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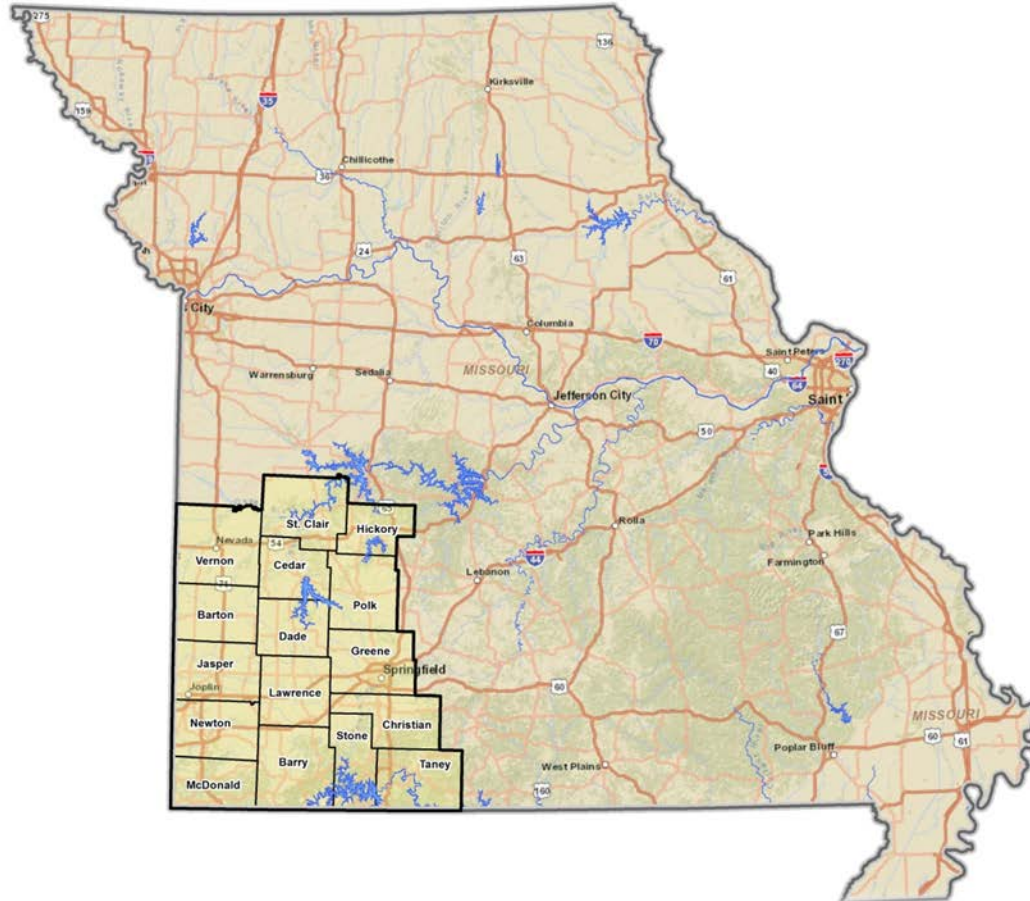
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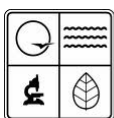
US Army Corps
of Engineers
Kansas City District

Southwest Missouri Water Resource Study – Phase I

Forecast of Regional Water Demands (2010-2060)



September 2012 (Revised November 2012)



Missouri
Department of
Natural Resources

**CDM
Smith**

TRI-STATE WATER
Resource Coalition

This study is intended for regional level planning purposes. The study findings are not intended for utility level planning decisions.

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Table of Acronyms

AF	Acre-feet
Ag Census	Census of Agriculture
CII	Commercial, Industrial, and Institutional
EPA	United States Environmental Protection Agency
gal	Gallons
GED	Gallons of Water Use per Employee per Day
GPCD	Gallons per Capita per Day
GPD	Gallons per Day
gpm	Gallons per Minute
M&I	Municipal and Industrial
MDNR	Missouri Department of Natural Resources
MERIC	Missouri Economic Research and Information Center
MGD	Million Gallons per Day
NAICS	North American Industrial Classification System
NCDC	National Climate Data Center
NRW	Non-Revenue Water
PS	Public-Supply
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	US Geological Survey

1.0 Executive Summary

This report describes the development of a long-term regional water demand forecast on behalf of the Missouri Department of Natural Resources (MDNR) in coordination with the Tri-State Water Resources Coalition. Prior studies have indicated that Southwest Missouri may experience future water supply shortages. To address regional concerns of high localized water demand growth rates, localized overuse of groundwater, and the potential for future overuse of surface water, the Tri-State Water Resource Coalition was formed as a not-for-profit, 501 c (4) corporation. The Coalition has a broad base of membership including cities, water districts, utilities, businesses and individuals. The Missouri Department of Natural Resources also supports and coordinates efforts in this region to address future water supply needs.

This forecast is designed to improve the understanding of current and estimated future water use within publically-supplied residential and non-residential, self-supplied residential and non-residential, and agricultural water use sectors in a sixteen county region of Southwest Missouri. The Southwest Missouri Water Resource Study: Water Demand and Forecast is the first phase of a two phase program to determine current and future regional water resource needs. Phase I provides an analysis of both existing and future water demand for each of the sixteen individual counties in the region. The next phase of the study will evaluate water supply sources followed by a gap analysis that will identify counties and areas that may experience either water supply shortages or unreliable sources of water in the future. The sixteen county region of study includes Barry, Barton, Cedar, Christian, Dade, Greene, Hickory, Jasper, Lawrence, McDonald, Newton, Polk, Saint Clair, Stone, Taney and Vernon Counties in Southwest Missouri.

This report begins with Section 2, Introduction, which presents goals and objectives and provides background information. Section 3 describes the process of data collection and the general methodology developed for the regional demand model. Sections 4 and 5 present the data processing efforts required prior to the development of municipal and industrial (M&I) water demands. Section 6 describes collection and processing of weather data inputs. Section 7 presents the data collection and processing required for the development of an agricultural demand forecast for both livestock and crop irrigation water needs. Section 8 presents the methodology and data processing efforts used in development of the water demand model. This section is divided by sector to provide a comprehensive overview of the development of the model. Section 9 presents an assessment of potential future conservation measures as well as the methodology used to develop future decreases in demand resulting from implementation of these measures. Section 10 describes the model verification and assumptions used in the development of the forecast. Section 11 presents results and findings as a profile of current and future water demands by year, sector, and county. The final section of the report, Section 12, provides conclusions and recommendations especially as they relate

to the next phase of the study. A brief summary of the information presented in these sections is provided below.

1.1 Data Collection

Development of the water demand forecast requires the use of different types of data, including water billing and consumption data, demographic and socioeconomic data, historical agricultural data, and weather data. Acquisition of much of this information required the development, distribution, and data processing of a comprehensive water use data request or survey distributed to regional water providers. The data request survey response accounted for 74.6% of the population served by public supply water systems for the regional study area.

Additionally, general demographic data and historical and projected population and employment data and estimates for high, medium, and low growth scenarios were provided by MDNR. A main difference between the high and medium growth rate scenarios is that under the medium forecast, some counties experienced a decrease in water demand in future years. The model forecasted that Cedar, Hickory, Saint Clair, and Vernon counties' water usage actually decreased between 2010 and 2060. However, overall the region's water usage was estimated to increase by 124.9 million gallons per day (MGD) in the medium growth scenario, as shown in Table 1-1. Christian, Greene, Jasper, and Taney counties were the main drivers in the growth in water demand.

1.2 Development of the Water Demand Model

Water demand is forecasted at the county-level, in an effort to provide useful regional planning information on trends in current and future water use. The forecast begins with baseline demands (2010) and projects these demands through the year 2060 in 10-year increments using a computational "driver times rate of use" approach. This approach multiplies a water use factor by the number of users to estimate future water demands. Based on available data, the residential sector portion of the model was developed using an econometric approach which statistically correlates sector water demands with weather and demographic factors that influence those demands. For the purposes of this model, those factors were found to include seasonality, water rates, median household income, the existence of leak detection programs, temperature, precipitation, and county binaries. The non-residential and agricultural portions of the forecast were developed utilizing a unit use approach to estimate future demands. The per unit water use rate, or water use factor, can be developed for most sectors given historical or current water use data and a defined demographic unit. Projection of future water demand then requires having projected values of the defined demographic unit. With this approach, the water use factor of each sector can be assumed to either remain constant into the future, decrease over time due to increases in water use efficiency, or increase over time due to more intensive water use. While trends in future water use can be difficult to know with certainty,

reasonable assumptions can be made that provide the foundation for estimating trends in the future and scenarios can be developed that consider demands under potential alternative conditions.

The regional water demand forecast was verified based on 2005-2010 regional water use data provided by the US Geological Survey (USGS) and MDNR. This methodology and similar model concepts have been used on numerous water resource projects including Oklahoma Comprehensive Water Plan, Georgia Regional Water Plans, Spokane County water demand model, City of San Diego water demand forecast, the ACT-ACF Comprehensive Water Study, and many others.

1.3 Conservation

Two distinct conservation scenarios were developed to assess the impacts of potential future conservation activities on regional publically supplied municipal and industrial water demands. These scenarios were developed based on current regional conservation activities as reported in the water use data request. The scenarios include estimated savings from residential and commercial metering, leak detection programs, educational programs on water savings, residential water audits and commercial water audits.

Water conservation activities are assessed in this study not only as an important tool for providing decreased costs to water providers and customers, but also as a means to reduce potential future gaps between water supply and demand.

1.4 Forecast Results

Under baseline conditions, that is, with no additional conservation measures, estimated system-wide demand under the medium growth scenario increases from 339.1 to 464.0 MGD, an increase of 36.8%. Water demand for the entire region is estimated to increase between 49.2 MGD and 245.0 MGD between 2010 and 2060, given the three different population growth scenarios. The total daily water demand in 2060 for the sixteen county region is estimated to grow to 388.3 MGD for the low growth scenario and up to 584.3 MGD for the high growth scenario.

Under conservation scenario I, water demands are estimated to decrease by 1-3% annually based on implementation of moderate conservation activities. Under conservation scenario II, water demands are expected to be reduced by 4-7% annually based on implementation of substantial conservation activities.

Table 1-1: Estimated Southwest Missouri baseline and projected average water demands (GPD) for the Southwest Missouri Region

	Baseline Demands			Conservation Sc. I			Conservation Sc. II		
	Growth Scenario								
Year	High	Medium	Low	High	Medium	Low	High	Medium	Low
2010*	339,305,578	339,127,961	339,127,961	339,305,578	339,127,961	339,127,961	339,305,578	339,127,961	339,127,961
2030	415,363,908	383,749,431	359,463,049	407,526,076	377,193,050	353,956,197	394,898,991	366,886,032	345,487,711
2060	584,263,474	464,011,711	388,331,036	569,202,759	453,986,856	381,622,250	543,771,066	437,376,540	370,692,784

* Variation in 2010 baseline demands between growth scenarios is due to the methodology used to determine future agricultural demands from a 2007 baseline. See Section 7.0, Agricultural Water Demand, for additional information.

1.5 Recommendations

The model has been developed to allow efficient updates and adjustments as additional data becomes available. As with all water demand forecasts, there are elements that can be improved upon by obtaining additional information. It is recommended that the forecast be adjusted with additional verified data sources as they become available. This study is intended for regional level planning purposes. The study findings are not intended for utility level planning decisions.

It is recommended that in Phase II an evaluation of supply availability and analysis of supply be conducted. Then compare the estimated future demands to supply to determine where additional supply sources are needed and what additional infrastructure is necessary to deliver that supply to meet the future demands of Southwest Missouri.

2.0 Introduction

2.1 Purpose

The purpose of this study is to evaluate current and future water demand through the year 2060 in sixteen counties in the Southwest Missouri area from primarily municipal, agricultural, and industrial/commercial sources. This study provides a comprehensive report addressing both the short-term and long-term water supply needs for the region. The sixteen county region includes Barry, Barton, Cedar, Christian, Dade, Greene, Hickory, Jasper, Lawrence, McDonald, Newton, Polk, Saint Clair, Stone, Taney and Vernon Counties in Southwest Missouri.

A comprehensive water demand analysis for the sixteen county region will serve as the initial guide for MDNR in coordination with the Tri-State Water Resource Coalition (Coalition) in determining the region's water needs. This will provide the base line of water demand to determine the most economically viable sources for satisfying the region's future water demand requirements.

2.2 Southwest Missouri Water Demand Characteristics

Study projections show that portions of Southwest Missouri may experience future water supply shortages. The Coalition was formed to address concerns such as high localized water demand growth rates, localized overuse of groundwater, and the potential for future overuse of surface water. The Coalition presented recommendations for addressing the water resource needs of southwestern Missouri. A final report presented on July 7, 2009 concluded that two new reservoirs to serve the eastern and western portions of the Tri-State region would be required to meet water supply needs. The Coalition publically stated that building new reservoir(s) is not currently their preferred alternative. The Coalition submitted official requests to the Kansas City Districts of the Corps of Engineers requesting reallocation of water supply storage within Stockton Reservoir.

The Coalition was initially formed based on a 2002 consultant's study commissioned to investigate the adequacy of the groundwater to meet the future needs of the Joplin Metropolitan Area. This study generated wide spread concern regarding the availability of reliable future water supplies for this regional area. The consultant determined that more water was being withdrawn from the groundwater (wells) than was being replenished. Missouri-American Water Company, and many neighboring water suppliers, recognized that they could face a water shortage in 10-15 years. As a result of this concern, the Tri-State Water Resource Coalition was formed. It is a not-for-profit, 501 c (4) corporation. The membership includes cities, water districts, utilities, businesses and individuals. The area served by the Coalition extends from Pittsburg, Kansas and Miami, Oklahoma on the west to Springfield, Missouri on the east, Lamar on the north and the Arkansas state line on the south.

The Coalition began leading an effort in 2003 to identify a long-term, sustainable water supply and develop an implementation strategy for the region. The Coalition completed two recent studies that identified potential water supplies consisting of existing and/or new surface water reservoirs. The 2006 Planning Assistance to States Study (B&V Project No. 41395) and a 2009 Water Supply Reservoir Screening Study both recommended that a more detailed analysis of projected water demands be conducted. The Corps' study identified 6 potential sources:

1. Grand Lake
2. Table Rock Lake
3. Stockton Lake
4. Truman Lake
5. A combination of Grand Lake, Table Rock Lake and Stockton Lake
6. Construct one or more new reservoirs

The Coalition subsequently met with officials from the State of Oklahoma to explore the possibility of acquiring water from Grand Lake but was not encouraged in its efforts. The Grand River Dam Authority which governs Grand Lake water has shown no interest in opening

discussions with the Coalition, and a lengthy moratorium prohibiting transferring water out of Oklahoma resulted in the conclusion that this water is not likely to be available to the majority of Coalition members.

Truman Lake was not found to be economically feasible. Stockton Lake's current discretionary water is already committed, but a congressional reallocation could provide water to the Coalition from Stockton Lake. Table Rock Lake has discretionary water available, though not enough to meet the total needs determined by the Coalition, and would also require congressional reallocation in order to provide necessary water to the Coalition. The Coalition desires to develop additional supplies and infrastructure in time to meet the critical future needs of the region.

The Coalition has also had reservoir site screening studies done, with 17 sites identified, but the Coalition prefers using existing sources. In order to meet this increasing regional demand for water, the Coalition believes it is essential to seek storage in Table Rock Lake and Stockton Lake to meet future water needs in the growing region. Preliminary data indicates that Stockton Lake and Table Rock Lake have adequate water supply available to meet the Coalition's requirements.

The Coalition strongly believes it would be in the best interests of the area to use these two reservoirs rather than build new reservoirs. The Coalition prefers existing reservoirs because a new reservoir would only store what is already being caught in the existing reservoirs; it is almost impossible to construct a new reservoir; and using existing reservoirs can be implemented faster than constructing a new reservoir.

While Springfield City Utilities has adequate supplies for the reasonable future, it may be called upon to supplement surrounding communities' supplies. If so, it could reduce the time in which City Utilities will need additional supply, making the need to act now to secure water for our future all the more imperative.

2.3 Regional Study Area

The sixteen county study area is located in southwestern Missouri and includes Barry, Barton, Cedar, Christian, Dade, Greene, Hickory, Jasper, Lawrence, McDonald, Newton, Polk, Saint Clair, Stone, Taney, and Vernon counties. These sixteen counties encompass a 9,615 square mile area, which accounts for 14.0% of the land area in the State of Missouri. The total population for the sixteen counties is 815,300, which equates to 13.61% of Missouri's total population. Greene County alone, mostly due to the City of Springfield, accounts for 33.75% of the entire population in the study area. Table 2-1 displays detailed population, housing, land, and income information for each county in the study area.

Table 2-1: Study Area Population and Housing

	2010 Population	2010 Housing Units	Median House Value	Households	Median Household Income	Land Area	Irrigated Acreage
Missouri	5,988,927	2,712,729	\$137,700	2,349,955	\$46,262	68,741.52	1,199,981
Barry	35,597	17,523	\$101,600	14,256	\$36,143	778.25	416
Barton	12,402	5,600	\$84,000	4,984	\$39,573	591.92	13,837
Cedar	13,982	7,224	\$92,300	6,135	\$32,800	474.48	150
Christian	77,422	31,576	\$146,800	28,385	\$51,135	562.65	158
Dade	7,883	3,965	\$73,000	3,276	\$32,714	490.01	8,621
Greene	275,174	125,387	\$125,500	112,993	\$41,059	675.30	123
Hickory	9,627	6,835	\$89,900	4,478	\$28,097	399.09	364
Jasper	117,404	50,668	\$93,400	44,505	\$37,894	638.49	5,169
Lawrence	38,634	16,649	\$94,700	15,043	\$38,350	611.74	2,416
McDonald	23,083	9,925	\$86,800	8,016	\$36,619	539.48	323
Newton	58,114	24,313	\$103,400	21,618	\$41,163	624.77	1,150
Polk	31,137	13,304	\$112,300	11,718	\$35,831	635.52	1,254
St Clair	9,805	5,640	\$82,800	4,320	\$32,217	669.98	208
Stone	32,202	20,373	\$139,900	13,529	\$41,351	464.03	74
Taney	51,675	29,255	\$132,100	20,281	\$39,026	632.44	--
Vernon	21,159	9,495	\$82,600	8,329	\$34,387	826.40	7,591
Study Area Total	815,300	377,732	\$102,569	321,866	\$37,397	9,614.55	41,854

As of 2010, the study area contained 377,732 housing units. The average median household income for the sixteen county area is \$37,397, somewhat less than the median income of the State of Missouri. The study area contains an estimated 41,854 acres of irrigated land according to the 2007 Census of Agriculture.

Some of the larger population centers in the study area include Bolivar, Branson, Carthage, Joplin, Neosho, Nevada, Ozark, and Springfield. Population, housing, and income information for these larger cities in the study area is shown in Table 2-2.

Table 2-2: Study Area Large Population Centers

City	County	2010 Population	2010 Housing Units	Median Household Income
Bolivar	Polk	10,325	4,432	\$31,786
Branson	Taney	10,520	8,599	\$45,499
Carthage	Jasper	14,378	5,753	\$29,024

City	County	2010 Population	2010 Housing Units	Median Household Income
Joplin	Jasper and Newton	50,150	23,322	\$36,884
Neosho	Newton	11,894	4,998	\$32,488
Nevada	Vernon	8,384	4,018	\$29,112
Ozark	Christian	17,820	7,311	\$48,473
Springfield	Greene, Polk, Christian	159,509	77,620	\$33,082

3.0 Data Collection and Water Demand Forecast

3.1 Data Collection

A water demand forecast model was developed based on water billing and production data, demographic and socioeconomic data, historical agricultural data and water use, and weather data. Water demand projections for the study area were first developed for the base year, or starting point of the forecast (2010) and then at 10-year intervals from 2020-2060. Given the variability of available data it was deemed appropriate to conduct the analysis using a custom-built Microsoft Excel based model. Utilizing this modeling approach allows flexibility for use of available data.

Following a comprehensive review of available data for the Little Rock and Kansas City Districts, it was concluded that water use data by sector was not available to facilitate development of a model with estimated water use projections by sector. As a result, a comprehensive water use data request was constructed for all large water providers in the sixteen-county region. The data request was distributed to all community-based water providers which currently serve populations greater than 100. The purpose of the data request is to provide baseline information for characterizing existing conditions. In an effort to collect data for several potential modeling scenarios, the data request included questions regarding monthly water consumption by sector for 2005-2010, number of metered customers by sector for 2005-2010, total population served 2005-2010, average annual monthly production and metered use 2005-2010, total accounts served, percent water demand per sector, as well as asking for information on billing rates and conservation efforts. Table 3-1, below, displays information about the survey as well as the response rate and population served information by county. A total of 131 surveys were sent out by the two districts. Of the 131 surveys sent out, 57 or 43.5% were returned. These responses accounted for 74.6% of the population served by public supply water systems and 44.4% of the total population for the study area.

Table 3-1: Water Demand Data Request Results

	Data Requests Sent	Data Requests Returned	Percentage of Data Requests Returned	Total Population	Of Data Requests Sent, Population Served	Of Data Requests Returned, Population Served	Percentage of Population Served Returned	Percentage of the Total Population
Barry	12	6	50.0%	35,597	18,815	12,127	64.5%	34.1%
Barton	5	3	60.0%	12,402	14,726	13,586	92.3%	100.0%
Cedar	5	2	40.0%	13,982	7,988	4,166	52.2%	29.8%
Christian	7	2	28.6%	77,422	38,715	1,405	3.6%	1.8%
Dade	5	3	60.0%	7,883	3,085	1,627	52.7%	20.6%
Greene	9	4	44.4%	275,174	183,026	167,575	91.6%	60.9%
Hickory	7	1	14.3%	9,627	3,607	687	19.0%	7.1%
Jasper	16	6	37.5%	117,404	95,359	80,095	84.0%	68.2%
Lawrence	8	4	50.0%	38,364	17,626	7,435	42.2%	19.4%
McDonald	9	2	22.2%	23,083	7,899	1,360	17.2%	5.9%
Newton	8	2	25.0%	58,114	17,156	11,460	66.8%	19.7%
Polk	9	4	44.4%	31,137	15,006	12,086	80.5%	38.8%
St Clair	5	4	80.0%	9,805	3,667	3,523	96.1%	35.9%
Stone	8	3	37.5%	32,202	6,512	3,945	60.6%	12.3%
Taney	9	5	55.6%	51,675	30,265	21,513	71.1%	41.6%
Vernon	9	6	66.7%	21,159	21,400	19,117	89.3%	90.3%
Total	131	57	43.5%	815,030	484,852	361,707	74.6%	44.4%

3.2 Water Demand Forecast Approach

The basic methodology of the water demand model is to estimate water demand separately for each water use category, also referred to as a water use sector. The methodology selected to forecast water demand for each sector is determined by data availability. This is the case for all sectors of the Southwest Missouri forecast.

