area per unit. Points required for each unit are based on this “average” square footage

Areas not included in the total square footage: (1) covered walkways, open roofed--over areas, porches and similar spaces; (2) pipe trenches, exterior terraces or steps, chimneys, roof overhangs and similar features.

15.30.080 SECTION 1: SITE/WATER CONSERVATION

1.1: Construction does not impact site 15’ outside of building footprint 2 points

Vegetation shall not be impacted by construction area. Show detailed construction management plan with fence/limits of construction no more than 15 feet around proposed building footprint. Driveways, utility lines and material storage exempted.

Compliance: Plan check and inspected (PC, 1: Foundation)

1.2: 100% of topsoil saved and reused on-site 2 points

Topsoil must remain on site during construction. Storage area for topsoil must be indicated on the site plan. Care should be exercised to conform with the Carbondale Weed Management Plan.

Compliance: Inspected (1: Foundation)

1.3: 100% of excavated fill reused on-site or within a 3-mile radius

On Site 2 points

Within 3-mile radius 1 point

Reuse of excavation material locally reduces transport of material and impacts. For points within a 3-mile radius, provide a signed receipt with details on the location.

Compliance: Inspected with documentation (1: Foundation)
Documentation required for off-site point.

1.4: House size less than the national standard 8 points

Average house size has increased dramatically over the past 20 years requiring additional heating energy, electricity and materials used in construction. Houses designed with total square footage below these sizes achieve these points.

Average house sizes	
For a studio	650 sf
1 bedroom	800 sf
2 bedrooms	1,375 sf
3 bedrooms	1,900 sf
4 bedrooms plus	2,650 sf

Compliance: Show calculation of house size on site plan. Plan check (PC)

1.5: Erosion controls during construction 1 point

Reduce runoff from construction sites by providing silt fencing or straw-bales in runoff areas. Protect stockpiled soil and disturbed areas from erosion.

Compliance: Inspected (1: Foundation)

1.6: Deciduous trees/large shrubs provide summer shade to west of structure 1 point

Mature landscaping must shade over 50% of subject glazing area. Show plantings on landscaping plan to provide shade from solar gain on west elevation from 2-6 PM in summer.

Compliance: Plan check (PC)

XERISCAPE LANDSCAPING

1.7: Addition of organic material to soil or use 2" of mulch or bark on all planting beds 1 point

Organic material can include but is not limited to manure and compost. Add organic material or mulch all planting beds with wood chips or bark at least 2” deep. (Except desert plantings.)

Compliance: Inspected with documentation (5: Final)

1.8 and 1.9: Reduction of turf areas

1.8 Area limited 3 points

1.9 Xeriscape 5 points

Irrigated turf area of high water demand turf must be less than 25% of landscaped area, or 2000 square feet, whichever is smaller for 3 points. Or use low-water-demand or xeriscape-rated plants only in at least 50% of landscaped area or 2000 square feet whichever is smaller for a total of 5 points.

Documentation includes landscaping plan or alternate, and must show xeriscape plants listed by Colorado State University Extension Horticulture office, listed on www.xratedgardening.com, or other recognized source.

Compliance: Inspected with documentation (5: Final).
Document with landscape plan.

1.10: Provide education on low water plants and list of xeriscape plants 1 point

Provide list of appropriate low water plants to homeowner as listed by Colorado State University Extension Horticulture office, listed on www.xratedgardening.com, or other recognized source.

Compliance: Inspected with documentation (5: Final).
Copy of list in the inspection container.

IRRIGATION SYSTEMS

1.11: Non-potable water used for irrigation 2 points

Use water sources other than potable city water for irrigation if appropriate access to water right is available from the Town or other source. Indicate sources on plan.

Compliance: Inspected with documentation (5: Final)
Documentation with landscape plan or signed letter by the architect or owner ensuring project is compliant.

1.12: Drip irrigation 2 points

At least 50% of landscaped area should include low to moderate water demanding plants, and should be irrigated with drip irrigation, bubbler, or micro-spray systems.

Compliance: Inspected with documentation (5: Final)
Documentation with landscape plan or signed letter by the architect or owner ensuring project is compliant.

1.13: Zoned irrigation system 2 points

Irrigation system must be zoned to deliver different amounts of water appropriate to the different plant zones. High-water zones should NOT be immediately adjacent to large hardscapes such as driveways or streets. Turf and planting beds must be zoned separately.

Compliance: Inspected with documentation (5: Final)
Documentation with landscape plan or signed letter by the architect or owner ensuring project is compliant.

1.14: Timer controls installed REQUIRED

REQUIRED if irrigation is to be installed, high-water zones should have irrigation controls that include timed devices; timer shall have night time activation with city water supplied systems. Night time activation for ditch water systems is required, if possible.