For each sector, the basic methodology for estimating water demand is to calculate a product of the driver and the rate of use. The driver is defined as a countable unit driving water demands up and down, which can be projected in future years, such as population or number of households, number of acres irrigated, number of employees in a business, etc. The rate of use is defined as the quantity of water used by the driving unit, such as gallons per person per day, gallons per household, or acre-feet (AF) per irrigated acre.

The per unit water use rate, or water use factor, can be developed for most sectors given historical or current water use data and a defined demographic unit. Projection of future water demand then requires having projected values of the defined demographic unit.

With this approach, the water use factor of each sector can be assumed to either remain constant into the future, decrease over time due to increases in water use efficiency, or increase over time due to more intensive water use per unit. While trends in future water use

can be difficult to know with certainty, reasonable assumptions can be made that provide the foundation for estimating trends in the future, and scenarios can be developed that consider future water demands under potential alternative conditions.

Data used to analyze water use, both historical and estimated future, include data from metered water use and data describing factors that influence water use for specific water use sectors. The Southwest Missouri Water Demand Forecast Model was developed with the sector structure shown in Figure 3-1.

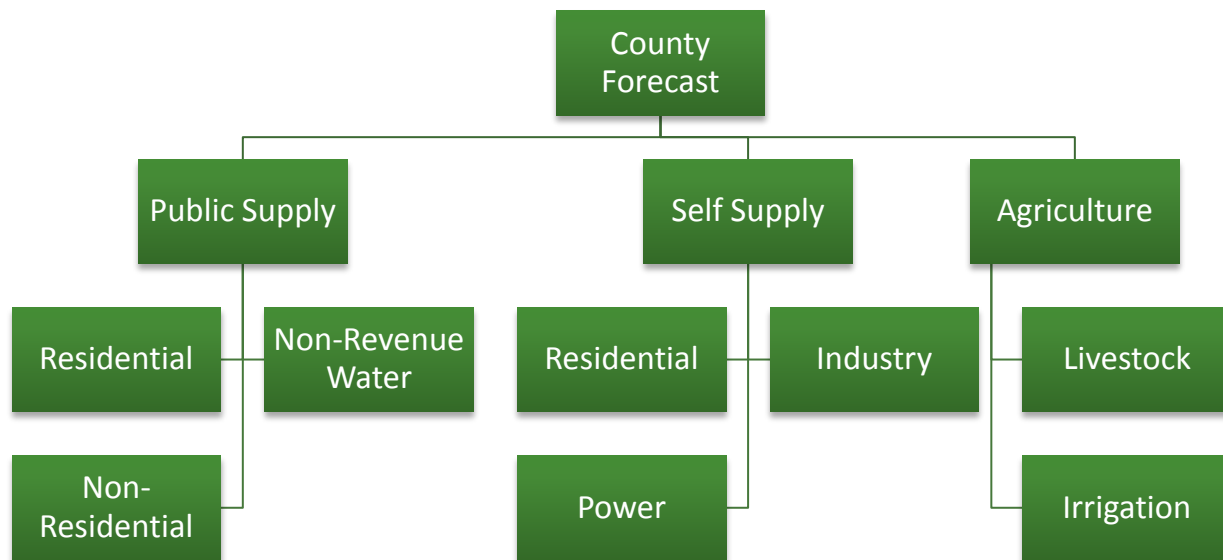


Figure 3-1: Structure of the Southwest Missouri Water Demand Forecast Model

4.0 Municipal and Industrial Water Use Data and Factors

4.1 Municipal Systems

A public supply municipal forecast can be derived using multiple forecast methodologies based on available data. For the purposes of this model the Little Rock and Kansas City Districts, with input from MDNR and CDM Smith, agreed that ideal data for this analysis would include monthly water use data by county for the period of 2005-2010 for the following sectors:

- Single Family Residential
- Multi-Family Residential
- Commercial
- Industrial
- Institutional

Ideally, these data would include monthly consumption for each sector as well as the monthly number of metered customers for each sector. Analysis of historical data from 2005-2010 allows for an accurate estimate of baseline water use while normalizing for weather variables in certain years during this time period (i.e. periods that are wetter or dryer than the regional average).

Data collected from the water provider data request was utilized to establish baseline water use trends. The data were supplemented with data from the Missouri Public Water Census, where necessary, to derive the information needed for the demand model.

Using the data from the providers, the provider average per capita water use by sector was derived. The following equation was used to calculate per capita water demand by provider:

$$GPCD_{s,m} = \frac{\left(\frac{G_{s,m}}{D_m}\right)}{P_{s,m}}$$

Where:

$GPCD_{c,s,m}$ = per capita demand for sector_(s), and month_(m) in gallons per capita per day

$G_{s,m}$ = consumption by sector_(s) for month_(m) in gallons

D_m = number of days per month_(m)

$P_{s,m}$ = population served by provider by sector_(s) and month_(m)

These sector demands were used to establish trends in water use for each county, which may be used in an econometric analysis to establish county-wide regional baseline demands.

Examples of charts used in this trend analysis are shown below in Figure 4-1 and Figure 4-2.

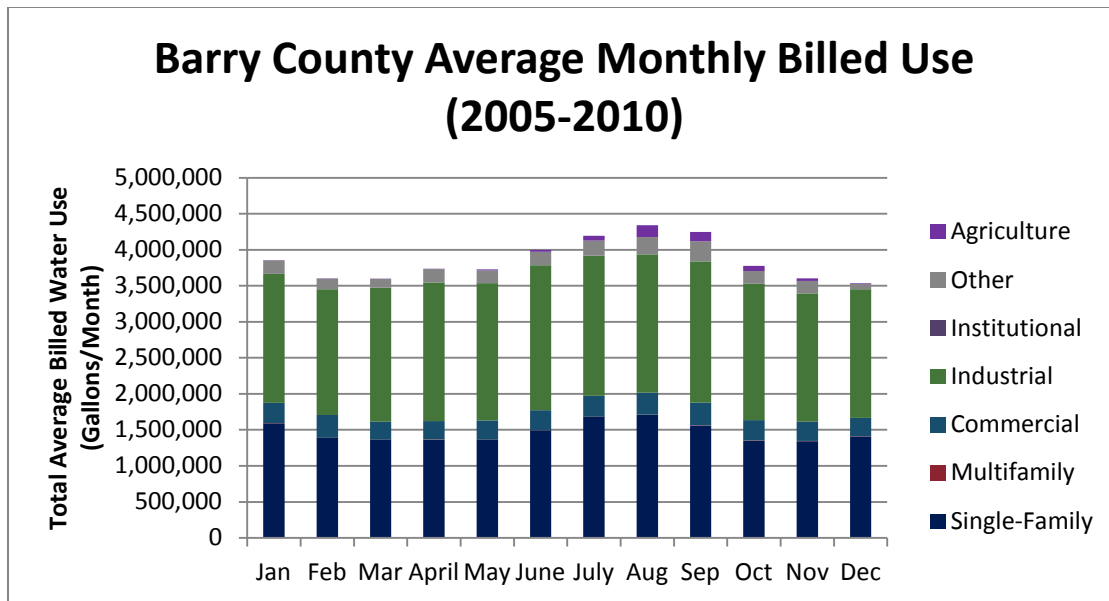


Figure 4-1: Barry County Average Monthly Billed Use by Sector (2005-2010)

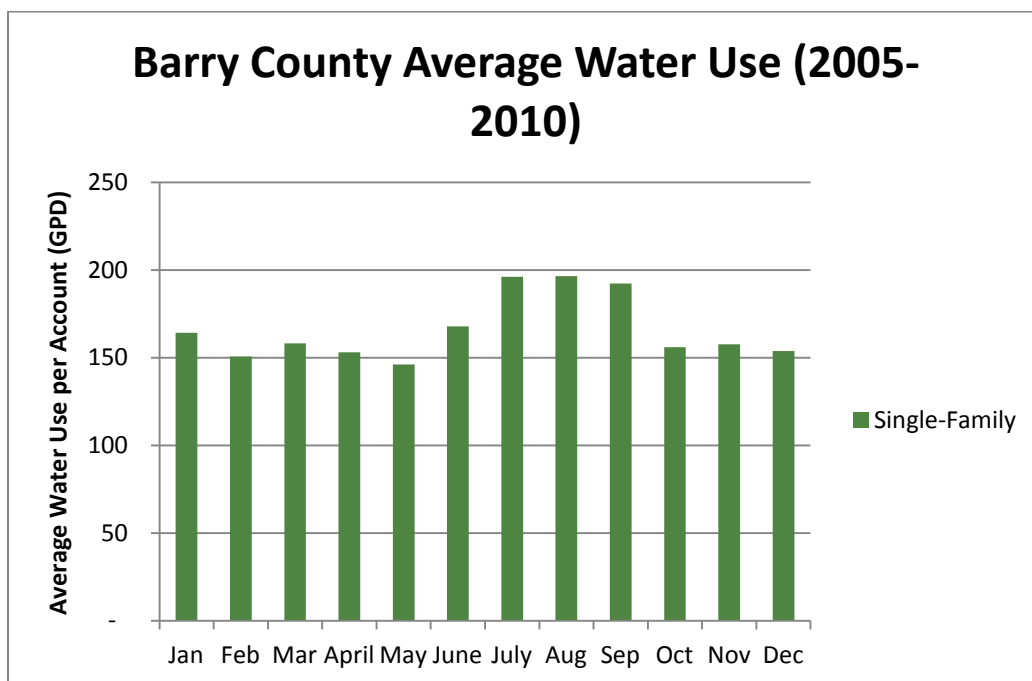


Figure 4-2: Barry County Single Family Average Water Use (2005-2010)

In addition to providing per capita water use values by sector, the results of this analysis were used to identify any outliers or data entry errors in the dataset. In many cases, outliers were determined to be the result of incorrect units of measure. In these cases, gallons per day were calculated with the available data. Any additional outliers or data entry errors were deleted from the database to avoid miscalculation of per capita demands.

Following a detailed review of the provider survey database, final analysis was completed to determine baseline per capita water use for the public-supplied residential and non-residential water users. While this data established consistent trends in water use for the residential sector, trends in the non-residential sector were varied. Based on available data, it was determined that an econometric modeling approach would best represent water use in the residential sector. This approach uses calculated per capita values along with demographic and weather data to correlate sector water demands with factors that influence those demands (details on the residential econometric model are presented in Section 8.0, Development of the Water Demand Model). For the non-residential sector, the factors that influence demands were found to vary widely, therefore, it was determined that a per unit use approach would best capture water use in the non-residential sector.

For non-residential water users, the rate of water use per employee is unique to the type of establishment, e.g., water use per employee would be significantly higher at a restaurant where water is being used to wash dishes and prepare food than at a bank where water use is for sanitary purposes. To account for this, the per employee water use rates were developed from the IWR-MAIN Water Demand Management Software Non-residential Database. The non-residential database contains average gallons of water use per employee per day (GED) at the 2-digit and 3-digit North American Industrial Classification System (NAICS)¹ code. A special tabulation was computed to transform the data to 2-digit NAICS code, where required. The water use coefficients represent all water used at a given establishment on an average day divided by the number of employees. Establishments that generally only use water for sanitary use, such as retail trade shops and offices, have lower water use rates than establishments using water for additional services, such as for food preparation at schools or laundry washing at hotels.

Supplemental information regarding the types of employment establishments in the arts, entertainment, and recreation NAICS classification in the Southwest Missouri Region show that establishments in this classification generally can be categorized as performing arts, spectator sports, and related industries. According to three digit NAICS codes, water use for performing arts averages 33.0 GED, as opposed to 446.6 GED for the two digit NAICS for arts, entertainment, and recreation. Therefore, the 33.0 GED water use value was assigned to all sixteen counties. Similarly, supplemental information shows water use in the local, state, and federal government employment group more closely follows the average of NAICS GED of 68.2 for NAICS codes 921 (executive, legislative, and other general government), 922 (justice, public order, and safety activities), 923 (administration of human resource programs), and 924 (administration of environmental quality programs), as opposed to 125.4 GED for the two digit

¹ NAICS is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

NAICS for Public Administration. Therefore, the 68.2 GED water use value was assigned to all sixteen counties. Similarly, the two-digit NAICS for accommodations and food services (NAICS code 71) of 185.5 was higher than average usage for this employment group in the Southwest Missouri region, therefore a GED of 149.8, taken from the average of three digit NAICS codes for accommodation (code 721, GED 213.4) and food services and drinking place (code 722, GED 86.2), was assigned to the accommodations and food services employment group. The resulting water use factors are summarized by major employment groups in Table 4-1.

Table 4-1: Non-residential Water Use Coefficients from IWR-MAIN

NAICS	GED*
11 - Agriculture, forestry, fishing and hunting	111.8
21 - Mining	488.4
22 - Utilities	28.4
23 - Construction	66.6
31 - Manufacturing ¹	144.5
42 - Wholesale trade	44.1
44 - Retail Trade	46.4
452 - General Merchandise Stores	36.5
453 - Miscellaneous Store Retailers	66.1
48 - Transportation and Warehousing ²	57.2
51 - Information	28.0
52 - Finance and insurance	59.8
53 - Real estate and rental and leasing	163.5
54 - Professional and technical services	68.6
55 - Management of companies and enterprises	64.0
56 - Administrative and waste services	41.2
61 - Educational Services	103.6
62 - Health care and social assistance	84.7
71 - Arts, entertainment, and recreation ³	33.0
72 - Accommodation and food services ³	149.8
81 - Other services, except public administration ⁴	73.9
Local, State and Federal Government ³	68.2

* GED - gallons per employee per day

1 Manufacturing GED adjusted for Barry County: 354.0 and McDonald County: 778.0 (See Section 5.3)

2 Transportation and Warehousing GED adjusted to 216.00 for Barry County

3 Adjusted from standard GED based on supplemental regional information

4 Average county-wide employment GED applied for each individual county (overall average 73.9)

Additionally, some GED values were adjusted for individual counties based on supplemental data. The transportation and warehousing employment group (NAICS code 48) was changed for Jasper County to reflect employment mainly in the warehousing and storage industry. The GED of 57.20 was changed to 216.0 based on the GED for the three digit NAICS category for

warehousing and storage (NAICS code 493). Additionally, GED values for NAICS code 81 – other services except public administration, were changed to represent average GED values for all employment groups by county. This change resulted in an average value for the sixteen county region of 73.9 GED, however, each county was assigned its own individual county-wide average employment GED water use for this category of employment. Changes to the manufacturing GED for Barry and McDonald counties were based on self-supplied industry data and are discussed later in this document in Section 5.3.

4.1.1 Seasonality

For residential water users, seasonality is captured as a result of econometric analysis, however, for non-residential users seasonality was calculated and added to the demand forecast. In order to distribute the yearly GED water into representative monthly values, the seasonality of non-residential water use based on the provider survey results were calculated. Monthly seasonality is determined by first calculating the average non-residential GPD per account water use for each county by month based on available survey data. The total non-residential annual average water use was then calculated for each county using the calculated monthly water use values. The monthly percent departure from the annual average was calculated by dividing monthly average water use by annual average water use and subtracting this percentage from 100 percent. These calculations generally result in a monthly percent decrease in water use from the average during winter months, and a percent increase in water use during summer months. For those counties without monthly non-residential water use data, a weighted average approach using all available survey data was applied. Monthly non-residential seasonality by county can be viewed in Table 4-2.

**Table 4-2: Public Supply Non-residential Seasonality of Water Use
(% Departure from Annual Average)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Barry	-6%	-7%	-4%	-1%	-1%	5%	5%	8%	9%	2%	-5%	-9%
Barton ¹	-7%	-7%	-9%	-6%	-8%	2%	11%	19%	16%	0%	-11%	-7%
Cedar	-3%	-1%	-7%	-12%	-9%	13%	15%	18%	7%	6%	-21%	-27%
Christian	-21%	-9%	-27%	-10%	10%	5%	9%	23%	21%	4%	-11%	-24%
Dade	-4%	2%	-28%	-1%	-7%	5%	10%	20%	9%	-10%	8%	-24%
Greene	-1%	-4%	-5%	-4%	-9%	-3%	7%	21%	13%	1%	-13%	-19%
Hickory ²	-4%	5%	-10%	0%	-1%	13%	1%	13%	-25%	0%	-1%	-1%
Jasper	-15%	-12%	-15%	-13%	-15%	4%	16%	19%	25%	-5%	-5%	-11%
Lawrence	-17%	2%	-17%	-3%	0%	8%	9%	17%	15%	0%	-13%	-18%

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
McDonald ¹	-7%	-7%	-9%	-6%	-8%	2%	11%	19%	16%	0%	-11%	-7%
Newton ¹	-7%	-7%	-9%	-6%	-8%	2%	11%	19%	16%	0%	-11%	-7%
Polk	-11%	-9%	-16%	-1%	1%	9%	13%	8%	20%	5%	-14%	-22%
St Clair ¹	-7%	-7%	-9%	-6%	-8%	2%	11%	19%	16%	0%	-11%	-7%
Stone	-14%	-1%	-24%	-27%	-11%	0%	10%	4%	21%	17%	7%	-8%
Taney ³	-96%	-96%	-70%	-31%	-18%	31%	44%	43%	24%	5%	-24%	-44%
Vernon	-8%	4%	-14%	-2%	-9%	-6%	15%	10%	9%	8%	-7%	-11%

¹ Regional average seasonality due to insufficient data

² November Seasonality applied to December due to insufficient data

³ January seasonality applied to February due to insufficient data

4.1.2 Non-Revenue Water

The water provider survey collected data on both water production and demand. For each provider that responded to the survey and provided the necessary data, this information was used to derive an average non-revenue water (NRW) percentage. The difference between water produced and billed water sales includes authorized meter water usage that is not billed, unauthorized water use, billing errors, metering errors, line breaks, and system losses. NRW is often further separated to distinguish real water loss, such as line breaks, storage overflow, and system losses, from apparent loss, such as unmetered use, billing errors, and metering errors. Authorized unmetered water uses include uses such as fire training, firefighting, water line and reservoir flushing, and water used for street cleaning. Real loss as a percent of total production can usually be maintained at less than about 10 percent through system leak detection and line replacement programs.

Survey results for NRW ranged from 10.9 percent to over 40 percent. For the purposes of the model, any reported NRW over 15 percent was assumed to be un-metered consumption, thus the percentage was capped at 15 percent and referred to as system losses. Based on this methodology, the overall average system loss percentage from all survey data is 14.0 percent. In order to aggregate this data from the provider level to the county level, a weighted average approach was utilized based on the population served by each provider. For those providers without available NRW data from the survey, the region-wide average of 14.0 percent system losses was applied. No NRW data were available for Barton, Christian, McDonald, Newton, St Clair, and Stone counties; therefore the region-wide estimate of 14.0 percent system losses was applied for these counties. Results of the system loss percentage for each county are shown in Table 4-3. No seasonality was applied to system losses; therefore, for the purposes of this model system loss percentages remain constant during all months of the year.

Table 4-3: Estimated Public Supply System Losses

	System Losses		System Losses
Barry	14.3%	Lawrence	14.6%
Barton	14.0%	McDonald	14.0%
Cedar	12.8%	Newton	14.0%
Christian	14.0%	Polk	14.6%
Dade	13.6%	St Clair	14.0%
Greene	14.8%	Stone	14.0%
Hickory	14.1%	Taney	14.2%
Jasper	14.2%	Vernon	14.4%

4.2 Self-Supplied Residential

The self-supplied residential sector captures water use from households not connected to a public water supply system. For the purposes of this model, it is assumed that public-supplied residential water use trends are representative of self-supplied residential users as well. The residential public-supplied per capita water use values are applied to the self-supplied residential population to determine total baseline water use for the self-supplied residential population.

4.3 Self-Supplied Non-Residential

A sector was added to the Southwest Missouri demand forecast to represent water use from large self-supplied non-residential users, such as manufacturing, aquaculture, thermoelectric power, mining and food processing facilities. The data used in this sector were obtained from *USGS Estimated Water Use in the United States, County-Level Data*. This dataset contains state-provided county-wide estimates of total surface water and groundwater withdrawals for self-supplied non-residential users in MGD. Additionally, golf course irrigation totals were provided for selected counties in the study region by MDNR. These golf course irrigation totals were added to the self-supplied non-residential demands for the months of May through October.

5.0 Municipal and Industrial Demographic Data and Projections

5.1 Municipal Systems

5.1.1 Public Supplied Residential

As mentioned in Section 2.0, Introduction, population and employment projections can be used as the primary driver of a forecast. Historical population and population projections by county were provided by MDNR. Historical county populations from 2000-2010 were obtained from the Missouri Census Data Center, while population projections through the year 2030 were obtained from the Missouri Office of Administration.

Population projections were developed by MDNR as follows:

- Historical population from 2000-2010 and Office of Administration projections from 2010-2030 were obtained and the annual growth rates were calculated. Two types of population projections were made – first, a linear population projection and second, a method based on births, deaths and immigration data.
- Linear projections were computed by assuming that the population for each county would grow at the same rate as that of 2025-2030, in other words, the population growth rate would be constant between 2025 and 2060.
- In order to generate projections using the second method, data on births, deaths and immigration were obtained for 2000-2030 from Missouri Department of Health and Senior Services. Three types of projections – a base-case low growth, a medium growth and high growth scenarios were developed. The population for the base-case low growth was calculated based on:

$$\text{Population}_t = \text{Population}_{t-1} + \text{Births}_t - \text{Deaths}_t + \text{Net Immigration}_t$$

Where :

t = current year

t-1= previous year

- For base-case low growth population projections from 2030-2060, the population was calculated based on a moving average population for the past 15 years and a standard deviation. The projections were very conservative and hovered around the average population. Typically, the population growth rate slowed down for most of the counties as we approach 2050.
- Growth rates for each county from 1970-2000 were calculated and the lowest growth and the highest growth were calculated. Medium growth was derived as an average

between low growth and high growth scenarios. Based on this data, the medium and high-growth scenarios projections were made.

Following examination of the results of each method of population projections, it was concluded that the method based on births, deaths and immigration data would provide the most accurate estimation of population growth in this region. The three growth scenario projections were used to accommodate low, medium, and high water demand scenarios for the M&I forecast.

Extremely high recent growth rates in Christian County resulted in unrealistic estimated projections in future populations. As a result, the approach for Christian County population projections was slightly altered. For the time period from 2030 to 2060, the regional (10 county) average growth rate was applied to Christian County.

Since population projections were based on the entire county, a percent served will be applied to the population for each county to estimate the population served by public supply utilities. This percentage is calculated by dividing the 2010 population served by public supply community classified utilities (taken from the Missouri Census of Public Water Supply) by the 2010 total county population. For the purposes of this model, it is assumed that the percent served will remain constant into the future for each county.

During a review and comment period for members of the Tri-State Water Resource Coalition, City Utilities of Springfield provided population served data. Based on the additional data, it was determined that the public-supply population served of Springfield would be best represented by an increase to 236,000 in the base year. This resulted in an increase of 48,167 public-supply individuals from the original MDNR estimates. Because population served by public-supply is based on a percentage of the total population, these changes resulted in a decrease of 48,167 individuals under the self-supplied residential sector of the forecast.

5.1.2 Public Supplied Non-Residential

The public-supply non-residential forecast is driven by economic activity, which can be difficult to predict. Thus, a typical measure of non-residential water use in forecasting is employment, which is more foreseeable. Employment projections were developed for Southwest Missouri and provided by MDNR by county and by employment group. Employment projections through 2018 were obtained from the Missouri Economic Research and Information Center (MERIC). The employment projections were developed by MERIC and MDNR as follows:

- Survival rates for male and female population were obtained from Office of Administration. The data are at a 5-year cohort level from 2000 to 2060. The current male and female population projections that are available until 2030 were extended to 2060 based on the survival rates.

- The labor force participation rate, i.e. population in the age group of 15-64, was calculated for each year. This labor force participation rate was applied to the population projections from 2030 to 2060 to develop the employment projections.
- Quarterly Census of Employment and Wages data was used to calculate the percent of employment in each NAICS sector for the year 2010 for each county. It is assumed that the percentage of employment in each NAICS sector will hold constant in each county until 2060. The county percentage employment by NAICS was applied to total employment for each county until 2060 to derive estimates of employment by NAICS sector.

5.1.3 Other Demographic Information

For the public-supplied and self-supplied residential forecasts, an econometric modeling approach is utilized which statistically correlates sector water demands with factors that influence those demands. Among these factors are county demographics including median household income and average household size. In an effort to examine potential relationships between water use and econometric demographics, MDNR provided median household income and average household size by county for all sixteen counties included in this analysis. The data were compiled from the 2010 US Census. County demographic data for median household income and average household size is assumed to be the same for both the public-supply and self-supply analysis.

5.2 Self-Supplied Residential

For the purposes of this model, it is assumed that all water users not served by a public water supplier are self-served water users. Therefore the population estimates for self-supplied residential customers are calculated by subtracting the estimated public-supply population from total county population in each year. The self-supplied residential population projections will be calculated for each county assuming a constant percentage into the future.

5.3 Self-Supplied Non-residential

Self-supplied industry employment numbers were needed in order to subtract employment from the total county employment projections used in the public-supply non-residential forecast, to avoid double-counting. However, employment estimates were available only for self-supplied manufacturing in Barry and McDonald Counties, the two largest water users in the self-supplied industry sector. For these counties, GEDs were re-estimated in the public-supplied non-residential sector for manufacturing using a weighted average approach. The new manufacturing GED was estimated using the average of the standard NAICS code manufacturing GED multiplied by the total county public supplied employment and the provided self-supplied manufacturing GED multiplied by the total county self-supplied

employment. These calculations resulted in an increase of 209.5 GED for manufacturing in Barry County, to bring the new total to 354.0 GED and an increase of 633.5 GED for manufacturing in McDonald County, to bring the new total to 778.0 GED.

Because future conditions in the self-supplied non-residential sector are unknown, this sector was forecasted into the future using a no growth scenario in which water use demands remain constant through 2060. Additionally, seasonality of the sector is only included for irrigation demands at golf courses (May through October). It is assumed that industrial, thermoelectric power, mining, and aquaculture self-supplied users do not exhibit trends in seasonality throughout the year, and therefore no seasonality for these users are included in the forecast.

6.0 Historic Weather Data

Historical weather data including total monthly precipitation and the monthly average of daily maximum temperature were collected for the years 2005-2010 for each county. Data were collected from the High Plains Regional Data Center. This monthly data is averaged to establish average monthly maximum temperature and precipitation for each county. Weather data is used in the econometric analysis for public-supplied residential water use.

Table 6-1: Study Area Average Monthly Maximum Temperatures by County

Average Monthly Daily Maximum Temperatures												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Barry	44.5	45.8	58.9	67.1	74.6	82.9	85.9	87.8	79.2	68.8	60.2	45.5
Barton	44.0	46.5	59.3	68.1	76.0	85.7	88.8	90.5	80.8	69.9	60.5	44.4
Cedar	43.4	45.1	59.6	68.8	75.7	86.4	90.1	91.6	80.3	70.4	59.8	45.2
Christian	45.0	47.3	60.1	68.0	75.2	85.3	88.6	90.6	80.5	68.9	59.8	45.4
Dade	42.5	45.2	57.9	66.5	74.5	84.3	87.3	88.8	79.3	68.5	58.9	43.5
Greene	43.9	47.0	59.5	67.6	75.6	85.7	88.6	89.8	79.7	68.4	58.5	44.3
Hickory	43.3	46.0	58.5	67.5	75.1	85.5	88.1	89.4	79.8	68.4	58.8	43.0
Jasper	46.3	48.8	60.9	69.5	77.9	85.9	90.6	91.1	82.3	71.7	59.8	47.5
Lawrence	45.1	47.2	59.6	67.7	75.8	85.5	88.7	90.7	80.9	69.9	60.6	45.8
McDonald	47.8	50.2	61.7	69.6	76.6	83.4	88.3	89.9	81.2	71.0	60.5	48.5
Newton	44.8	47.2	59.8	68.4	75.6	84.1	87.1	88.8	79.7	69.0	60.8	45.5
Polk	43.2	45.7	58.3	67.6	75.7	85.3	88.0	89.8	79.9	68.7	59.4	44.0
St Clair	40.7	43.5	57.2	66.3	74.4	84.1	86.7	88.8	78.6	67.8	58.0	41.8
Stone	46.7	48.2	60.7	70.0	77.2	86.8	89.7	91.4	81.5	70.6	61.6	46.5
Taney	46.1	47.7	60.6	69.4	77.1	87.2	88.9	90.5	80.6	69.4	60.0	45.7
Vernon	42.6	45.2	58.4	67.8	75.9	85.9	88.6	89.8	80.5	69.8	59.8	43.3

Table 6-2: Study Area Average Monthly Precipitation by County

Average Monthly Precipitation												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Barry	3.8	2.2	4.4	4.5	6.3	4.2	3.0	3.9	6.2	3.2	1.9	2.2
Barton	2.3	2.2	3.8	5.1	7.3	8.9	4.8	2.7	5.9	3.6	2.1	2.5
Cedar	2.2	2.5	3.8	5.4	6.5	7.8	4.1	2.7	5.1	3.2	2.2	2.3
Christian	3.7	2.6	4.5	4.1	4.7	5.2	3.2	3.5	6.9	3.4	3.1	2.2
Dade	2.4	2.1	3.9	5.0	6.4	6.1	3.7	3.1	5.6	2.9	1.9	2.1
Greene	3.3	2.5	3.9	5.0	4.7	6.0	3.0	3.5	4.8	3.0	3.0	2.4
Hickory	2.2	2.0	2.8	5.4	4.9	5.8	3.5	3.4	5.8	3.8	1.8	1.9
Jasper	2.2	2.1	3.3	4.7	6.3	7.2	3.1	3.8	4.9	2.8	2.2	2.3
Lawrence	3.2	1.8	4.0	4.4	5.1	7.3	3.7	3.6	5.8	3.2	3.0	2.2
McDonald	2.6	1.9	3.8	5.2	5.6	5.8	3.2	3.9	3.6	3.0	3.2	2.4
Newton	3.2	2.3	4.0	5.4	7.1	5.1	5.1	3.5	6.9	4.0	2.2	2.1
Polk	2.8	2.1	3.6	4.7	6.1	7.1	4.4	3.4	5.3	2.9	2.4	2.0
St Clair	1.9	1.7	3.3	4.7	4.7	6.0	5.0	4.4	5.0	3.6	1.9	1.8
Stone	3.3	2.5	4.9	4.6	5.7	5.8	3.5	2.7	5.7	3.4	2.8	2.1
Taney	2.8	2.3	5.0	3.9	4.7	4.2	5.0	2.6	6.0	3.2	2.1	1.9
Vernon	1.5	2.0	3.5	5.7	6.8	6.4	5.3	2.6	5.6	3.6	1.8	1.7

7.0 Agricultural Water Demand

For the Southwest Missouri model, current and future agriculture water demands are estimated by county for two sub-sectors: livestock and irrigation.

The Census of Agriculture (Ag Census) is the main source of data utilized for the agriculture water demand forecast. Taken every 5 years by the United States Department of Agriculture (USDA), the Ag Census is a complete count of U.S. farms and ranches and the people who operate them. The most recent Ag Census was conducted in 2007 and reports on land use and ownership; operator characteristics; production practices including irrigation, income, and expenditures; livestock counts; and many other areas.

7.1 Livestock Water Use

Livestock require water for animal nutrition, animal cooling, sanitation, and waste removal. Current estimates of livestock water demand were developed based on the major livestock groups in Southwest Missouri and their respective daily water requirements. Major livestock groups evaluated include: cattle/calves, beef cows, milk cows, other cattle, hogs/pigs, sheep/lambs, poultry-layers, poultry-pullets, poultry-broilers, turkeys, goats, and horses/ponies. The monthly livestock water demand is calculated by multiplying the daily water

requirement (gallons) for each group by the number of livestock and then the number of days in a month.

$$QLS_{n, c, m} = LSC_{n, c, m} \times DWR_n \times D_m$$

Where:

- $QLS_{n, c, m}$ = Livestock water demand in gallons for animal group (n) in county (c) in month (m)
- $LSC_{n, c, m}$ = Livestock count for animal group (n) in county (c) and month (m)
- DWR_n = Daily water requirement per animal (n) in gallons per day
- D_m = Days in month (m)

For the purposes of this model, it is assumed that daily water use is constant year-round for each animal group. Total monthly water demand for each animal group is then summed by county to determine total daily consumption for each county.

Once current livestock inventories by county were collected, a methodology was developed to project livestock inventories by county to 2060. Two separate growth scenarios were developed for the projection of water use by livestock. The moderate growth scenario for livestock is applied to the high growth scenario of the municipal water demand forecast. The no growth scenario for livestock is applied to both the medium and low growth scenarios of the municipal forecast.

The moderate growth scenario is used to estimate a reasonable maximum projection for livestock. To develop this scenario an analysis was conducted from the three most recent Ag Census years. The Ag Census data from 1997, 2002, and 2007 were analyzed to obtain the highest reported number of livestock by livestock group in each county. It is believed that using the highest reported number allows for maximum future fluctuations due to unforeseen circumstances. The historical maximum was then assumed to be the build-out inventory for 2060. Linear interpolation was applied to obtain the inventory for forecast years between 2007 and 2060. In some instances, 2007 represents the highest livestock count for a given county and animal group, in which case no growth is assumed.

In the no growth scenario, 2010 water use demands from livestock are assumed to remain constant through 2060.

7.2 Crop Irrigation

Variation in weather, politics, and socioeconomic forces cause significant swings in cropping patterns, irrigation use, and ultimately water demand for irrigation. The demands developed for 2060 under this task represent a reasonable maximum demand for each county under average weather and current economic conditions (i.e., base scenario) that is a useful input into the planning process. A basic methodology was developed based on the best available data to

estimate irrigation water demands now and in the future. The methodology is total irrigated acres by county times a crop irrigation water requirement.

Crop irrigation water demand for a given county is driven by the type of crops planted, irrigation water required for those crops, number of acres planted, and type of irrigation system utilized. The crop irrigation water requirement was determined by subtracting average growing season precipitation from 2001-2010 by county from an average crop water requirement of 19 inches for this study area.

The total irrigation water demand was converted from acre-inches to gallons. Equations used to complete crop irrigation requirements are shown in the equations below:

$$CIR_c = PR_{c,b} - \Delta P_{c,b}$$

$$QI_{c,b}^{Gal} = IA_{c,b} \times CIR_c \times 27,156$$

Where:

- CIR_c = Total crop irrigation requirement in inches per growing season in county (c)
- $PR_{c,b}$ = Crop precipitation requirement in inches in county (c) in base year (b)
- $\Delta P_{c,b}$ = Average growing season precipitation in inches in county (c) for base year (b) (2001-2010 average)
- $QI_{c,b}^{Gal}$ = Irrigation water demand in county (c) in the base year (b) (2007) in gallons
- $IA_{c,b}$ = Irrigated acres in county (c) in base year (b) (2007)
- 27,156 = gallons per inch per acre

Irrigated acreage by county was collected from the Ag Census for the base year (2007) (variable $IA_{(c,b)}$ in the equation above). This Ag Census category includes all land watered by any artificial or controlled means, such as sprinklers, flooding, furrows or ditches, sub-irrigation, and spreader dikes. The crop precipitation requirement (variable $PR_{(c,b)}$) and average growing season (June – Sept) precipitation from 2001-2010 (variable $\Delta P_{(c,b)}$) were collected from the agricultural extension service. The extension estimates that there is a 19 inch precipitation requirement for the study area, regardless of crop type. For the purposes of this model, we assume that for this region the growing season is a 122 day period from the beginning of June through the end of September. Also, the model assumes that required precipitation is the same for each month regardless of crop growing stage. The model assumes that all soil types are consistent and there is 100% efficiency in irrigation systems. These assumptions are reasonable for general planning purposes. The assumption regarding irrigation efficiency may be modified to adjust for water losses during irrigation practices and subsequently used as a base for estimating water savings from improved irrigation techniques. However such an analysis would require estimates of the percent of irrigation water that is applied from flood, spray, and micro-drip technologies by county.

Two separate growth scenarios were developed for the projection of irrigation water use. The moderate growth scenario for irrigation is applied to the high growth scenario of the municipal water demand forecast. The no growth scenario for irrigation is applied to both the medium and low growth scenarios of the municipal forecast.

The moderate growth scenario is used for estimation of future water requirements for irrigation and is based upon the projection of future irrigated acres within each county. Thus, estimates were developed to project the total number of irrigated acres by county through 2060. Historical levels of irrigated acres by county as reported in the Ag Census were reviewed. The maximum number of acres irrigated from 1987 to 2007 is assumed to represent the maximum build-out irrigated acres in 2060. For a number of counties, irrigated acres were highest in 2007 in comparison to prior periods, resulting in "no growth" in the forecast for those counties. The number of irrigated acres per forecast year is interpolated from the 2007 current acreage to the 2060 build-out maximum using linear interpolation. Thus, crop irrigation demand will show a linear growth from 2007 to 2060 for most counties.

In the no growth scenario, 2010 water use demands from irrigation are assumed to remain constant through 2060.

8.0 Development of the Water Demand Model

8.1 Public Supplied Residential

Following analysis of the sixteen county Southwest Missouri provider data request results, it was determined that an econometric approach would be the ideal means to determine average monthly baseline per capita water use for the residential sector. An econometric approach statistically correlates sector water demands with factors that influence those demands. The econometric model relies on regression analysis to compute coefficients or elasticities that describe how a water use factor influences water demand. A regression analysis calculates elasticity values for each water use factor, or explanatory variable, used to explain the variation in water use. For instance, a price elasticity of -0.10 implies that a ten percent increase in real price will result in a one percent decrease in water demand.

The following is an example of an equation used to calculate sector water demand using an econometric approach:

$$E(y) = a + b_1x_1 + b_2x_2 + b_nx_n$$

Where:

- $E(y)$ = the expected value of dependent variable (y) as estimated by the function
- a = intercept, or the value of (y) when $x = 0$

- b = coefficient of x , or the change in y given a change in x
- x = value of the independent variable

Based on the available data, one statistical model was generated for residential water use. The independent variable is the residential per capita water use for single family and multi-family units. These per capita values were calculated using the data collected from the public water provider survey using the methodology explained in Section 4.1, Municipal Systems.

The explanatory variables that the statistical model found relationships to public supply residential water use are:

- Monthly Binary Variables (Seasonality of the forecast January-December)
- County Binaries for the following counties with unusual usage patterns:
 - Cedar County
 - Dade County
 - Stone County
 - Taney County
- Weather (maximum monthly temperature and total monthly precipitation)
- Average County Income in thousands of dollars (kincome) (taken from US Census data)
- Leak Detection Programs (the percentage of a county currently utilizing leak detection programs – taken from survey data)
- Residential Rate (average block two residential rate calculated from survey data)

The results of this statistical analysis can be viewed in Table 8-1.

Table 8-1: Residential Demand Model

Number of Observations				1,190
Adj. R-Squared				0.5709
Explanatory Variables	Parameter Estimate	Standard Error	t Value	Pr> t
Intercept	98.21162	5.98864	16.4	<.0001
Monthly Binaries:				
June	8.32075	1.73452	4.77	<.0001
July	10.74014	1.82431	5.89	<.0001
August	16.72634	1.87811	8.91	<.0001
September	14.53823	1.62978	8.92	<.0001

County Binaries:					
	Cedar	-11.34033	1.62908	-6.96	<.0001
	Dade	30.77839	1.8956	16.24	<.0001
	Stone	-11.15498	1.65494	-6.74	<.0001
	Taney	26.58822	1.6253	16.36	<.0001
Weather Variable:					
	MaxTemp	0.09322	0.03971	2.35	<.0001
	Precip	-0.66481	0.15579	-4.27	<.0001
Other Variables:					
	kincome	-0.88276	0.14632	-6.03	<.0001
	Leak Detection	-13.411	0.86217	-15.55	<.0001
	Residential Rate	-1.18563	0.08428	-14.07	<.0001

Results of the regression analysis were used to calculate the monthly per capita baseline (2010) water use in GPCD by county. These per capita values were then driven by the residential public-supplied population served described in Section 5.1.1 using the following equation:

$$PSR_{c,m,y}^{GPD} = BRD_{c,m}^{GPCD} \times POP_{c,y} \times \%PS_c$$

Where:

- $PSR_{c,m,y}^{GPD}$ = Public-supplied residential water demand in gallons per day in county (c) in month (m) in year (y)
- $BRD_{c,m}^{GPCD}$ = Baseline residential demands in gallons per capita per day in county (c) and month (m)
- $POP_{c,y}$ = Population in county (c) in year (y)
- $\%PS_c$ = Percentage of the population in county (c) served by public-supply systems

8.2 Public Supplied Non-Residential

For commercial, industrial and institutional publically supplied water use, demographic employment data was utilized. High variability in the commercial and industrial sector provider survey results resulted in difficulty establishing common non-residential water use trends among the sixteen county study area. In order to best represent current trends while establishing a baseline public supply non-residential forecast, a unit use approach was constructed using the GED water use factors described in Section 4.1, Municipal Systems.

County non-residential water use is estimated by multiplying county employment by water use per employee. Projections of employment and water use are obtained at the most detailed level available. Both employment and water use per employee are available at the 2-digit North American Industrial Classification System level. Water use per employee is assumed to remain constant while employment grows in the future. The equation below provides the detailed formula for estimating water use for the public-supplied non-residential sector.

$$PSNR_{c,m,y}^{GPD} = \left[\sum (E_{c,y}^{NAICS} \times GED_c^{NAICS}) - SSI_{c,m,y}^{GPD} \right] \times S_{c,m}$$

Where:

- $PSNR_{c,m,y}^{GPD}$ = Public-supplied non-residential water use in county (c) in month (m) in year (y) in GPD
- $E_{c,y}^{NAICS}$ = Employment by NAICS group in county (c) and year (y)
- GED_c^{NAICS} = Water use per employee by NAICS group, which may be adjusted for a specific county (c)
- $SSI_{c,m,y}^{GPD}$ = Self-supplied industrial water use in county (c) in month (m) in year (y) in GPD
- $S_{c,m}$ = Seasonality of Public-supplied non-residential water use in county (c) in month(m)

8.3 System Losses

System loss applies to the public-supplied sectors of the demand forecast. Therefore, the system loss percentages by county are applied to the sum of public-supplied residential and public-supplied non-residential demands. System losses are applied to the demand forecast using the following equation:

$$NRW_{c,m,y}^{GPD} = (PSR_{c,m,y}^{GPD} + PSNR_{c,m,y}^{GPD}) \times [\%NRW_c / (1 - \%NRW_c)]$$

Where:

- $NRW_{c,m,y}^{GPD}$ = System loss water demand in gallons per day in county (c) in month (m) in year (y)
- $PSR_{c,m,y}^{GPD}$ = Public-supplied residential water demand in gallons per day in county (c) in month (m) in year (y)
- $PSNR_{c,m,y}^{GPD}$ = Public-supplied non-residential water use in county (c) in month (m) in year (y) in GPD
- $\%NRW_c$ = Percentage of system loss water in county (c)

For the purposes of this model, system loss percentages are assumed to remain constant into the future.