Compliance: Inspected with documentation (5: Final)
Documentation with landscape plan or signed letter by the architect or owner ensuring project is compliant.

1.15: Rain sensor installed with irrigation system 2 points

Sensors installed as part of an irrigation system turn off system when adequate rainfall has occurred.

Compliance: Inspected with documentation (5: Final)
Documentation with landscape plan or signed letter by the architect or owner ensuring project is compliant.

FOOD PRODUCTION

1.16: On-Site Greenhouse of 30 Square Feet or Larger 4 points

Solar Greenhouses can add heat to the home on sunny winter days, and also provide fresh local vegetables year round. Greenhouse must be isolatable from living space. Any heating must be provided by a separately controllable system

or zone with a maximum temperature set point of 50 degrees F. Proper sizing of glazing area, thermal mass and insulation must be followed.

Compliance: Plan check and inspected (PC, 5: Final)

1.17: Edible Landscaping 1 point

Edible Landscaping takes advantage of planted areas by turning them into food producers. A minimum of 50 square feet must be prepared and dedicated for edible landscaping. In ground, raised bed, and container planting areas qualify.

Compliance: Inspected (5: Final)

WATER CONSERVATION

1.18: Low flow or dual-flush toilets 1-4 points

A low flow toilet uses 1.4 gallons per flush (GPF) or less AND is equal to or greater than 400 grams per flush as per Maximum Performance testing (MaP). (MaP data is found on the California Urban Water Conservation Council web site www.cuwcc.org. MaP test to be 18th version or most recent).

A dual flush toilet has a minimum of 2 flushing option and provides at least one flush choice less than 1.4 GPF.

Receive 1 point each low flow toilet and 2 points for each dual flush toilet installed. Note a toilet can be both low flow and dual flush. In this case the toilet will receive 2 points. Maximum of 4 points.

Compliance: Inspection with documentation (5: Final).
Provide documentation on site. Toilet must be on the MaP list to qualify for low flow

1.19: Low-flow showerheads 1 point per showerhead

Showerheads 2.0 gallons per minute or less must be installed on all showers. Only 1 shower head in each shower to obtain points. Maximum of 2 points.

Compliance: Inspection with documentation (5: Final).
Provide product documentation on-site

1.20: Hot water recirculation system 1 point

Saves water by maintaining hot water at faucets. Sensors or switches turn circulation pumps on and off to save energy.

Compliance: Inspection with documentation (4: Rough-in).

Provide product documentation at inspection.

1.21: Water efficient clothes washer 3 points

Select an ENERGY STAR front loading washer to save both water and energy.

Compliance: Inspected. (5: Final). Must be installed.

15.30.090 SECTION 2: RECYCLING AND REUSE

2.1: Wood, scrap metal, cardboard recycled on site 2 to 6 points
2 points per material type recycled

There shall be labeled containers or areas on site designated for recycling with evidence of use and service. The Pitkin County Landfill offers a reduced tipping fee for separated wood waste and cardboard can be recycled free. For example, if cardboard and wood scraps are being recycled in containers on site, 4 points would be given.

Compliance: Inspected (1 thru 5).

2.2: Use of spruce/pine beetle salvage wood 4 points for structural
1 point for other uses
- 2 total

Spruce/pine beetle affected lumber harvested in Colorado can be utilized as dimensional framing material, as well as siding, flooring and trim. Material must be used for over 50% of the use in the structure. For example: for flooring, 50% of the flooring installed must be pine or spruce beetle affected for 1 point.

Compliance: Inspected with documentation. (2: Framing or 5: Final)
Provide documentation of source.

2.3: Use of compost from local landfills for landscaping 2 points

Provide delivery or purchase slip confirmation in the permit sleeve.

Compliance: Inspected with documentation. (5: Final).

2.4: 20% or more of fly ash content in over 50% of concrete used 3 points

Provide receipt from batch plant. Follow guidelines of American Concrete Institute for cure time.

Compliance: Inspected with documentation. (1: Foundation).

APPENDIX B

TOWN OF CARBONDALE MUNICIPAL WATER EFFICIENCY PLAN PUBLIC NOTICE ANNOUNCEMENT, PUBLIC COMMENTS, AND OFFICIAL PLAN ADOPTION RESOLUTION

B1. PUBLIC NOTICE ANNOUNCEMENT

The draft Water Efficiency Plan was made available for public comment through the Town of Carbondale's website as well as the Roaring Fork Conservancy website. Information was also circulated through Coyote Gulch, a Colorado and western-water focused internet reporting site, and through an interview with the Town's Utilities Director Mark O'Meara, aired on KDNK, the local community radio station.