8.4 Self-Supplied Residential

For the purpose of this model, the assumption is made that self-supplied residential water use is equal to the per capita water use for publically-supplied water users of the same county. The total number of self-supplied residential customers is calculated by subtracting the total public supply customers by county (data from the Missouri Public Water Census) from the total county population. These data allow calculation of the percentage of self-supplied residential customers in each county. For the purposes of this model, it is assumed that all users not served by a public water supply provider are self-served water users. Self-supply residential demand is calculated and projected using the following equation:

$$SSR_{c,m,y}^{GPD} = BRD_{c,m}^{GPCD} \times POP_{c,y} \times \%SS_c$$

Where:

- $SSR_{c,m,y}^{GPD}$ = Self-supplied residential water demand in gallons per day in county (c) in month (m) in year (y)
- $BRD_{c,m}^{GPCD}$ = Baseline residential demands in gallons per capita per day in county (c) and month (m)
- $POP_{c,y}$ = Population in county (c) in year (y)
- $\%SS_c$ = Percentage of the population in county (c) under self-supply

8.5 Self-Supplied Non-residential

Self-supplied industrial users may include food processing facilities, aquaculture, mining operations, or any other commercial or industrial user that is not served by a public water supplier. Data for analysis of this sector is taken from the USGS water use estimates as described in Sections 4.3 and 5.3, Self-Supplied Non-residential. The most recent data currently available for the sixteen county region for industrial, mining, thermoelectric, and aquaculture self-supplied employment categories is 2005 estimates. Therefore, the total 2005 USGS estimates were designated as the baseline demands by county for self-supplied non-residential water use. Self-supplied irrigation data for golf courses provided by MDNR for selected counties (2010 estimates) are added to the forecast for the months of May through October.

Because future conditions in the self-supplied non-residential sector are unknown, this sector was forecasted into the future using a no growth scenario in which water use demands remain constant through 2060. It is assumed that industrial, thermoelectric power, mining, and aquaculture self-supplied users do not exhibit trends in seasonality throughout the year, and therefore no seasonality for these users are included in the forecast.

8.6 Agriculture

Agricultural water demands for livestock and crop irrigation in 2010 were combined to give the baseline agricultural demand forecast. Demands were projected through 2060 using the methodologies described in Section 7.0, Agricultural Water Demand.

9.0 Assessment of Conservation Measures

In order to assess the impacts of potential future conservation activities in Southwest Missouri, conservation scenarios were developed that are applied to the previously developed baseline forecast for the Municipal and Industrial (M&I) sector of the Southwest Missouri Regional Demand Model. Demand scenarios with conservation were developed based on patterns of current regional conservation and factors affecting future conservation activities occurring throughout the region and state. These factors include cost-effectiveness of potential

programs, ease of implementation, and acceptance by both the citizens of Southwest Missouri and water provider decision makers.

Water conservation is being recognized as an important tool in managing water resources. In addition to providing decreased cost to water providers and reductions in customer water bills, the water saved through conservation programs has been shown to help reduce or avoid the demand for water restrictions during periods of drought. Conservation can be implemented on both the demand and supply/distribution side of water management. Distribution conservation involves the effective management of system water losses through metering, analysis of water use, and leak detection in order to identify sources of non-revenue water. Municipal and industrial supply side conservation techniques reduce water demand by changing consumer behavior through: implementing education programs, promoting the use of water efficient appliances through voucher, rebates or plumbing codes, and employing conservation pricing (Sturm and Thornton).

Reductions in water demand diminish the amount of water required by end users while supply side leak detection reduces water loss in a system. Both approaches can reduce the volume of water utilities produce, helping decrease operation and maintenance expenses. Reduced water demand from conservation also prolongs the lifespan of current supplies; allowing utilities to defer, down size, or even eliminate costly investment in new facilities and water supplies (Maddaus 1999). Customers also benefit from conservation through reduced water and energy utility bills. Reductions in energy use for residential customers largely come from conserving hot water used by household appliances. Heating water for washing machines, dishwashers, and showers is the biggest water related energy use for residential users as well as many commercial users (Teliinghuisen 2009). Other significant benefits that are difficult to quantify can include lower discharge of treated wastewater into receiving waters, more water available for the environment, and the creation of water conservation jobs (Maddaus 1999).

For the purposes of this report, the impact of region-wide expansion of a number of basic conservation activities to all Southwest Missouri water providers is evaluated.

9.1 Public Supply Residential and Non-Residential Conservation

In order to provide useful and realistic conservation scenarios for the Southwest Missouri Region, an analysis of current regional conservation activities was conducted identifying current conservation activities occurring at the provider-level throughout Southwest Missouri. Information on conservation activities were gathered from available resources including the Southwest Missouri Provider Survey (described in Section 2.2, Southwest Missouri Water Demand Characteristics) and water provider websites.

One of the main goals of this study is to build on current successful conservation activities which are being implemented by individual water providers in the region. In order to achieve this goal, the conservation matrix was utilized as an essential tool for determining potential future conservation activities. Analysis of the matrix database resulted in percentages of water providers currently practicing specific conservation activities for a given county. Analysis of the matrix revealed that City Utilities of Springfield in Greene County is implementing progressive water conservation activities including educational programs for children and adults, a website with conservation water savings tips, leak detection measures, residential and commercial meters, and residential and commercial water use audits among other programs. These fundamental programs were used to form the basis of future conservation goals throughout the region.

9.1.1 Conservation Activities

For the purpose of this report, conservation activities are actions performed in an effort to save water. These actions can include behavioral changes or installation of conservation devices used to conserve water. These activities can be implemented at a variety of levels including the state level, by the water provider, or by the water customer.

Commercial and Residential Metering with Reduction in System Losses

Metering is a fundamental tool of water conservation that benefits both the supplier and the customer. Through a universal metering program, water use is measured on a per unit basis; which requires the installation of individual water meters. When customers are metered and billed for their actual water use, customers can experience a direct consequence of higher overall costs of water. A water bill which varies based on the amount of water used allows customers to realize the actual value of utility-provided water (California 2005). According to U.S. Environmental Protection Agency (EPA) Water Conservation Plan Guidelines (2004) as well as additional sources, connection metering can lead to a 20 percent reduction in customer end use (Inman and Jeffrey 2006). Metering efforts include the metering of new construction projects, installing meters at existing customer sites, and replacing poorly operating meters (A&N 2005). Analysis of current water conservation activities throughout the region via the conservation matrix indicates that approximately 89 percent of the publically-supplied population in Southwest Missouri is currently metered.

The equations below are used to estimate county-level savings from metering unmetered customers. Savings from metering were applied to public supply residential and nonresidential customers. Data were collected regarding which water providers are currently metering their customers. Based on the population serviced by the providers, the percent was calculated for the population serviced that is not metered for each county.

$$Sm_Y^C = Rm \times M\&I_Y^C \times (\%Um^C - \%Um^T)$$

$$\%Um^C = \sum_C Ump \div \sum_C D$$

Where:

- Sm_Y^C = Savings from metering unmetered customers in county (C) and year (Y)
- $M\&I_Y^C$ = M&I baseline demand in county (C) and year (Y)
- $\%Um^C$ = Percent of population unmetered in county (C)
- $\%Um^T$ = Target percent of population unmetered (if current percent unmetered is greater than target percent unmetered)
- Rm = Reduction in demand from metering unmetered customers
- $\sum_C Ump$ = Sum of population served unmetered in county (C)
- $\sum_C D$ = Sum of population served in county (C) where metering status is known

Metering customers and leak detection are conservation activities that are closely related, because water loss auditing can be more adequately conducted once a utility customer base is fully metered. Water losses occur in two distinctly different manners. Apparent losses occur due to customer meter inaccuracies, billing system data errors and unauthorized consumption. These losses cost utilities revenue and distort data on customer consumption patterns. Losses also occur as real losses or water that escapes the water distribution system, including leakage and storage overflows. These losses inflate the water utility's production costs and stress water resources since they represent water that is extracted and treated, yet never reaches beneficial use. Non-revenue water represents the difference between water production and revenue-generating (billed) consumption. This difference includes authorized unmetered use, apparent losses and real losses.

Analysis of current water conservation efforts in Southwest Missouri indicates that approximately 57 percent of the publically-supplied regional population is under some type of leak detection program. Additionally, Southwest Missouri water providers are reporting NRW system losses at 13-15 percent, with a study area wide average at 14 percent.

For leak detection and loss reduction, the weighted average county NRW system losses percent calculated for the baseline forecast is reduced to a target percentage for all counties. If the weighted average is less than or equal to the target percentage, then the NRW will remain equal to the baseline. New NRW volume was calculated based on the reduced percent resulting in water savings using the equation below.

$$Sl_Y^C = M\&I_Y^C - \left\{ \left[M\&I_Y^C \times (1 - NRW_B^C) \times \left(\frac{NRW_R^C}{1 - NRW_R^C} \right) \right] + [M\&I_Y^C \times (1 - NRW_B^C)] \right\}$$

Where:

- Sl_Y^C = Savings from leak reduction (reducing system losses) in county (C) and year (Y)
- $M\&I_Y^C$ = M&I baseline demand in county (C) and year (Y), includes NRW volume
- NRW_B^C = Baseline (B) NWR system losses percent for county (C)
- NRW_R^C = Reduced (R) NWR system losses percent for county (C)

Water saved from leakage recovery acts as a new supply and is often the best source for new water resources for systems facing water shortages. Adequate leak detection efforts can lead to a substantial amount of water savings. For example, a one-inch crack in a distribution main at 100 pounds per square inch can leak 57 gallons per minute (gpm). Leak detection efforts increase the level of service provided to customers by improving the reliability of water supplies, improving public health protection, and reducing the liability of water suppliers.

Community Education and Information

Customer education is a critical component of any water conservation program and nearly all water conservation efforts are dependent on public awareness and an understanding of the need for conservation (Butler and Howarth 2004). In addition to communicating water savings habits, the effectiveness of additional conservation measures is enhanced by educational programs. While educational savings are difficult to estimate, providing information which changes water use habits can produce considerable water savings. EPA Conservation Plan Guidelines (2004) and additional sources estimate a 3-5 percent reduction in end use as a result of information and education programs (Inman and Jeffrey 2006).

Education programs can be aimed at any age level and often times can be implemented into school curriculums. Community-wide education can focus on a variety of topics including tips for indoor and outdoor water conservation, water-wise landscaping, and general water education. This information can be distributed by means of water bill inserts, brochures, media campaigns, websites, and public exhibitions. According to data collection efforts, 10 percent of water utilities in Southwest Missouri implement some form of water conservation educational programs.

Savings from implementing an educational program are applied to the percent of baseline demand currently not targeted by a provider-implemented water conservation education program within a given county, as shown in the equation below. The percent of population not targeted by a water conservation educational program was estimated from data collected in the conservation matrix and using the equation below. Targeting a population with a water conservation educational program is assumed to reduce public-supply (PS) residential and PS non-residential sector demand by 1-5 percent, depending on the program and the sector.

$$Se_Y^C = M\&I_Y^C - (\%Ue^C \times Re \times M\&I_Y^C)$$

$$\%Ue^C = \sum_C Uep \div \sum_C D$$

Where:

- Se_Y^C = Savings from implementing conservation education program in county (C) and year (Y) in GPD
- $M\&I_Y^C$ = M&I baseline demand in county (C) and year (Y)
- $\%Ue^C$ = Percent of population not targeted by conservation education program in county (C)
- Re = Reduction in demand from implementing conservation education program
- $\sum_C Uep$ = Sum of population not targeted by conservation education program in county (C)
- $\sum_C D$ = Sum of population in county (C) where conservation education program status is known

Residential and Commercial Water Use Audits

Water audits are a common component of both residential and nonresidential conservation programs. Water audits are generally implemented at the provider level and can be offered to all water customers, or can be targeted to high-volume water users.

Residential audits are conducted to educate customers on ways to save water and energy and to provide guidance on implementation of simple water-efficiency measures and repairs. A residential audit may also serve to raise awareness of additional conservation programs the customer may be eligible for. An audit generally consists of determining of water use patterns, testing for leaks, and evaluating water efficiency measures and outdoor water use. Following the audit, suggestions are made regarding leak repair, utilization and installation of retrofit devices, and general water use practices to assist the homeowner in reducing household water use. Though the results of residential audits vary, those that involve installing some efficiency devices and educating customers about reduced indoor and outdoor water use have reported savings for indoor and outdoor use ranging from 20 to 30 GPD per single family household (Vickers 2001).

Commercial audits are aimed at commercial, industrial, and institutional (CII) water users to assess water use and help them to develop target areas where water conservation improvements can be efficiently implemented. In many cases, commercial audits involve preparation of a site water conservation plan or water use evaluation report identifying current water use patterns and water-related costs. These plans may also identify opportunities for water conservation and estimated payback periods using lifecycle costing at each facility (Vickers 2001). While water savings resulting from CII audits are mainly dependent on follow-through activities by the customer, studies have shown average water savings of 8 percent with

potential savings of up to 30 percent (Albuquerque Bernalillo County Water Utility Authority 2007).

Savings from implementing a water audit program are applied to the percent of public supply residential and non-residential baseline demand currently not targeted by a water audit program within a given county, as shown in the equation below. The percent of population not targeted by a water audit program was estimated from data collected in the conservation matrix and using the equation below. Implementation of a residential water audit program is assumed to reduce PS residential sector demand by 7 percent; implementation of a non-residential water audit program is assumed to reduce PS non-residential sector demand by 8 percent.

$$Sa_Y^C = M\&I_Y^C - (\%Ua^C \times Re \times M\&I_Y^C)$$

$$\%Ua^C = \sum_C Uap \div \sum_C D$$

Where:

- Sa_Y^C = Savings from implementing a water audit program in county (C) and year (Y)
- $M\&I_Y^C$ = M&I baseline demand in county (C) and year (Y)
- $\%Ua^C$ = Percent of population not targeted by a water audit program in county (C)
- Re = Reduction in demand from implementing a water audit program
- $\sum_C Uap$ = Sum of population not targeted by a water audit program in county (C)
- $\sum_C D$ = Sum of population in county (C) where water audit program status is known

9.2 Conservation Scenarios

The five conservation activities described above are combined in a logical and consistent manner to develop two conservation scenarios for Southwest Missouri. Using these scenarios, the potential reduction in demand is estimated at the county level. Scenario I, Moderately Expanded Conservation, is an analysis of expanded metering, leak detection, and education programs. Scenario II, Substantially Expanded Conservation, is an analysis of more aggressive levels of the Scenario I programs with the addition of the residential and non-residential water audits. Both scenarios are described in detail, as follows.

9.2.1 Scenario I: Moderately Expanded Conservation

The moderately expanded conservation scenario, or Scenario I, is a combination of conservation programs which are most likely to be implemented by water purveyors in Southwest Missouri based on costs and ease of implementation. In this scenario, savings from metering are calculated based on a minimum metering implementation percentage of 90 percent of providers in each county. Counties with metering implementation percentage currently at or above 90 percent were not changed and no future potential savings from metering are calculated for those counties.

Also in Scenario I, leak detection methods are assumed to decrease NRW system losses in each county to 12 percent. Those counties with NRW system losses currently at or below 12 percent were left unchanged and no future potential NRW system losses savings are assumed.

Educational programs under this scenario are assumed to be expanded to include educational water bill inserts. This measure is assumed to decrease water demand for the PS residential sector by an average of 3 percent and for the PS non-residential sector by an average of 1 percent for customers not currently targeted by educational materials (Baumann et. al 1998).

In summary, Scenario I is based on the following assumptions:

- 90 percent of water providers in each county will be metering their customers, unless current metered percentage is greater than 90 percent
- NRW system losses will be reduced to 12 percent, where applicable
- Educational programs will be implemented by all providers, which include billing inserts to reduce residential demands by 3 percent and non-residential demands by 1 percent

9.2.2 Scenario II: Substantially Expanded Conservation

The substantially expanded conservation scenario involves a set of robust yet achievable conservation programs for Southwest Missouri water providers.

In this scenario, potential savings are included from implementation of both residential and commercial water audits. Savings from metering are calculated for 100 percent statewide implementation. Additionally, leak detection techniques are expected to decrease NRW system losses to 10 percent in those counties with NRW system losses currently above this threshold.

Educational programs in this scenario are expected to reduce demands by 5 percent for residential users and 3 percent for non-residential users in counties not currently utilizing water conservation educational programs. This aggressive decrease in water demands is expected based on development of a website with conservation tips and educational programs encouraging water conservation in addition to the water bill inserts encouraged in Scenario I (Inman and Jeffrey 2006).

In summary, Scenario II is based on the following assumptions:

- Implementation of metering by all purveyors statewide
- NRW system loss reduction to 10 percent where applicable
- Water conservation education programs include school educational programs and conservation tip website in addition to billing inserts to reduce demands by 3-5 percent
- Implementation of residential and non-residential water audits

10.0 Forecast Verification and Requirements

It is important to understand that the statistical ranges in demand forecasts are based on a set of assumptions regarding data inputs. The range in data inputs may not reflect the entire possibility of outcomes. CDM Smith relied on the best planning information available in setting these ranges, and only used professional judgment when planning information was not available. It is strongly recommended that these data inputs be revisited at least every five years in order to evaluate the short and long term trends of demographics. In addition, any future conservation programs implemented in the region may alter water use. Therefore, Southwest Missouri should continue to model water demand trends within the region.

10.1 Forecast Verification

Following data processing efforts, regional baseline model estimates for 2010 align closely with USGS and MDNR 2005-2010 water use estimates. The USGS estimates, MDNR estimates, and Southwest Missouri Regional Demand Model baseline estimates were all developed using different methodologies based on available data and assumptions. Slight variations in results are expected based on each individual methodology.

Analysis was completed to determine the level of alignment of Southwest Regional Demand Model baseline demand estimates with 2005 USGS estimates and 2007 and 2010 MDNR estimates. Analysis was completed both on a county and regional-level. In most cases 2005 USGS estimates were used in the comparison of demands, however, in some instances of the public-supply residential demands, 2010 MDNR demand estimates were used for comparison based on significant changes in population or employment from 2005-2010. The results of these comparisons can be viewed in Table 10-1 through Table 10-6, below.

**Table 10-1: Comparison of USGS and Missouri DNR Withdrawal Estimates (MGD)
with the Southwest Missouri Regional Demand Model
Baseline Demands for the Public-Supplied Sector**

	USGS 2005	MDNR 2007	MDNR 2010	Selected for Analysis	Model 2010	Difference (MGD) Estimates minus Selected USGS
Barry	3.720	3.582	4.295	3.720	3.377	-0.343
Barton	1.440	1.556	1.598	1.440	1.342	-0.098
Cedar	1.040	N/A	N/A	1.040	1.002	-0.038
Christian	3.910	2.737	2.745	3.910	6.904	2.994
Dade	0.470	N/A	N/A	0.470	0.752	0.282
Greene	44.020	27.196	27.038	27.038	27.223	0.185
Hickory	0.250	N/A	N/A	0.250	0.775	0.525
Jasper	20.070	16.972	16.758	16.758	14.329	-2.429
Lawrence	2.160	2.836	2.836	2.160	3.194	1.034
McDonald	1.610	2.247	1.452	1.610	1.825	0.215
Newton	4.700	3.827	3.860	4.700	4.028	-0.672
Polk	1.850	N/A	N/A	1.850	2.781	0.931
St Clair	0.200	N/A	N/A	0.200	0.733	0.533
Stone	1.840	1.885	1.915	1.840	2.931	1.091
Taney	6.940	5.635	5.545	6.940	6.763	-0.177
Vernon	2.640	N/A	N/A	2.640	2.429	-0.211
Total	96.860	68.474	68.041	76.566	80.388	3.822

Table 10-2: Comparison of USGS and Missouri DNR Withdrawal Estimates (MGD) with the Southwest Missouri Regional Demand Model Baseline Demands for the Self-Supplied Residential Sector

	USGS 2005	MDNR 2007	MDNR 2010	Selected for Analysis	Model 2010	Difference (MGD) Estimates minus Selected USGS
Barry	1.162	1.098	1.068	1.162	0.947	-0.215
Barton	0.014	0.002	0.000	0.014	0.000	-0.014
Cedar	0.352	N/A	N/A	0.352	0.219	-0.133
Christian	2.514	2.920	2.337	2.514	1.934	-0.580
Dade	0.260	N/A	N/A	0.260	0.422	0.162
Greene	5.051	5.558	6.118	5.051	2.214	-2.837
Hickory	0.449	1.282	1.199	0.449	0.317	-0.131
Jasper	1.141	1.339	1.435	1.141	1.224	0.084
Lawrence	1.302	1.054	0.939	1.302	1.156	-0.146
McDonald	1.069	2.667	2.777	1.069	0.852	-0.216
Newton	2.570	N/A	N/A	2.570	2.102	-0.468
Polk	1.215	N/A	N/A	1.215	1.347	0.132
St Clair	0.445	N/A	N/A	0.445	0.449	0.003
Stone	1.019	1.105	1.076	1.019	0.975	-0.045
Taney	0.571	0.480	0.743	0.571	1.098	0.527
Vernon	0.067	N/A	N/A	0.067	0.000	-0.067
Total	19.200	17.505	17.693	19.201	15.256	-3.944

Table 10-3: Comparison of USGS and Missouri DNR Withdrawal Estimates (MGD) with the Southwest Missouri Regional Demand Model Baseline Demands for the Self-Supplied Commercial/Industrial Sector

	USGS 2005	MDNR 2007	MDNR 2010	Selected for Analysis	Model 2010	Difference (MGD) Estimates minus Selected USGS
Barry	1.620	0.040	1.635	1.620	1.620	0.000
Barton	0.060	0.023	0.006	0.060	0.060	0.000
Cedar	0.000	N/A	N/A	0.000	-	0.000
Christian	0.330	0.000	0.005	0.330	0.330	0.000
Dade	0.000	N/A	N/A	0.000	-	0.000
Greene	1.550	1.042	0.850	1.550	1.550	0.000
Hickory	0.000	N/A	N/A	0.000	-	0.000
Jasper	0.420	0.797	0.486	0.420	0.420	0.000
Lawrence	0.050	0.043	0.041	0.050	0.050	0.000
McDonald	3.020	0.551	2.657	3.020	3.020	0.000
Newton	0.000	0.008	0.008	0.000	-	0.000
Polk	0.000	N/A	N/A	0.000	-	0.000
St Clair	0.000	N/A	N/A	0.000	-	0.000
Stone	0.000	0.014	0.017	0.000	-	0.000
Taney	0.010	0.086	0.082	0.010	0.010	0.000
Vernon	0.400	N/A	N/A	0.400	0.400	0.000
Total	7.460	2.604	5.787	7.460	7.460	0.000

Table 10-4: Comparison of USGS and Missouri DNR Withdrawal Estimates (MGD) with the Southwest Missouri Regional Demand Model Baseline Demands for Livestock

	USGS 2005	MDNR 2007	MDNR 2010	Selected for Analysis	Model 2010	Difference (MGD) Estimates minus Selected USGS
Barry	2.060	2.060	2.060	2.060	2.870	0.810
Barton	0.820	0.820	0.820	0.820	0.907	0.087
Cedar	0.760	N/A	N/A	0.760	0.718	-0.042
Christian	0.840	0.840	0.840	0.840	0.702	-0.138
Dade	0.930	N/A	N/A	0.930	0.823	-0.107
Greene	1.100	1.100	1.100	1.100	0.890	-0.210
Hickory	0.540	N/A	N/A	0.540	0.414	-0.126
Jasper	0.970	0.970	0.970	0.970	0.931	-0.039
Lawrence	1.590	1.590	1.590	1.590	1.879	0.289
McDonald	1.120	1.120	1.120	1.120	1.211	0.091
Newton	1.590	1.590	1.590	1.590	1.878	0.288
Polk	1.620	N/A	N/A	1.620	1.507	-0.113
St Clair	0.670	N/A	N/A	0.670	0.649	-0.021
Stone	0.420	0.420	0.420	0.420	0.421	0.001
Taney	0.310	0.310	0.310	0.310	0.191	-0.119
Vernon	1.330	N/A	N/A	1.330	1.996	0.666
Total	16.670	10.820	10.820	16.670	17.987	1.316

Table 10-5: Comparison of USGS and Missouri DNR Withdrawal Estimates (MGD) with the Southwest Missouri Regional Demand Model Baseline Demands for Crop Irrigation

	USGS 2005	MDNR 2007	MDNR 2010	Selected for Analysis	Model 2010	Difference (MGD) Estimates minus Selected USGS
Barry	0.060	0.680	1.008	0.060	0.369	0.309
Barton	9.620	0.000	23.870	9.620	2.153	-7.467
Cedar	0.020	N/A	N/A	0.020	0.048	0.028
Christian	0.040	0.040	0.072	0.040	0.061	0.021
Dade	3.760	N/A	N/A	3.760	2.245	-1.515
Greene	0.010	0.180	0.124	0.010	0.068	0.058
Hickory	0.170	N/A	N/A	0.170	0.233	0.063
Jasper	3.980	1.560	10.734	3.980	2.284	-1.696
Lawrence	0.890	0.000	5.727	0.890	0.631	-0.259
McDonald	0.310	0.440	0.313	0.310	0.179	-0.131
Newton	1.930	1.560	1.464	1.930	0.348	-1.582
Polk	0.270	N/A	N/A	0.270	0.642	0.372
St Clair	0.330	N/A	N/A	0.330	0.100	-0.230
Stone	0.020	0.060	0.087	0.020	0.031	0.011
Taney	0.080	0.260	0.084	0.080	0.049	-0.031
Vernon	1.540	N/A	N/A	1.540	2.940	1.400
Total	23.030	4.780	43.483	23.030	12.379	-10.651

Table 10-6: Comparison of USGS and Missouri DNR Withdrawal Estimates (MGD) with the Southwest Missouri Regional Demand Model Baseline Demands for Public Supply and Self-Supply Residential and Commercial/Industrial and Agriculture

	USGS 2005	MDNR 2007	MDNR 2010	Selected for Analysis	Model 2010	Difference (MGD) Estimates minus Selected USGS	Weighted Percent Difference based on USGS total MGD
Barry	8.622	7.460	10.066	8.622	9.183	0.561	0.39%
Barton	11.954	2.401	26.294	11.954	4.462	-7.492	-5.24%
Cedar	2.172	N/A	N/A	2.172	1.987	-0.185	-0.13%
Christian	7.634	6.538	6.000	7.634	9.932	2.298	1.61%
Dade	5.420	N/A	N/A	5.420	4.242	-1.178	-0.82%
Greene	51.731	35.077	35.230	34.749	31.945	-2.804	-1.96%
Hickory	1.409	N/A	N/A	1.409	1.739	0.330	0.23%
Jasper	26.581	21.638	30.383	23.268	19.187	-4.081	-2.86%
Lawrence	5.992	5.523	11.133	5.992	6.910	0.918	0.64%
McDonald	7.129	7.026	8.318	7.129	7.087	-0.041	-0.03%
Newton	10.790	N/A	N/A	10.790	8.356	-2.434	-1.70%
Polk	4.955	N/A	N/A	4.955	6.277	1.322	0.92%
St Clair	1.645	N/A	N/A	1.645	1.931	0.285	0.20%
Stone	3.299	3.484	3.515	3.299	4.357	1.058	0.74%
Taney	7.911	6.771	6.764	7.911	8.110	0.200	0.14%
Vernon	5.977	N/A	N/A	5.977	7.764	1.787	1.25%
Total¹	163.220	95.916	137.703	142.926	133.469	-9.456	-6.62%

¹ Totals do not include water use for thermoelectric, aquaculture, mining, and golf course irrigation

It is important to note that the purpose of this model is to provide regional water demand estimates utilizing available data. The methodologies and data used to develop USGS and MDNR withdrawals vary from those used to develop estimated baseline demand in the Southwest Missouri Regional Demand Model. As seen in Table 10-6, above, the total comparison of demands regionally resulted in a deficit of only 7 percent in Demand Model estimates compared to USGS and MDNR total withdrawals. The Demand Model has been designed to allow efficient manipulation of current data if additional verified data sources become available in the future.

10.2 Assumptions

The county-level water demand forecasts presented in this report are contingent upon a number of assumptions. These assumptions include the following:

- Population by county will increase to 2060 as projected by the Missouri Office of Administration and MDNR.
- Residential water use in each county will maintain the current average rate of water use per capita.
- Self-supplied residential water use is the same per capita rate of use as publically-supplied residential users within the same county.
- The ratio of self-served population to system-served population will remain constant at current levels for each county.
- State-wide employment will increase to 2018 as projected by Missouri Economic Research and Information Center and through 2060 as projected by MDNR.
- Future county employment growth will maintain the current proportion by NAICS classifications.
- Water use per employee will maintain the current average rate of use per employee per NAICS group.
- System losses among public and rural water district systems will maintain the current average rate of loss per county, and not exceed 15 percent real system loss.
- Self-supplied non-residential water use will remain constant at current levels for each county.
- Water use for livestock will remain at current levels per animal.
- Water use per crop type will remain at current levels per acre.
- Water use efficiency and irrigation type by county will remain at current levels.
- Future weather conditions will be similar to conditions associated with current rates of water use.
- The rates of water use per unit for each sector do not account for future improvements in water use efficiency (i.e., water conservation) beyond current levels for the baseline forecast.

11.0 Results

Figure 11-1 illustrates the 2010 baseline data for the public-supplied residential, public-supplied non-residential, self-supplied residential, and agricultural water demand sectors that were modeled for this effort for each county. This data was used as the basis for the model to project future water demand.

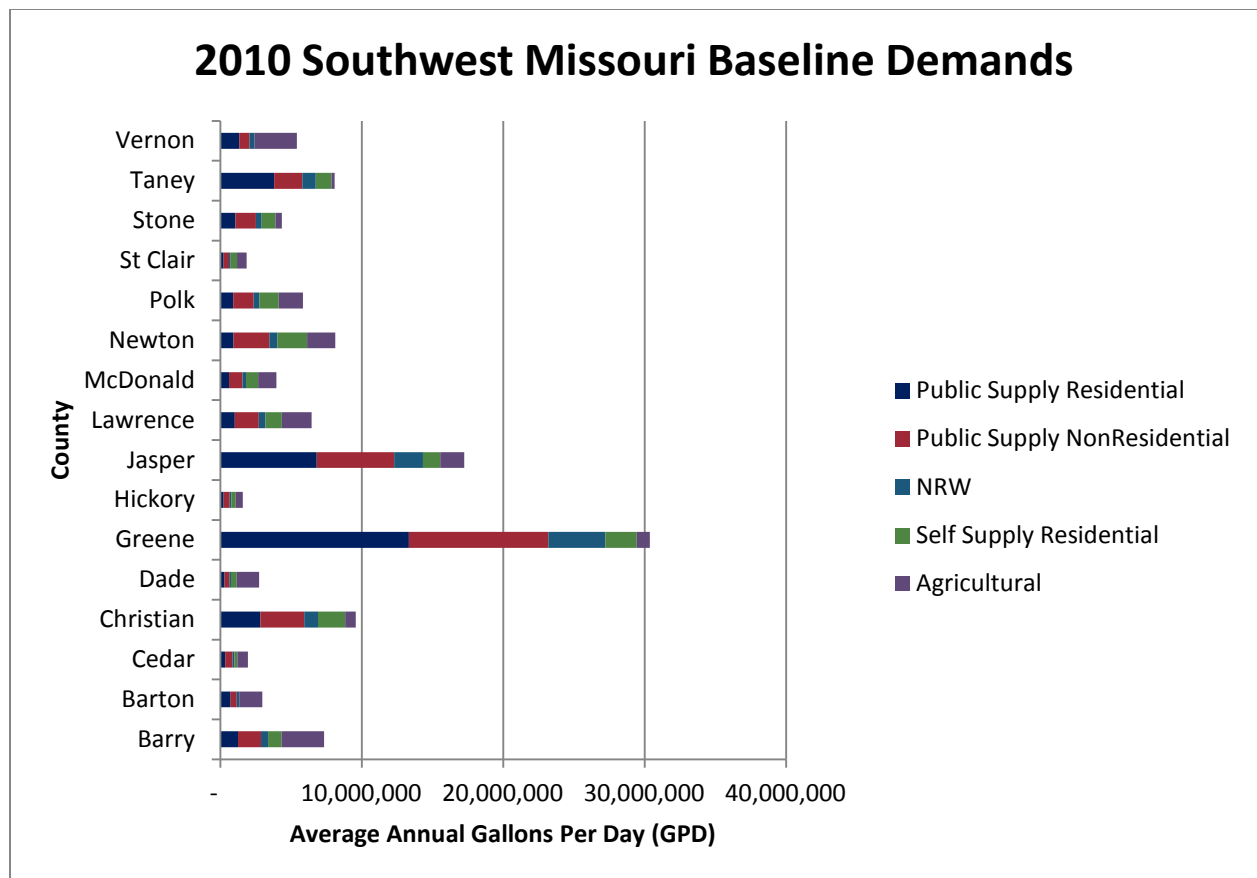


Figure 11-1: Study Area 2010 Baseline Demands

Figure 11-2 shows the average water demand projections for each decade from 2010 to 2060 under the high population growth scenario for the entire study area. The high growth scenario summary tables for each individual county are located in Appendix B.

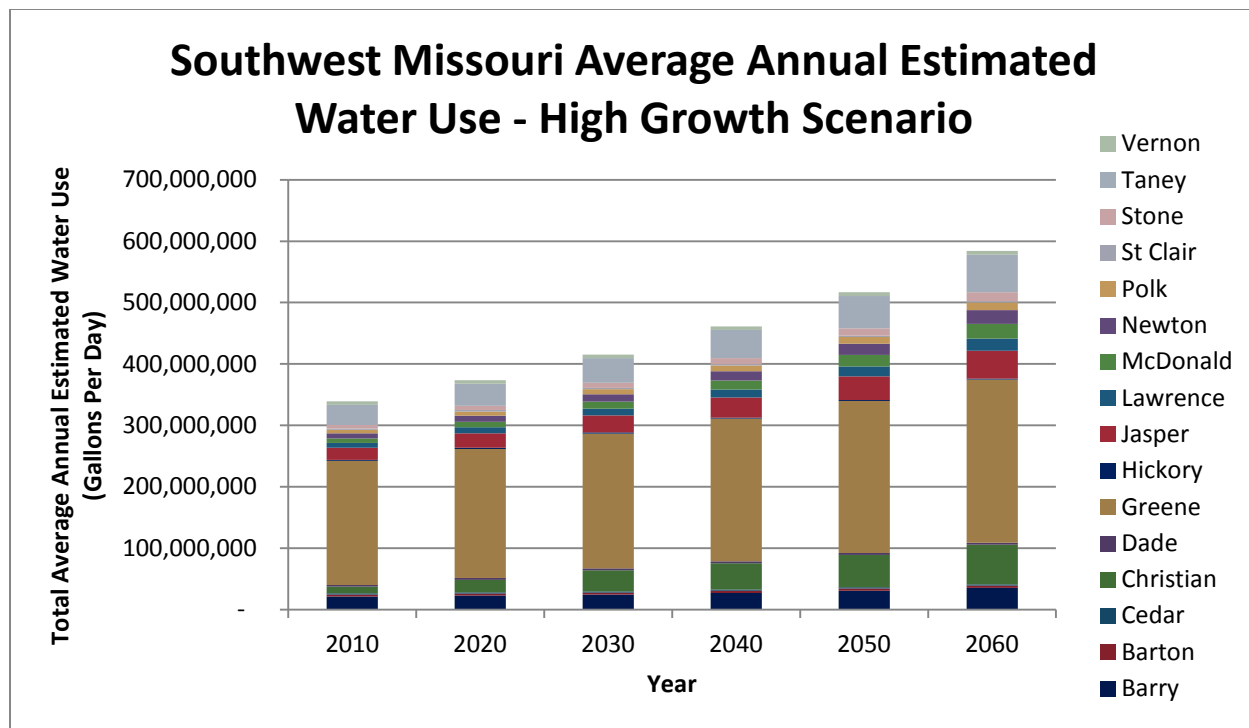


Figure 11-2: Area Average Annual Estimated Water Use – High Growth Scenario

Under the high population growth scenario, since the population increases significantly, the water demand projections increase significantly as well. The estimated average annual baseline water demand for the study area is 339.3 million gallons per day in 2010, compared to an estimated 584.3 million gallons per day by 2060, an increase of 245.0 million gallons per day. This is equal to a 72.2% increase in demand over the 50 year period. Christian County, the fastest growing county in the state due to the expansion of suburbs outside of Springfield, accounts for 21.9% of the increase. Greene County, currently more than double the population of any other county in the study area, accounts for 26.1% of this increase. Taney, Christian, Jasper and Greene Counties combined account for nearly 70% of the entire increase for the study area. This is likely due to the majority of the major population centers for the study area being mostly located within these four counties. Table 11-1 displays the water usage numbers used to generate Figure 11-2 above.

Table 11-1: Study Area Average Annual Estimated Water Use (gal) – High Growth Scenario

	2010	2020	2030	2040	2050	2060
Barry	21,139,006	22,779,996	24,074,577	27,079,242	30,670,919	35,098,550
Barton	3,127,764	3,243,600	3,320,692	3,466,223	3,638,932	3,823,132
Cedar	1,959,780	1,971,192	1,979,433	1,986,435	1,996,220	2,005,848
Christian	11,111,478	20,380,252	34,550,418	42,784,059	52,733,856	64,678,957
Dade	2,800,710	2,899,848	2,978,232	3,092,607	3,217,780	3,352,509
Greene	201,942,515	210,439,870	219,789,507	232,328,983	247,441,210	265,809,636

	2010	2020	2030	2040	2050	2060
Hickory	1,612,965	1,669,508	1,675,971	1,655,375	1,637,316	1,618,839
Jasper	19,787,462	23,796,061	27,860,267	32,930,587	38,646,624	45,131,715
Lawrence	8,082,569	9,487,243	11,084,401	13,331,927	16,106,865	19,534,296
McDonald	7,128,979	9,078,703	11,347,703	14,564,776	18,720,716	24,146,459
Newton	8,148,516	9,792,944	11,813,207	14,655,772	18,198,662	22,633,119
Polk	5,907,435	7,144,060	8,417,514	9,627,758	10,848,505	12,150,462
St Clair	2,030,061	2,143,528	2,212,658	2,274,686	2,362,391	2,485,019
Stone	5,554,650	6,931,328	8,094,431	9,798,725	11,852,851	14,238,037
Taney	33,117,805	36,112,074	40,148,914	45,570,473	52,456,832	61,128,940
Vernon	5,853,884	5,911,768	6,015,983	6,145,903	6,285,355	6,427,956

Figure 11-3 illustrates the average water demand projections for each decade from 2010 to 2060 under the medium population growth scenario for the study area. The medium growth scenario summary tables for each individual county are located in Appendix B. As expected, the water demand increase is more moderate under this scenario.

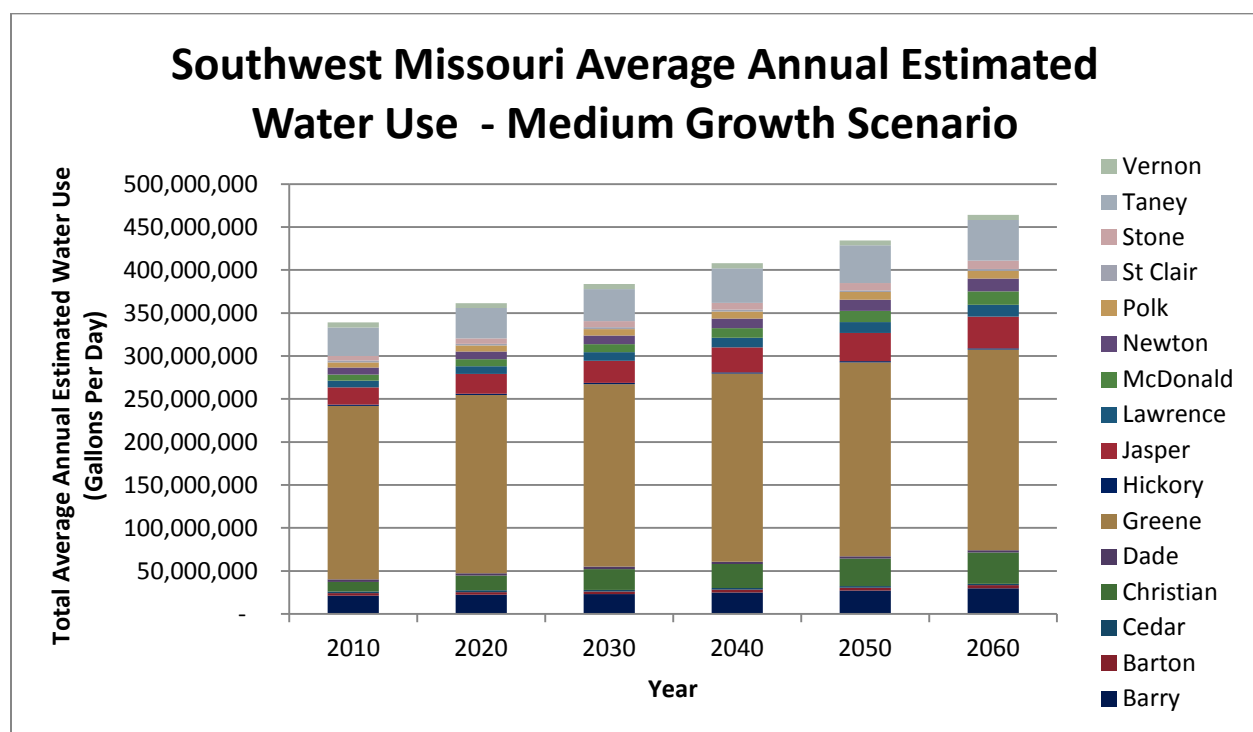


Figure 11-3: Study Area Average Annual Estimated Water Use – Medium Growth Scenario

Under the medium growth scenario, the estimated average annual baseline water demand for the study area is 339.1 million gallons per day in 2010. Under this scenario, demand for the sixteen counties reaches 464.0 million gallons per day in 2060, an increase of 124.9 million gallons per day. Taney, Christian, Jasper and Greene Counties combined account for about 70% of this increase here as well. While under the high growth scenario, every county

experienced some kind of population growth, under the medium growth scenario, Cedar, Hickory, Saint Clair, and Vernon Counties all lost population, so their water demands actually decrease. Table 11-2 displays the water usage numbers used to generate the figure above.

**Table 11-2: Study Area Average Annual Estimated Water Use (gal)
Medium Growth Scenario**

	2010	2020	2030	2040	2050	2060
Barry	21,126,701	22,281,921	22,974,532	24,996,332	27,223,210	29,783,988
Barton	3,126,918	3,211,488	3,255,046	3,361,130	3,487,942	3,619,893
Cedar	1,954,753	1,917,094	1,877,562	1,838,152	1,802,536	1,767,900
Christian	11,101,445	17,131,329	24,081,366	27,708,169	31,721,896	36,130,751
Dade	2,795,139	2,800,735	2,783,058	2,793,316	2,806,668	2,821,284
Greene	201,924,381	207,233,827	212,226,876	218,684,747	225,706,603	233,468,068
Hickory	1,603,674	1,606,133	1,559,932	1,489,718	1,424,311	1,360,821
Jasper	19,774,737	22,879,378	25,733,989	29,185,388	32,836,248	36,738,079
Lawrence	8,073,572	8,962,142	9,830,278	11,013,467	12,323,327	13,779,054
McDonald	7,098,007	8,291,464	9,517,879	11,229,539	13,272,774	15,743,968
Newton	8,134,179	9,037,573	10,040,999	11,426,902	12,979,166	14,732,872
Polk	5,898,760	6,777,260	7,563,205	8,179,199	8,703,075	9,195,204
St Clair	2,024,160	2,051,374	2,032,604	2,006,407	2,000,435	2,018,620
Stone	5,546,795	6,452,336	6,994,107	7,821,440	8,712,649	9,617,109
Taney	33,110,314	35,094,225	37,514,487	40,450,540	43,746,998	47,420,072
Vernon	5,834,426	5,776,017	5,763,509	5,774,854	5,793,786	5,814,029

Figure 11-4 illustrates the average water demand projections for each decade from 2010 to 2060 under the low population growth scenario for the study area. The low growth scenario summary tables for each individual county are located in Appendix B.