B2. PUBLIC COMMENTS

The 60-day public review process was held from December 22, 2014 through February 23, 2015. During this period, one person submitted written comments. The comments and responses from the Town of Carbondale are presented below.

B2.1 COMMENTS RECEIVED

The comments received are reprinted below, as received.

Based on a very preliminary review of the current document, I have comments that relate mainly to the ability of intelligent "laymen" to relate to it:

1. Water usage data are presented primarily in "acre-feet" or "acre-feet per year." While this is consistent with the (antiquated) system of allocating water rights in Colorado, hardly anybody other than a rancher can relate that to the quantity of water that they use in their household, which leads me to.....
2. There is an ENORMOUS difference between water that is used non-consumptively, as is the case with about 95% of domestic use other than lawn irrigation, and consumptive use, which constitutes the vast majority of irrigation use.

To have any value as to review and comments by the general public (especially, those people who are intelligent but not necessarily familiar with the technology of water resources) this report should explain these concepts. For example, typical residential indoor (non-consumptive) use is about 50 gallons per person per day. An "average" household with about 3 residents would use about 150 gallons per day or 55,000 gallons per year. Since one acre-foot is about 326,000 gallons, this would be about 1/6 of an acre-foot per year.

The data in the report indicate that the typical resident of Carbondale uses about 72 gallons per day in winter (i.e., non-consumptively). That is more than the 50 gallon per day average, but so what?, when 95% is returned to the Roaring Fork River via the wastewater treatment plant, and the vast majority of water usage in the Roaring Fork Valley is used consumptively for irrigating low valued forage crops to feed to cows and horses.

B2.2 RESPONSES FROM TOWN OF CARBONDALE

Thank for you for taking the time and effort to prepare these useful comments. Below is a summary of how these comments were addressed in the Water Efficiency Plan.

An acre-foot is a measurement used to describe a volume of water, and is sometimes characterized as a football field (approximately one acre) covered with one foot of water. One acre-foot of water is approximately 325,851 gallons and additional descriptions have been incorporated into the List of Abbreviations at the beginning of the report and footnoted.

While domestic uses are largely non-consumptive, the reach of river between the point of diversion and the point of return from the wastewater treatment plant is impacted by the diversions. Accordingly, a reduction in indoor water use can decrease the amount of water that needs to be diverted.

The purpose of the Town of Carbondale Water Efficiency Plan is to address municipal water uses. The Roaring Fork Regional Water Efficiency Plan is also initially focused on municipal uses, but provides opportunity to engage other water users throughout the valley.

B3. OFFICIAL PLAN ADOPTION RESOLUTION

The Town of Carbondale Board of Trustees reviewed the draft Water Efficiency Plan after it was updated in response to public comments. On March 31, 2015, the Board adopted the plan with the updates included in this final version. A copy of the Board meeting minutes and adoption is included in Appendix C.

APPENDIX C

TOWN OF CARBONDALE MUNICIPAL WATER EFFICIENCY PLAN BOARD OF TRUSTEES APPROVAL OF CARBONDALE'S MUNICIPAL WATER EFFICIENCY PLAN

C1. OFFICIAL PLAN ADOPTION RESOLUTION

Attached is a copy of the Board of Trustees meeting minutes dated March 31, 2015.

MUNICIPAL WATER EFFICIENCY PLAN

Jay explained that adoption of a water efficiency plan is a requirement for State agency funding. Mayor Bernot noted that this plan is specific to Carbondale. The Board will be commenting on a regional plan at a later date.

Jay stated if the Board chooses to adopt the Plan the motion should include language that the adoption of the Water Efficiency Plan does not include adoption of the regional plan.

Trustee Harvey asked if the Plan changes the Town's water rates; it does not, it's a guideline. Trustee Harvey asked if it directs ditch policy; it does not. The Comprehensive Plan discusses ditch management. Trustee Harvey asked if the Plan contains wording for charging for ditch water usage? It does not, the Water Master Plan would be the guiding document for charging for ditch water usage.

The Board agreed that the last sentence on page 39 should be amended to read: The Town is interested in a regional partnership to improve water efficiency and is assisting with the implementation of the Regional Water Efficiency Plan."

Trustee Zentmyer arrived at the meeting.

Trustee Hoffmann made a motion to adopt the Municipal Water Efficiency Plan with the amendments noted above. Adoption of the Municipal Water Efficiency Plan does not include adoption of the regional plan. Trustee Harvey seconded the motion and it passed with:

5 yes votes: Byars, Harvey, Bernot, Hoffmann, Zentmyer