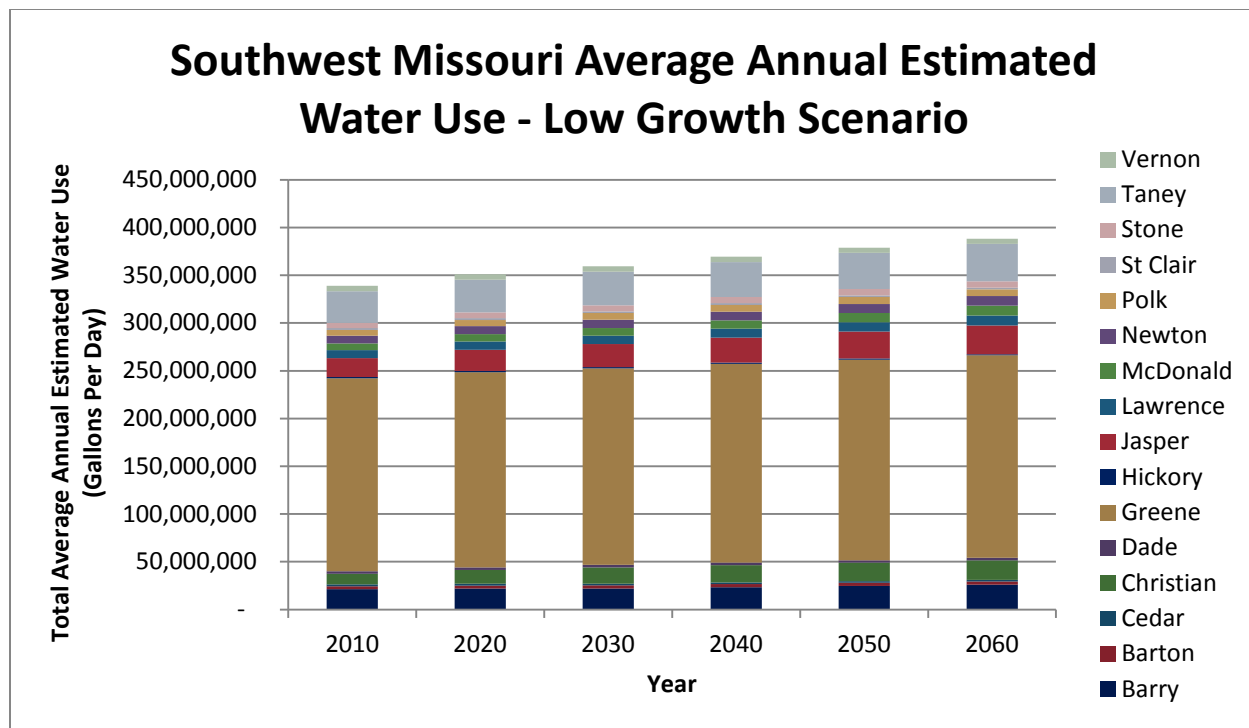


Figure 11-4: Study Area Average Annual Estimated Water Use – Low Growth Scenario

Under the low growth scenario, demand for the sixteen counties reaches 388.3 million gallons per day in 2060, an increase of 49.2 million gallons per day. Taney, Christian, Jasper and Greene Counties combined account for about 73% of this increase under the low population growth scenario. Cedar, Dade, Hickory, Saint Clair, and Vernon Counties all lost population, so their water demands decrease. Table 11-3 displays the water usage numbers used to generate Figure 11-4 above.

Table 11-3: Study Area Average Annual Estimated Water Use (gal) – Low Growth Scenario

	2010	2020	2030	2040	2050	2060
Barry	21,126,701	21,860,102	22,075,469	23,355,378	24,625,394	25,969,022
Barton	3,126,918	3,183,519	3,197,966	3,270,439	3,358,925	3,448,223
Cedar	1,954,753	1,885,554	1,817,397	1,752,166	1,693,055	1,637,232
Christian	11,101,445	14,436,168	16,890,354	18,102,920	19,292,665	20,444,905
Dade	2,795,139	2,729,820	2,647,501	2,594,374	2,546,363	2,501,599
Greene	201,924,381	204,330,041	205,880,883	208,105,340	210,152,726	212,120,836
Hickory	1,603,674	1,583,448	1,516,868	1,430,000	1,350,740	1,276,110
Jasper	19,774,737	22,051,387	23,868,750	26,014,534	28,101,385	30,164,363
Lawrence	8,073,572	8,513,121	8,828,184	9,295,675	9,734,526	10,150,938
McDonald	7,098,007	7,686,725	8,164,034	8,892,100	9,686,702	10,575,451
Newton	8,134,179	8,400,826	8,651,745	9,091,684	9,510,664	9,920,378
Polk	5,898,760	6,467,363	6,867,162	7,057,581	7,131,871	7,152,560
St Clair	2,024,160	1,987,936	1,910,890	1,832,427	1,775,578	1,740,425

	2010	2020	2030	2040	2050	2060
Stone	5,546,795	6,041,575	6,116,102	6,362,227	6,576,860	6,727,102
Taney	33,110,314	34,190,198	35,366,053	36,634,859	37,827,892	38,935,221
Vernon	5,834,426	5,725,413	5,663,689	5,625,834	5,595,539	5,566,673

12.0 Conclusions and Recommendations

12.1 Conclusions

This water demand study was conducted to evaluate current and future water demand through the year 2060 in sixteen counties in the Southwest Missouri area to provide a comprehensive report addressing both the short-term and long-term water supply needs for the region. This sixteen county region includes Barry, Barton, Cedar, Christian, Dade, Greene, Hickory, Jasper, Lawrence, McDonald, Newton, Polk, Saint Clair, Stone, Taney and Vernon Counties in Southwest Missouri.

The Southwest Missouri Regional water demand forecast was designed to serve as the first step in determining the region's water needs. It estimated future water usage (demand) based on a 2010 baseline of water usage obtained by surveying water providers in the region and collecting different kinds of agricultural, weather, and water use data. From this baseline demand, three different population projection scenarios, provided by MDNR, were used to project the future demand in the region. This study is intended for regional level planning purposes. The study findings are not intended for utility level planning decisions.

Under the high growth scenario, the 2010 baseline water usage for the regional area was 339.3 million gallons per day. Based on the high growth population projection, water demand increased to 584.3 million gallons per day for the region by 2060, a 72.2% increase in water consumption. Table 12-1 illustrates the percentage change in water demand from 2010 for each decade between 2010 and 2060, for each county.

Table 12-1: Southwest Missouri – Percentage Change in Estimated Water Use under the High Growth Scenario.

County	2010 Baseline (GPD)	% Change 2010 - 2020	% Change 2010 - 2030	% Change 2010 - 2040	% Change 2010 - 2050	% Change 2010 - 2060
Barry	21,139,006	7.8%	13.9%	28.1%	45.1%	66.0%
Barton	3,127,764	3.7%	6.2%	10.8%	16.3%	22.2%
Cedar	1,959,780	0.6%	1.0%	1.4%	1.9%	2.4%
Christian	11,111,478	83.4%	210.9%	285.0%	374.6%	482.1%
Dade	2,800,710	3.5%	6.3%	10.4%	14.9%	19.7%
Greene	201,942,515	4.2%	8.8%	15.0%	22.5%	31.6%
Hickory	1,612,965	3.5%	3.9%	2.6%	1.5%	0.4%
Jasper	19,787,462	20.3%	40.8%	66.4%	95.3%	128.1%

County	2010 Baseline (GPD)	% Change 2010 - 2020	% Change 2010 - 2030	% Change 2010 - 2040	% Change 2010 - 2050	% Change 2010 - 2060
Lawrence	8,082,569	17.4%	37.1%	64.9%	99.3%	141.7%
McDonald	7,128,979	27.3%	59.2%	104.3%	162.6%	238.7%
Newton	8,148,516	20.2%	45.0%	79.9%	123.3%	177.8%
Polk	5,907,435	20.9%	42.5%	63.0%	83.6%	105.7%
St Clair	2,030,061	5.6%	9.0%	12.1%	16.4%	22.4%
Stone	5,554,650	24.8%	45.7%	76.4%	113.4%	156.3%
Taney	33,117,805	9.0%	21.2%	37.6%	58.4%	84.6%
Vernon	5,853,884	1.0%	2.8%	5.0%	7.4%	9.8%
Total	339,305,579	10.2%	22.4%	36.0%	52.3%	72.2%

There were a few significant differences noted under the medium growth scenario. Probably the most important difference is that some counties experienced a decrease in water demand in future years. The model forecasted that Cedar, Hickory, Saint Clair, and Vernon's water usage actually decreased between 2010 and 2060. However, overall the region's water usage was estimated to increase by 124.9 million gallons per day. And here again, Christian, Greene, Jasper, and Taney were the main drivers of this growth in water demand. Under the medium growth scenario, usage increased to 464.0 million gallons per day, an increase of 36.8%. Table 12-2 shows the county by county percentage change in water demand under the medium growth scenario.

Table 12-2: Southwest Missouri – Percentage Change in Estimated Water Use under the Medium Growth Scenario.

County	2010 Baseline (GPD)	% Change 2010 - 2020	% Change 2010 - 2030	% Change 2010 - 2040	% Change 2010 - 2050	% Change 2010 - 2060
Barry	21,126,701	5.5%	8.7%	18.3%	28.9%	41.0%
Barton	3,126,918	2.7%	4.1%	7.5%	11.5%	15.8%
Cedar	1,954,753	-1.9%	-3.9%	-6.0%	-7.8%	-9.6%
Christian	11,101,445	54.3%	116.9%	149.6%	185.7%	225.5%
Dade	2,795,139	0.2%	-0.4%	-0.1%	0.4%	0.9%
Greene	201,924,381	2.6%	5.1%	8.3%	11.8%	15.6%
Hickory	1,603,674	0.2%	-2.7%	-7.1%	-11.2%	-15.1%
Jasper	19,774,737	15.7%	30.1%	47.6%	66.1%	85.8%
Lawrence	8,073,572	11.0%	21.8%	36.4%	52.6%	70.7%
McDonald	7,098,007	16.8%	34.1%	58.2%	87.0%	121.8%
Newton	8,134,179	11.1%	23.4%	40.5%	59.6%	81.1%
Polk	5,898,760	14.9%	28.2%	38.7%	47.5%	55.9%
St Clair	2,024,160	1.3%	0.4%	-0.9%	-1.2%	-0.3%
Stone	5,546,795	16.3%	26.1%	41.0%	57.1%	73.4%
Taney	33,110,314	6.0%	13.3%	22.2%	32.1%	43.2%
Vernon	5,834,426	-1.0%	-1.2%	-1.0%	-0.7%	-0.3%
Total	339,127,961	6.6%	13.2%	20.3%	28.1%	36.8%

Under the low growth scenario, the region predictably experienced lower growth in water demand and a number of counties (Cedar, Dade, Hickory, Saint Clair, and Vernon) experienced a decrease in demand. The low growth population projection also showed an increased in water usage to 388.3 million gallons per day, 14.5% increase. Table 12-3 shows the percentage increase in water demand for each county.

Table 12-3: Southwest Missouri – Percentage Change in Estimated Water Use under the Low Growth Scenario.

County	2010 Baseline (GPD)	% Change 2010 - 2020	% Change 2010 - 2030	% Change 2010 - 2040	% Change 2010 - 2050	% Change 2010 - 2060
Barry	21,126,701	3.5%	4.5%	10.5%	16.6%	22.9%
Barton	3,126,918	1.8%	2.3%	4.6%	7.4%	10.3%
Cedar	1,954,753	-3.5%	-7.0%	-10.4%	-13.4%	-16.2%
Christian	11,101,445	30.0%	52.1%	63.1%	73.8%	84.2%
Dade	2,795,139	-2.3%	-5.3%	-7.2%	-8.9%	-10.5%
Greene	201,924,381	1.2%	2.0%	3.1%	4.1%	5.0%
Hickory	1,603,674	-1.3%	-5.4%	-10.8%	-15.8%	-20.4%
Jasper	19,774,737	11.5%	20.7%	31.6%	42.1%	52.5%
Lawrence	8,073,572	5.4%	9.3%	15.1%	20.6%	25.7%
McDonald	7,098,007	8.3%	15.0%	25.3%	36.5%	49.0%
Newton	8,134,179	3.3%	6.4%	11.8%	16.9%	22.0%
Polk	5,898,760	9.6%	16.4%	19.6%	20.9%	21.3%
St Clair	2,024,160	-1.8%	-5.6%	-9.5%	-12.3%	-14.0%
Stone	5,546,795	8.9%	10.3%	14.7%	18.6%	21.3%
Taney	33,110,314	3.3%	6.8%	10.6%	14.2%	17.6%
Vernon	5,834,426	-1.9%	-2.9%	-3.6%	-4.1%	-4.6%
Total	339,127,961	3.5%	6.0%	8.9%	11.7%	14.5%

Water demand for the entire region is expected to increase between 49.2 million gallons per day and 245.0 million gallons per day between 2010 and 2060, given the different population scenarios. The total daily water demand in 2060 for the sixteen county region is estimated to be between 388.3 and 584.3 million gallons.

The water usage for the region is projected to increase in each of the three population growth scenarios. Further phases will examine the gap between supply and this projected demand. The next step of this process involves identifying the most economically viable sources for satisfying the region's future water demand requirements.

12.2 Phase II – Water Supply Assessment and Alternative Formulation

12.2.1 Water Supply

The purpose of quantifying water supply in the Southwest region of Missouri is to estimate the amount of water that might be physically and legally available. The frequency and magnitude of

droughts should be examined to determine the level of reliability of various supplies. Two definitions in the assessment of water supply are:

- Supply availability – the volume of water that can be produced per unit of time (per year, for example) within the **constraints of applicable regulatory framework**
- Supply – the volume of water that can be produced per unit of time based on **existing infrastructure and constraints of applicable regulatory framework**

The approach to estimating surface water supplies requires an assessment of streamflow and surface water storage resources by basin for average, wet, and dry-year conditions. Streamflow and surface water storage data are available from the USGS, United States Corps of Engineers (USACE) and from the National Climate Data Center (NCDC) database.

There are three basic approaches to quantify surface water supply

1. Basin Water Budgets
2. Sub-basin Systems Analysis
3. Water Provider/User Alternatives Analysis

Each has its appropriate application based on level of detail and complexity as illustrated below in Figure 12-1.

There are several steps in determining the best approach to quantifying groundwater supply availability.

- Data collection and review
- Review of existing groundwater data, models and tools
- Prioritizing aquifers and aquifer units for determination of sustainable yields
- Review calibration of groundwater flow models and other predictive tools
- Use of tools to assess range of planning conditions for prioritized aquifers

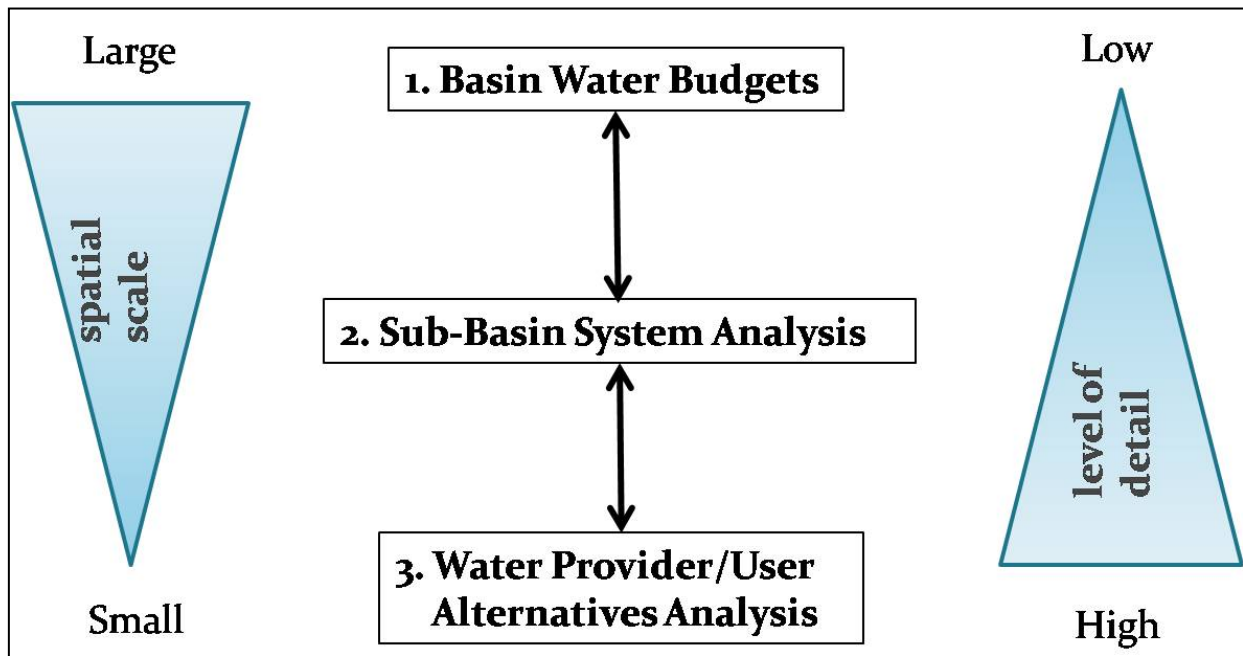


Figure 12-1: Infrastructure Needs and Conditions Assessment

An assessment of physical and legal supply is vital to determine water needs. However without the necessary infrastructure the supplies cannot be delivered to the end user. An infrastructure assessment should be completed for publically supplied water and waste water unless a specific water supply alternative is identified that needs to be developed in greater detail (i.e., water supply alternative to address agricultural sustainability) as part of a “gap” analysis and alternative development.

The goal of this effort is to generally characterize long-term infrastructure needs and to assess economic trends and funding needs based on demographic forecasts and trends. This information is intended to be used to help MDNR identify the programs and funding needs for new and aging infrastructure to ensure that long-term demands and water quality standards can be reliably met.

12.2.2 Gap Analysis

As discussed above the capacity of existing facilities and infrastructure to meet forecasted needs should be considered as part of a water supply gap analysis. A water supply gap would be determined based upon the difference between future demand and available supplies as illustrated below. In this illustration, the gap may be met initially by demand side conservation measures deferring water treatment plant capital investments into the future.

Available supplies should be derived based upon quantified streamflows using historical data and quantified/modeled sustainable groundwater supply yield. Withdrawal permit volumes and considerations for future supply development will also determine the availability of future water supplies in Southwest Missouri.

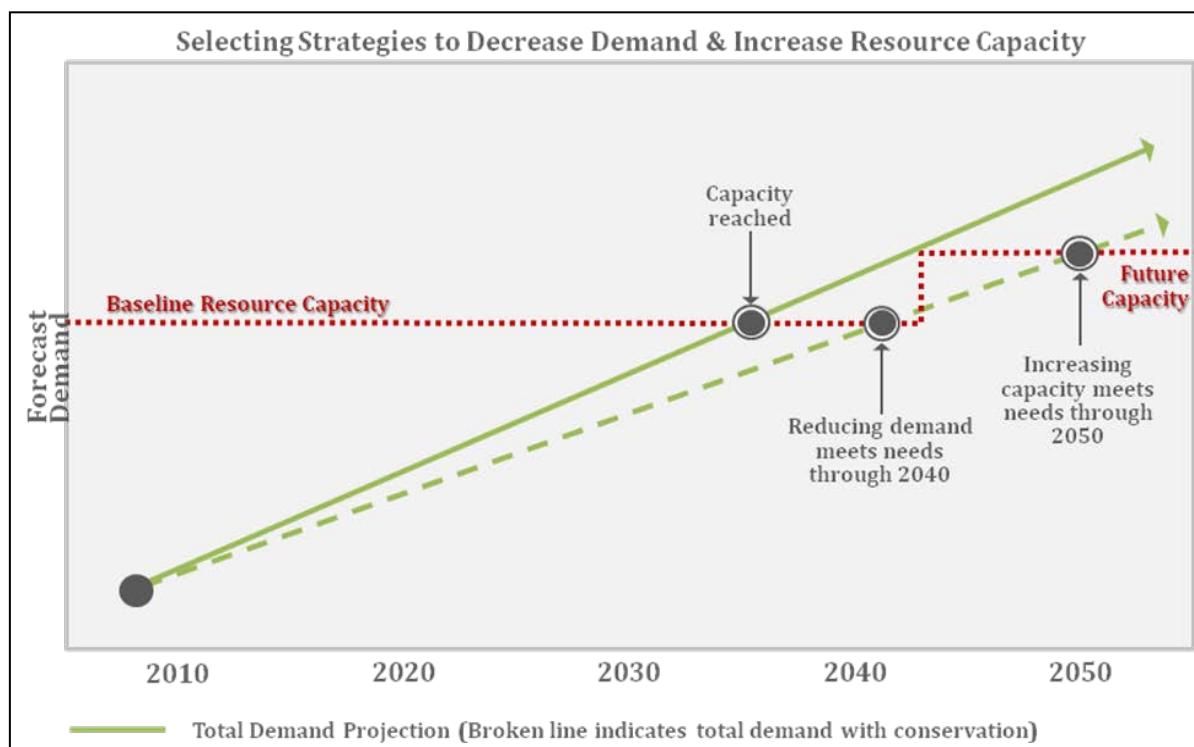


Figure 12-2: Demand Reduction Strategies

Basin water budgets are simply the difference between projected demand and surface and groundwater supply availability. This approach is appropriate for a regional scale on an annual time step. This approach does not take into account seasonality or legal, infrastructure or water quality constraints.

However, a more refined approach is a sub-basins system analysis guided by a basin water budget with seasonal or monthly time steps. This approach can account for those things unable to be addressed in the water budget as noted above and also including non consumptive demands such as environmental flows, recreation and navigation as well as water rights and climate change scenarios. The sub-basin level can be applied in complex areas such as assessment of the Fayetteville Shale non-riparian, excess surface water and cumulative impacts.

A more drilled down approach is at the water provider or user level to look at specific infrastructure needs to address gaps in supply or water efficiency programs to reduce demands. This can be done in select cases.

12.2.3 Developing Water Resource Strategies and Management Actions

The final step to address shortfalls between water demands and supplies is to identify strategies or management actions to address identified needs. In very few cases does a single solution to a water resource need arise. A more likely outcome is that a range of strategies or

management actions will emerge. These strategies/management actions are typically arranged into one or more portfolio of strategies both structural and non-structural (e.g., infrastructure, policies, programs etc.) options to meet future statewide water quality and quantity needs as illustrated below here. All strategies should be vetted through the stakeholder process.

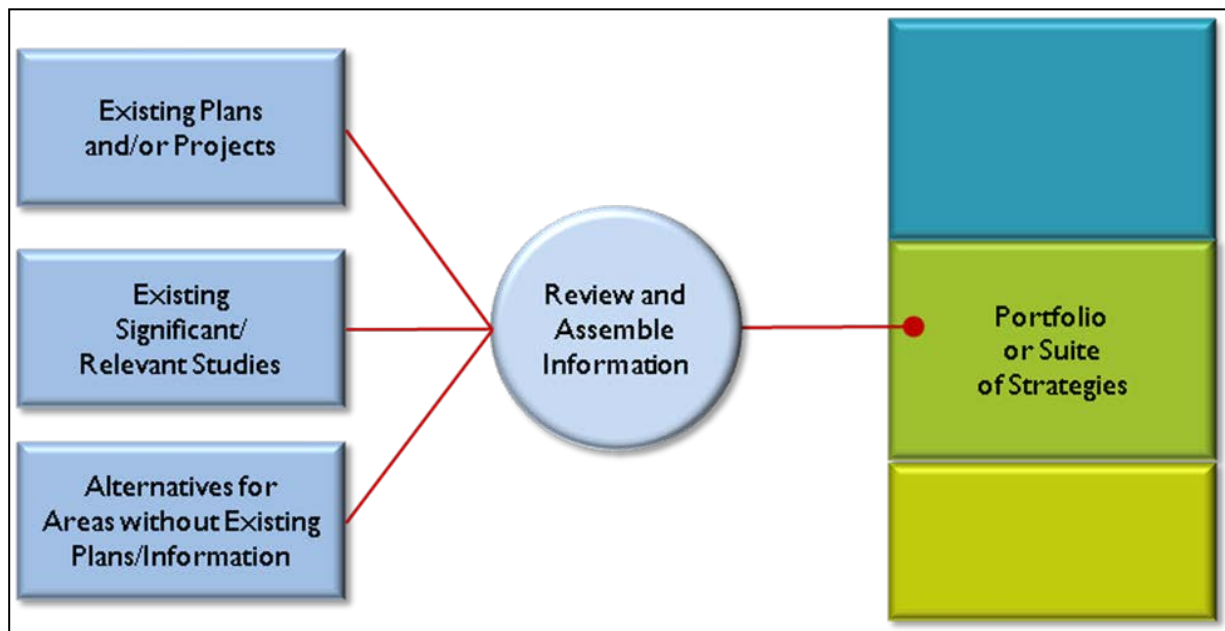


Figure 12-3: Identification of Actions to Address Identified Needs

Examples of possible water resource strategies/management action to consideration for both quantity and quality scenarios are offered below. Listed below are considerations for demand and supply alternatives.

- Demand
 - Water Conservation
 - Water reuse
- Return
 - Centralized wastewater treatment
 - Onsite sewage management system
- Supply
 - Reservoirs
 - Interbasin and intrabasin transfers / interconnections
 - Conjunctive use of groundwater and surface water
 - Aquifer storage and recovery

Also, considerations for water quality alternatives are noted for creation of scenarios.

- Point Sources
 - Reuse
 - Centralized wastewater treatment
 - Direct discharges
- Non-point Sources
 - Improving compliance
 - Best management practices
 - Environmental planning/low impact development
 - Onsite sewage system management
- Integrated Management Strategies
 - Watershed based permitting
 - Water quality credit trading

Careful evaluation of strategies will make these more likely to be implementable and provide for adaptability for implementation and future updates.

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Appendix A - Data Log

Data	Description	Source
Census 2010 Estimates	Median household income by county	http://www.census.gov/
Census of Missouri Public Water Systems	Names and addresses of water systems for provider survey, public-supplied population	http://www.dnr.mo.gov/env/wpp/census.htm
High Plains Regional Climate Center Weather Information	Historic maximum monthly precipitation and mean maximum monthly temperature by county	http://www.hprcc.unl.edu/
IWR-MAIN software	Per employee water use factors developed from non-residential database	CDM-Smith
Missouri Census Data Center	Historical Population (2000-2010)	http://mcdc.missouri.edu/
Missouri DNR	Population and Employment Projections 2030-2060	Sreedhar Upendram Missouri DNR
Missouri DNR 2007 and 2010 Water Use Estimates	Little Rock District estimated water use for model verification	Cynthia Brookshire, Missouri DNR
Missouri Economic Research and Information Center	Employment projections through 2018 by county	http://www.missourieconomy.org/
Missouri Office of Administration	County population projections through 2030	http://oa.mo.gov/
Southwest Missouri Provider Survey	Used to develop the public-supply residential, public-supply non-residential, and the self-supplied residential forecast	CDM Smith/ USACE Kansas City and Little Rock District
USDA's National Agricultural Statistics Service (NASS)	County level agricultural data	http://www.agcensus.usda.gov/index.php
USGS Estimated Water Use in the United States	Self-supplied nonresidential data, model verification data	http://water.usgs.gov/watuse/data/2005/index.html

Appendix B - County Specific Data

Barry - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	20,340	26,299	32,047	38,757	46,657	56,187
Self-Supplied Population	15,257	19,727	24,038	29,071	34,997	42,145
Employment, Total						
11 Agriculture, forestry, fishing and hunting	548	677	760	1,073	1,451	1,922
21 Mining, quarrying, and oil and gas extraction	36	44	50	70	95	126
22 Utilities	83	103	115	163	220	291
23 Construction	400	494	555	783	1,059	1,403
31 Manufacturing	6,907	8,532	9,571	13,520	18,281	24,213
42 Wholesale trade	533	659	739	1,044	1,411	1,869
44 Retail trade	1,429	1,765	1,980	2,797	3,783	5,010
452 - General Merchandise Stores	816	1,008	1,130	1,597	2,159	2,859
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	226	279	313	442	597	791
51 Information	148	183	205	290	392	519
52 Finance and insurance	453	559	628	886	1,199	1,587
53 Real estate and rental and leasing	122	151	169	239	323	427
54 Professional and technical services	230	284	319	450	608	806
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	468	578	649	916	1,239	1,641
61 Educational services	42	51	58	81	110	146
62 Health care and social assistance	829	1,024	1,149	1,623	2,195	2,907
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	1,151	1,422	1,595	2,253	3,047	4,035
81 Other services, except public administration	435	537	603	851	1,151	1,524
Local, State and Federal Government	2,454	3,031	3,400	4,803	6,495	8,602
Public-Supply Nonresidential (GPD)	1,632,677	2,396,637	2,885,119	4,741,611	6,979,940	9,768,780
Public-Supply Residential (GPD)	1,262,515	1,632,388	1,989,173	2,405,650	2,896,025	3,487,534
System Losses (GPD)	481,834	670,533	811,208	1,189,488	1,643,615	2,206,192
Self-Supply Residential (GPD)	947,010	1,224,451	1,492,075	1,804,474	2,172,303	2,615,993
Projection of Irrigated Lands (in Acres)	422	443	463	484	504	525
Crop Irrigation (GPD)	124,753	130,830	136,907	142,985	149,062	155,139
Livestock (GPD)	2,880,217	2,915,156	2,950,095	2,985,034	3,019,973	3,054,912
Aquaculture (GPD)	12,100,000	12,100,000	12,100,000	12,100,000	12,100,000	12,100,000
Mining (GPD)	90,000	90,000	90,000	90,000	90,000	90,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	1,620,000	1,620,000	1,620,000	1,620,000	1,620,000	1,620,000
Total Water Demand, All Sectors (GPD)	21,139,006	22,779,996	24,074,577	27,079,242	30,670,919	35,098,550

Barry - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	20,340	24,801	28,490	32,479	36,857	41,839
Self-Supplied Population	15,257	18,603	21,370	24,363	27,647	31,384
Employment, Total						
11 Agriculture, forestry, fishing and hunting	548	639	676	900	1,147	1,432
21 Mining, quarrying, and oil and gas extraction	36	42	44	59	75	94
22 Utilities	83	97	102	136	174	217
23 Construction	400	466	493	657	837	1,045
31 Manufacturing	6,907	8,046	8,508	11,330	14,441	18,030
42 Wholesale trade	533	621	657	875	1,115	1,392
44 Retail trade	1,429	1,665	1,761	2,344	2,988	3,731
452 - General Merchandise Stores	816	950	1,005	1,338	1,705	2,129
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	226	263	278	370	472	589
51 Information	148	173	183	243	310	387
52 Finance and insurance	453	528	558	743	947	1,182
53 Real estate and rental and leasing	122	142	150	200	255	318
54 Professional and technical services	230	268	283	377	481	600
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	468	545	577	768	979	1,222
61 Educational services	42	48	51	68	87	108
62 Health care and social assistance	829	966	1,021	1,360	1,734	2,164
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	1,151	1,341	1,418	1,888	2,407	3,005
81 Other services, except public administration	435	507	536	713	909	1,135
Local, State and Federal Government	2,454	2,859	3,023	4,025	5,131	6,406
Public-Supply Nonresidential (GPD)	1,632,677	2,168,134	2,385,680	3,712,131	5,174,791	6,862,083
Public-Supply Residential (GPD)	1,262,515	1,539,396	1,768,383	2,016,015	2,287,754	2,597,000
System Losses (GPD)	481,834	617,028	691,343	953,311	1,241,960	1,574,235
Self-Supply Residential (GPD)	947,010	1,154,698	1,326,461	1,512,209	1,716,040	1,948,005
Projection of Irrigated Lands (in Acres)	416	416	416	416	416	416
Crop Irrigation (GPD)	122,930	122,930	122,930	122,930	122,930	122,930
Livestock (GPD)	2,869,736	2,869,736	2,869,736	2,869,736	2,869,736	2,869,736
Aquaculture (GPD)	12,100,000	12,100,000	12,100,000	12,100,000	12,100,000	12,100,000
Mining (GPD)	90,000	90,000	90,000	90,000	90,000	90,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	1,620,000	1,620,000	1,620,000	1,620,000	1,620,000	1,620,000
Total Water Demand, All Sectors (GPD)	21,126,701	22,281,921	22,974,532	24,996,332	27,223,210	29,783,988

Barry - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	20,340	23,380	25,310	27,190	29,075	31,101
Self-Supplied Population	15,257	18,603	21,370	24,363	27,647	31,384
Employment, Total						
11 Agriculture, forestry, fishing and hunting	548	602	600	753	905	1,064
21 Mining, quarrying, and oil and gas extraction	36	40	39	49	59	70
22 Utilities	83	91	91	114	137	161
23 Construction	400	440	438	550	660	777
31 Manufacturing	6,907	7,585	7,559	9,485	11,392	13,403
42 Wholesale trade	533	585	583	732	879	1,035
44 Retail trade	1,429	1,569	1,564	1,963	2,357	2,773
452 - General Merchandise Stores	816	896	893	1,120	1,345	1,583
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	226	248	247	310	372	438
51 Information	148	163	162	203	244	288
52 Finance and insurance	453	497	496	622	747	879
53 Real estate and rental and leasing	122	134	133	167	201	236
54 Professional and technical services	230	252	252	316	379	446
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	468	514	512	643	772	908
61 Educational services	42	46	45	57	69	81
62 Health care and social assistance	829	911	907	1,139	1,368	1,609
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	1,151	1,264	1,260	1,581	1,899	2,234
81 Other services, except public administration	435	478	476	597	717	844
Local, State and Federal Government	2,454	2,695	2,686	3,370	4,047	4,762
Public-Supply Nonresidential (GPD)	1,632,677	1,951,414	1,939,201	2,844,722	3,741,297	4,686,574
Public-Supply Residential (GPD)	1,262,515	1,451,199	1,571,006	1,687,720	1,804,717	1,930,483
System Losses (GPD)	481,834	566,282	584,189	754,315	923,000	1,101,249
Self-Supply Residential (GPD)	947,010	1,088,542	1,178,409	1,265,956	1,353,715	1,448,052
Projection of Irrigated Lands (in Acres)	416	416	416	416	416	416
Crop Irrigation (GPD)	122,930	122,930	122,930	122,930	122,930	122,930
Livestock (GPD)	2,869,736	2,869,736	2,869,736	2,869,736	2,869,736	2,869,736
Aquaculture (GPD)	12,100,000	12,100,000	12,100,000	12,100,000	12,100,000	12,100,000
Mining (GPD)	90,000	90,000	90,000	90,000	90,000	90,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	1,620,000	1,620,000	1,620,000	1,620,000	1,620,000	1,620,000
Total Water Demand, All Sectors (GPD)	21,126,701	21,860,102	22,075,469	23,355,378	24,625,394	25,969,022

Barton - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	12,402	13,679	14,806	16,034	17,513	19,083
Self-Supplied Population	0	0	0	0	0	0
Employment, Total						
11 Agriculture, forestry, fishing and hunting	94	98	97	107	118	130
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	247	257	255	281	311	344
31 Manufacturing	839	876	868	956	1,058	1,169
42 Wholesale trade	321	335	332	366	405	447
44 Retail trade	0	0	0	0	0	0
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	24	25	25	27	30	33
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	50	52	51	57	63	69
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	222	232	230	253	280	309
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	680	709	703	774	857	947
71 Arts, entertainment, and recreation	20	21	21	23	25	28
72 Accommodation and food services	729	761	755	831	920	1,016
81 Other services, except public administration	165	172	171	188	208	230
Local, State and Federal Government	1,786	1,864	1,849	2,035	2,253	2,488
Public-Supply Nonresidential (GPD)	408,336	428,699	424,764	473,630	530,743	592,288
Public-Supply Residential (GPD)	745,992	822,813	890,617	964,471	1,053,448	1,147,875
System Losses (GPD)	188,059	203,892	214,297	234,290	258,091	283,501
Self-Supply Residential (GPD)	0	0	0	0	0	0
Projection of Irrigated Lands (in Acres)	13,837	13,837	13,837	13,837	13,837	13,837
Crop Irrigation (GPD)	717,583	717,583	717,583	717,583	717,583	717,583
Livestock (GPD)	907,795	910,613	913,431	916,249	919,068	921,886
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	100,000	100,000	100,000	100,000	100,000	100,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	60,000	60,000	60,000	60,000	60,000	60,000
Total Water Demand, All Sectors (GPD)	3,127,764	3,243,600	3,320,692	3,466,223	3,638,932	3,823,132

Barton - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	12,402	13,424	14,259	15,152	16,241	17,366
Self-Supplied Population	0	0	0	0	0	0
Employment, Total						
11 Agriculture, forestry, fishing and hunting	94	96	93	101	109	119
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	247	253	246	266	289	313
31 Manufacturing	839	859	836	904	982	1,064
42 Wholesale trade	321	329	320	346	375	407
44 Retail trade	0	0	0	0	0	0
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	24	24	24	26	28	30
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	50	51	50	54	58	63
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	222	227	221	239	260	282
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	680	696	677	732	795	862
71 Arts, entertainment, and recreation	20	20	20	21	23	25
72 Accommodation and food services	729	747	727	785	853	925
81 Other services, except public administration	165	169	165	178	193	209
Local, State and Federal Government	1,786	1,829	1,781	1,923	2,090	2,264
Public-Supply Nonresidential (GPD)	408,336	419,588	406,841	444,301	487,855	533,637
Public-Supply Residential (GPD)	745,992	807,462	857,665	911,427	976,920	1,044,604
System Losses (GPD)	188,059	199,906	206,009	220,870	238,636	257,121
Self-Supply Residential (GPD)	0	0	0	0	0	0
Projection of Irrigated Lands (in Acres)	13,837	13,837	13,837	13,837	13,837	13,837
Crop Irrigation (GPD)	717,583	717,583	717,583	717,583	717,583	717,583
Livestock (GPD)	906,949	906,949	906,949	906,949	906,949	906,949
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	100,000	100,000	100,000	100,000	100,000	100,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	60,000	60,000	60,000	60,000	60,000	60,000
Total Water Demand, All Sectors (GPD)	3,126,918	3,211,488	3,255,046	3,361,130	3,487,942	3,619,893

Barton - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	12,402	13,173	13,730	14,317	15,059	15,801
Self-Supplied Population	0	0	0	0	0	0
Employment, Total						
11 Agriculture, forestry, fishing and hunting	94	94	90	95	101	108
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	247	248	237	251	268	285
31 Manufacturing	839	843	805	854	910	968
42 Wholesale trade	321	322	308	327	348	370
44 Retail trade	0	0	0	0	0	0
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	24	24	23	24	26	28
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	50	50	48	51	54	57
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	222	223	213	226	241	256
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	680	683	652	692	737	784
71 Arts, entertainment, and recreation	20	20	19	20	22	23
72 Accommodation and food services	729	733	700	742	791	841
81 Other services, except public administration	165	166	159	168	179	191
Local, State and Federal Government	1,786	1,795	1,715	1,818	1,938	2,060
Public-Supply Nonresidential (GPD)	408,336	410,630	389,550	416,535	448,010	480,166
Public-Supply Residential (GPD)	745,992	792,368	825,873	861,208	905,822	950,454
System Losses (GPD)	188,059	195,988	198,012	208,165	220,561	233,071
Self-Supply Residential (GPD)	0	0	0	0	0	0
Projection of Irrigated Lands (in Acres)	13,837	13,837	13,837	13,837	13,837	13,837
Crop Irrigation (GPD)	717,583	717,583	717,583	717,583	717,583	717,583
Livestock (GPD)	906,949	906,949	906,949	906,949	906,949	906,949
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	100,000	100,000	100,000	100,000	100,000	100,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	60,000	60,000	60,000	60,000	60,000	60,000
Total Water Demand, All Sectors (GPD)	3,126,918	3,183,519	3,197,966	3,270,439	3,358,925	3,448,223

Cedar - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	8,423	8,720	9,008	9,301	9,629	9,984
Self-Supplied Population	5,333	5,521	5,704	5,889	6,096	6,321
Employment, Total						
11 Agriculture, forestry, fishing and hunting	20	20	19	17	16	15
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	219	210	199	188	176	164
31 Manufacturing	827	790	750	708	665	620
42 Wholesale trade	210	201	190	180	169	157
44 Retail trade	868	829	787	742	698	651
452 - General Merchandise Stores	119	114	108	102	96	89
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	6	5	5	5	4	4
51 Information	63	60	57	54	51	47
52 Finance and insurance	186	178	169	159	150	139
53 Real estate and rental and leasing	52	50	47	45	42	39
54 Professional and technical services	61	59	56	52	49	46
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	32	30	29	27	25	24
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	881	842	799	754	709	661
71 Arts, entertainment, and recreation	45	43	40	38	36	33
72 Accommodation and food services	554	529	502	474	446	415
81 Other services, except public administration	195	186	177	167	157	146
Local, State and Federal Government	2,246	2,146	2,036	1,921	1,806	1,684
Public-Supply Nonresidential (GPD)	528,297	504,724	478,930	451,815	424,853	396,038
Public-Supply Residential (GPD)	345,561	357,746	369,581	381,570	395,025	409,585
System Losses (GPD)	128,296	126,624	124,575	122,354	120,371	118,278
Self-Supply Residential (GPD)	218,791	226,506	233,999	241,590	250,109	259,328
Projection of Irrigated Lands (in Acres)	153	162	171	181	190	199
Crop Irrigation (GPD)	16,322	17,309	18,297	19,285	20,273	21,260
Livestock (GPD)	722,513	738,283	754,052	769,821	785,590	801,359
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	0	0	0	0	0	0
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	1,959,780	1,971,192	1,979,433	1,986,435	1,996,220	2,005,848

Cedar - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	8,423	8,488	8,536	8,578	8,645	8,725
Self-Supplied Population	5,333	5,374	5,404	5,431	5,473	5,524
Employment, Total						
11 Agriculture, forestry, fishing and hunting	20	19	18	16	15	13
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	219	204	188	173	158	144
31 Manufacturing	827	769	711	653	597	542
42 Wholesale trade	210	195	180	166	152	138
44 Retail trade	868	807	746	685	627	569
452 - General Merchandise Stores	119	111	102	94	86	78
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	6	5	5	4	4	4
51 Information	63	59	54	50	46	41
52 Finance and insurance	186	173	160	147	134	122
53 Real estate and rental and leasing	52	48	45	41	38	34
54 Professional and technical services	61	57	53	48	44	40
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	32	29	27	25	23	21
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	881	820	757	695	636	577
71 Arts, entertainment, and recreation	45	41	38	35	32	29
72 Accommodation and food services	554	515	476	437	400	363
81 Other services, except public administration	195	182	168	154	141	128
Local, State and Federal Government	2,246	2,089	1,929	1,772	1,622	1,471
Public-Supply Nonresidential (GPD)	528,297	491,307	453,803	416,727	381,442	346,120
Public-Supply Residential (GPD)	345,561	348,236	350,191	351,937	354,662	357,960
System Losses (GPD)	128,296	123,258	118,039	112,852	108,072	103,370
Self-Supply Residential (GPD)	218,791	220,485	221,722	222,828	224,553	226,641
Projection of Irrigated Lands (in Acres)	150	150	150	150	150	150
Crop Irrigation (GPD)	16,025	16,025	16,025	16,025	16,025	16,025
Livestock (GPD)	717,783	717,783	717,783	717,783	717,783	717,783
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	0	0	0	0	0	0
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	1,954,753	1,917,094	1,877,562	1,838,152	1,802,536	1,767,900

Cedar - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	8,423	8,262	8,087	7,910	7,759	7,623
Self-Supplied Population	5,333	5,231	5,120	5,009	4,913	4,826
Employment, Total						
11 Agriculture, forestry, fishing and hunting	20	19	17	15	13	12
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	219	199	179	160	142	126
31 Manufacturing	827	749	673	602	536	474
42 Wholesale trade	210	190	171	153	136	120
44 Retail trade	868	786	706	631	562	497
452 - General Merchandise Stores	119	108	97	87	77	68
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	6	5	5	4	4	3
51 Information	63	57	51	46	41	36
52 Finance and insurance	186	168	151	135	120	106
53 Real estate and rental and leasing	52	47	42	38	34	30
54 Professional and technical services	61	56	50	45	40	35
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	32	29	26	23	20	18
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	881	798	717	641	571	504
71 Arts, entertainment, and recreation	45	40	36	32	29	26
72 Accommodation and food services	554	501	451	403	359	317
81 Other services, except public administration	195	177	159	142	127	112
Local, State and Federal Government	2,246	2,033	1,828	1,634	1,455	1,285
Public-Supply Nonresidential (GPD)	528,297	478,212	429,931	384,280	342,367	302,384
Public-Supply Residential (GPD)	345,561	338,954	331,770	324,535	318,330	312,728
System Losses (GPD)	128,296	119,973	111,830	104,065	97,001	90,308
Self-Supply Residential (GPD)	218,791	214,608	210,059	205,478	201,550	198,003
Projection of Irrigated Lands (in Acres)	150	150	150	150	150	150
Crop Irrigation (GPD)	16,025	16,025	16,025	16,025	16,025	16,025
Livestock (GPD)	717,783	717,783	717,783	717,783	717,783	717,783
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	0	0	0	0	0	0
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	1,954,753	1,885,554	1,817,397	1,752,166	1,693,055	1,637,232

Christian - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	46,078	93,908	169,436	210,833	260,785	320,717
Self-Supplied Population	31,344	63,880	115,257	143,417	177,396	218,164
Employment, Total						
11 Agriculture, forestry, fishing and hunting	91	178	305	386	483	600
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	4,489	8,778	15,047	18,993	23,780	29,538
31 Manufacturing	4,460	8,722	14,950	18,871	23,627	29,349
42 Wholesale trade	0	0	0	0	0	0
44 Retail trade	8,224	16,082	27,567	34,798	43,567	54,118
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	762	1,490	2,554	3,223	4,036	5,013
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	1,804	3,528	6,048	7,634	9,558	11,873
55 Management of companies and enterprises	95	185	318	401	502	624
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	200	392	672	848	1,062	1,319
62 Health care and social assistance	4,361	8,528	14,619	18,453	23,103	28,698
71 Arts, entertainment, and recreation	292	570	977	1,234	1,545	1,919
72 Accommodation and food services	6,173	12,072	20,693	26,120	32,703	40,622
81 Other services, except public administration	0	0	0	0	0	0
Local, State and Federal Government	10,229	20,004	34,290	43,284	54,192	67,315
Public-Supply Nonresidential (GPD)	3,093,176	6,356,067	11,124,427	14,126,463	17,767,457	22,147,920
Public-Supply Residential (GPD)	2,843,787	5,795,716	10,457,030	13,011,934	16,094,793	19,793,640
System Losses (GPD)	967,228	1,979,724	3,515,971	4,421,287	5,516,713	6,832,964
Self-Supply Residential (GPD)	1,934,451	3,942,466	7,113,268	8,851,210	10,948,287	13,464,383
Projection of Irrigated Lands (in Acres)	180	253	326	399	472	545
Crop Irrigation (GPD)	23,265	32,707	42,149	51,592	61,034	70,477
Livestock (GPD)	709,572	733,572	757,572	781,572	805,572	829,572
Aquaculture (GPD)	580,000	580,000	580,000	580,000	580,000	580,000
Mining (GPD)	630,000	630,000	630,000	630,000	630,000	630,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	330,000	330,000	330,000	330,000	330,000	330,000
Total Water Demand, All Sectors (GPD)	11,111,478	20,380,252	34,550,418	42,784,059	52,733,856	64,678,957

Christian - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	46,078	77,591	115,397	133,469	153,447	175,394
Self-Supplied Population	31,344	52,780	78,498	90,791	104,380	119,309
Employment, Total						
11 Agriculture, forestry, fishing and hunting	91	19	18	16	15	13
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	4,489	204	188	173	158	144
31 Manufacturing	4,460	769	711	653	597	542
42 Wholesale trade	0	195	180	166	152	138
44 Retail trade	8,224	807	746	685	627	569
452 - General Merchandise Stores	0	111	102	94	86	78
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	5	5	4	4	4
51 Information	762	59	54	50	46	41
52 Finance and insurance	0	173	160	147	134	122
53 Real estate and rental and leasing	0	48	45	41	38	34
54 Professional and technical services	1,804	57	53	48	44	40
55 Management of companies and enterprises	95	0	0	0	0	0
56 Administrative and waste services	0	29	27	25	23	21
61 Educational services	200	0	0	0	0	0
62 Health care and social assistance	4,361	820	757	695	636	577
71 Arts, entertainment, and recreation	292	41	38	35	32	29
72 Accommodation and food services	6,173	515	476	437	400	363
81 Other services, except public administration	0	182	168	154	141	128
Local, State and Federal Government	10,229	2,089	1,929	1,772	1,622	1,471
Public-Supply Nonresidential (GPD)	3,093,176	5,195,826	7,474,065	8,825,014	10,322,278	11,966,719
Public-Supply Residential (GPD)	2,843,787	4,788,647	7,121,949	8,237,300	9,470,259	10,824,734
System Losses (GPD)	967,228	1,626,633	2,377,929	2,779,729	3,224,527	3,713,099
Self-Supply Residential (GPD)	1,934,451	3,257,419	4,844,620	5,603,323	6,442,029	7,363,394
Projection of Irrigated Lands (in Acres)	158	158	158	158	158	158
Crop Irrigation (GPD)	20,432	20,432	20,432	20,432	20,432	20,432
Livestock (GPD)	702,372	702,372	702,372	702,372	702,372	702,372
Aquaculture (GPD)	580,000	580,000	580,000	580,000	580,000	580,000
Mining (GPD)	630,000	630,000	630,000	630,000	630,000	630,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	330,000	330,000	330,000	330,000	330,000	330,000
Total Water Demand, All Sectors (GPD)	11,101,445	17,131,329	24,081,366	27,708,169	31,721,896	36,130,751

Christian - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	46,078	63,871	78,004	83,815	89,516	95,047
Self-Supplied Population	31,344	43,447	53,062	57,014	60,892	64,654
Employment, Total						
11 Agriculture, forestry, fishing and hunting	91	121	141	153	166	178
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	4,489	5,970	6,927	7,551	8,163	8,754
31 Manufacturing	4,460	5,932	6,883	7,502	8,110	8,698
42 Wholesale trade	0	0	0	0	0	0
44 Retail trade	8,224	10,938	12,691	13,834	14,955	16,038
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	762	1,013	1,176	1,281	1,385	1,486
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	1,804	2,400	2,784	3,035	3,281	3,519
55 Management of companies and enterprises	95	126	146	159	172	185
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	200	267	309	337	365	391
62 Health care and social assistance	4,361	5,800	6,730	7,336	7,930	8,505
71 Arts, entertainment, and recreation	292	388	450	491	530	569
72 Accommodation and food services	6,173	8,211	9,526	10,384	11,225	12,039
81 Other services, except public administration	0	0	0	0	0	0
Local, State and Federal Government	10,229	13,606	15,786	17,207	18,602	19,949
Public-Supply Nonresidential (GPD)	3,093,176	4,220,288	4,948,136	5,422,412	5,887,873	6,337,698
Public-Supply Residential (GPD)	2,843,787	3,941,897	4,814,184	5,172,820	5,524,638	5,865,971
System Losses (GPD)	967,228	1,329,753	1,590,441	1,726,136	1,859,284	1,988,177
Self-Supply Residential (GPD)	1,934,451	2,681,427	3,274,790	3,518,748	3,758,068	3,990,256
Projection of Irrigated Lands (in Acres)	158	158	158	158	158	158
Crop Irrigation (GPD)	20,432	20,432	20,432	20,432	20,432	20,432
Livestock (GPD)	702,372	702,372	702,372	702,372	702,372	702,372
Aquaculture (GPD)	580,000	580,000	580,000	580,000	580,000	580,000
Mining (GPD)	630,000	630,000	630,000	630,000	630,000	630,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	330,000	330,000	330,000	330,000	330,000	330,000
Total Water Demand, All Sectors (GPD)	11,101,445	14,436,168	16,890,354	18,102,920	19,292,665	20,444,905

Dade - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	3,157	3,447	3,732	4,113	4,548	5,038
Self-Supplied Population	4,402	4,807	5,204	5,735	6,342	7,025
Employment, Total						
11 Agriculture, forestry, fishing and hunting	66	68	66	66	66	66
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	90	92	90	91	91	90
31 Manufacturing	600	615	600	604	604	599
42 Wholesale trade	517	529	517	520	520	516
44 Retail trade	486	497	486	489	489	485
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	90	92	90	91	91	90
51 Information	42	43	42	42	42	42
52 Finance and insurance	174	178	173	175	175	173
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	45	46	45	45	45	45
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	191	195	191	192	192	190
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	104	107	104	105	105	104
71 Arts, entertainment, and recreation	49	50	49	49	49	48
72 Accommodation and food services	194	199	194	195	196	194
81 Other services, except public administration	59	60	59	59	59	59
Local, State and Federal Government	2,016	2,064	2,015	2,028	2,029	2,011
Public-Supply Nonresidential (GPD)	346,789	355,046	346,618	348,888	349,027	345,860
Public-Supply Residential (GPD)	302,539	330,365	357,627	394,140	435,851	482,806
System Losses (GPD)	102,302	107,987	110,954	117,064	123,658	130,556
Self-Supply Residential (GPD)	421,848	460,648	498,662	549,574	607,734	673,207
Projection of Irrigated Lands (in Acres)	8,621	8,621	8,621	8,621	8,621	8,621
Crop Irrigation (GPD)	748,335	748,335	748,335	748,335	748,335	748,335
Livestock (GPD)	828,897	847,467	866,036	884,605	903,175	921,744
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	50,000	50,000	50,000	50,000	50,000	50,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	2,800,710	2,899,848	2,978,232	3,092,607	3,217,780	3,352,509

Dade - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	3,157	3,241	3,299	3,418	3,554	3,702
Self-Supplied Population	4,402	4,519	4,600	4,767	4,956	5,162
Employment, Total						
11 Agriculture, forestry, fishing and hunting	66	63	58	55	52	48
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	90	87	80	75	71	66
31 Manufacturing	600	578	530	502	472	440
42 Wholesale trade	517	498	457	432	407	379
44 Retail trade	486	468	429	406	382	356
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	90	87	80	75	71	66
51 Information	42	40	37	35	33	31
52 Finance and insurance	174	167	153	145	136	127
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	45	43	40	38	35	33
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	191	184	169	160	150	140
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	104	100	92	87	82	76
71 Arts, entertainment, and recreation	49	47	43	41	38	36
72 Accommodation and food services	194	187	172	162	153	142
81 Other services, except public administration	59	57	52	49	46	43
Local, State and Federal Government	2,016	1,941	1,781	1,686	1,586	1,478
Public-Supply Nonresidential (GPD)	346,789	333,820	306,396	289,981	272,774	254,162
Public-Supply Residential (GPD)	302,539	310,614	316,127	327,592	340,630	354,799
System Losses (GPD)	102,302	101,531	98,078	97,299	96,642	95,942
Self-Supply Residential (GPD)	421,848	433,108	440,795	456,782	474,961	494,719
Projection of Irrigated Lands (in Acres)	8,621	8,621	8,621	8,621	8,621	8,621
Crop Irrigation (GPD)	748,335	748,335	748,335	748,335	748,335	748,335
Livestock (GPD)	823,326	823,326	823,326	823,326	823,326	823,326
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	50,000	50,000	50,000	50,000	50,000	50,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	2,795,139	2,800,735	2,783,058	2,793,316	2,806,668	2,821,284

Dade - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	3,157	3,046	2,914	2,838	2,774	2,716
Self-Supplied Population	4,402	4,248	4,063	3,957	3,868	3,787
Employment, Total						
11 Agriculture, forestry, fishing and hunting	66	60	51	46	40	35
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	90	82	70	63	55	49
31 Manufacturing	600	543	468	417	368	323
42 Wholesale trade	517	468	403	359	317	278
44 Retail trade	486	440	379	337	298	261
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	90	82	70	63	55	49
51 Information	42	38	32	29	26	22
52 Finance and insurance	174	157	135	120	106	93
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	45	41	35	31	28	24
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	191	173	149	132	117	103
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	104	94	81	72	64	56
71 Arts, entertainment, and recreation	49	44	38	34	30	26
72 Accommodation and food services	194	176	152	135	119	104
81 Other services, except public administration	59	53	46	41	36	32
Local, State and Federal Government	2,016	1,824	1,573	1,400	1,237	1,084
Public-Supply Nonresidential (GPD)	346,789	313,743	270,633	240,743	212,855	186,431
Public-Supply Residential (GPD)	302,539	291,932	279,229	271,969	265,805	260,250
System Losses (GPD)	102,302	95,424	86,631	80,778	75,413	70,375
Self-Supply Residential (GPD)	421,848	407,059	389,346	379,223	370,628	362,882
Projection of Irrigated Lands (in Acres)	8,621	8,621	8,621	8,621	8,621	8,621
Crop Irrigation (GPD)	748,335	748,335	748,335	748,335	748,335	748,335
Livestock (GPD)	823,326	823,326	823,326	823,326	823,326	823,326
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	50,000	50,000	50,000	50,000	50,000	50,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	2,795,139	2,729,820	2,647,501	2,594,374	2,546,363	2,501,599

Greene - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	236,000	308,491	393,555	489,309	604,668	744,203
Self-Supplied Population	39,174	51,207	65,327	81,221	100,370	123,531
Employment, Total						
11 Agriculture, forestry, fishing and hunting	173	212	249	317	399	499
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	5,605	6,841	8,037	10,229	12,879	16,126
31 Manufacturing	11,333	13,834	16,251	20,685	26,042	32,608
42 Wholesale trade	9,087	11,092	13,029	16,584	20,880	26,144
44 Retail trade	20,695	25,262	29,674	37,771	47,554	59,544
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	0	0	0	0	0	0
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	2,426	2,961	3,478	4,427	5,573	6,979
54 Professional and technical services	4,886	5,965	7,007	8,918	11,228	14,059
55 Management of companies and enterprises	3,436	4,194	4,926	6,270	7,894	9,885
56 Administrative and waste services	9,473	11,564	13,584	17,290	21,768	27,257
61 Educational services	2,176	2,656	3,120	3,971	5,000	6,260
62 Health care and social assistance	31,566	38,531	45,262	57,612	72,533	90,821
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	15,059	18,382	21,593	27,486	34,604	43,329
81 Other services, except public administration	4,933	6,021	7,073	9,003	11,335	14,193
Local, State and Federal Government	20,511	25,036	29,410	37,435	47,130	59,013
Public-Supply Nonresidential (GPD)	9,867,178	12,382,326	14,812,900	19,272,675	24,660,711	31,264,683
Public-Supply Residential (GPD)	13,335,472	17,431,653	22,238,300	27,649,010	34,167,509	42,052,087
System Losses (GPD)	4,020,680	5,166,326	6,420,431	8,130,841	10,194,069	12,704,723
Self-Supply Residential (GPD)	2,213,575	2,893,507	3,691,369	4,589,501	5,671,517	6,980,290
Projection of Irrigated Lands (in Acres)	142	206	271	335	399	463
Crop Irrigation (GPD)	26,225	38,052	49,880	61,707	73,534	85,361
Livestock (GPD)	904,336	952,957	1,001,578	1,050,199	1,098,820	1,147,441
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	540,000	540,000	540,000	540,000	540,000	540,000
Thermoelectric, Withdrawals (GPD)	168,890,000	168,890,000	168,890,000	168,890,000	168,890,000	168,890,000
Golf Course Irrigation (GPD)	595,050	595,050	595,050	595,050	595,050	595,050
Self-Supply Large Industry (GPD)	1,550,000	1,550,000	1,550,000	1,550,000	1,550,000	1,550,000
Total Water Demand, All Sectors (GPD)	201,942,515	210,439,870	219,789,507	232,328,983	247,441,210	265,809,636

Greene - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	236,000	284,171	333,882	382,233	434,908	492,825
Self-Supplied Population	39,174	47,170	55,422	63,447	72,191	81,805
Employment, Total						
11 Agriculture, forestry, fishing and hunting	173	195	211	247	287	331
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	5,605	6,302	6,818	7,991	9,263	10,679
31 Manufacturing	11,333	12,743	13,787	16,158	18,731	21,594
42 Wholesale trade	9,087	10,217	11,054	12,955	15,018	17,313
44 Retail trade	20,695	23,270	25,175	29,506	34,203	39,431
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	0	0	0	0	0	0
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	2,426	2,727	2,951	3,458	4,009	4,621
54 Professional and technical services	4,886	5,494	5,944	6,967	8,076	9,310
55 Management of companies and enterprises	3,436	3,863	4,179	4,898	5,678	6,546
56 Administrative and waste services	9,473	10,652	11,524	13,507	15,657	18,050
61 Educational services	2,176	2,447	2,647	3,102	3,596	4,146
62 Health care and social assistance	31,566	35,493	38,399	45,005	52,169	60,143
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	15,059	16,933	18,319	21,471	24,889	28,693
81 Other services, except public administration	4,933	5,547	6,001	7,033	8,153	9,399
Local, State and Federal Government	20,511	23,063	24,951	29,243	33,898	39,079
Public-Supply Nonresidential (GPD)	9,867,178	11,285,416	12,334,650	14,720,055	17,307,255	20,186,730
Public-Supply Residential (GPD)	13,335,472	16,057,424	18,866,401	21,598,556	24,575,036	27,847,712
System Losses (GPD)	4,020,680	4,738,114	5,406,686	6,293,484	7,257,588	8,323,666
Self-Supply Residential (GPD)	2,213,575	2,665,396	3,131,663	3,585,177	4,079,248	4,622,484
Projection of Irrigated Lands (in Acres)	123	123	123	123	123	123
Crop Irrigation (GPD)	22,677	22,677	22,677	22,677	22,677	22,677
Livestock (GPD)	889,749	889,749	889,749	889,749	889,749	889,749
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	540,000	540,000	540,000	540,000	540,000	540,000
Thermoelectric, Withdrawals (GPD)	168,890,000	168,890,000	168,890,000	168,890,000	168,890,000	168,890,000
Golf Course Irrigation (GPD)	595,050	595,050	595,050	595,050	595,050	595,050
Self-Supply Large Industry (GPD)	1,550,000	1,550,000	1,550,000	1,550,000	1,550,000	1,550,000
Total Water Demand, All Sectors (GPD)	201,924,381	207,233,827	212,226,876	218,684,747	225,706,603	233,468,068

Greene - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	236,000	261,590	282,871	297,977	311,953	325,243
Self-Supplied Population	39,174	43,422	46,954	49,462	51,782	53,987
Employment, Total						
11 Agriculture, forestry, fishing and hunting	173	180	179	193	206	218
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	5,605	5,801	5,776	6,229	6,644	7,048
31 Manufacturing	11,333	11,731	11,680	12,596	13,435	14,251
42 Wholesale trade	9,087	9,405	9,365	10,100	10,772	11,426
44 Retail trade	20,695	21,421	21,329	23,002	24,533	26,023
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	0	0	0	0	0	0
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	2,426	2,511	2,500	2,696	2,875	3,050
54 Professional and technical services	4,886	5,058	5,036	5,431	5,793	6,144
55 Management of companies and enterprises	3,436	3,556	3,541	3,818	4,073	4,320
56 Administrative and waste services	9,473	9,806	9,764	10,529	11,230	11,912
61 Educational services	2,176	2,252	2,242	2,418	2,579	2,736
62 Health care and social assistance	31,566	32,673	32,532	35,084	37,420	39,692
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	15,059	15,588	15,521	16,738	17,852	18,936
81 Other services, except public administration	4,933	5,106	5,084	5,483	5,848	6,203
Local, State and Federal Government	20,511	21,230	21,139	22,797	24,315	25,791
Public-Supply Nonresidential (GPD)	9,867,178	10,266,957	10,216,142	11,137,690	11,981,227	12,801,508
Public-Supply Residential (GPD)	13,335,472	14,781,480	15,983,967	16,837,576	17,627,312	18,378,230
System Losses (GPD)	4,020,680	4,340,528	4,540,095	4,847,704	5,130,726	5,402,992
Self-Supply Residential (GPD)	2,213,575	2,453,600	2,653,203	2,794,895	2,925,984	3,050,630
Projection of Irrigated Lands (in Acres)	123	123	123	123	123	123
Crop Irrigation (GPD)	22,677	22,677	22,677	22,677	22,677	22,677
Livestock (GPD)	889,749	889,749	889,749	889,749	889,749	889,749
Aquaculture (GPD)	540,000	540,000	540,000	540,000	540,000	540,000
Mining (GPD)	168,890,000	168,890,000	168,890,000	168,890,000	168,890,000	168,890,000
Thermoelectric, Withdrawals (GPD)	595,050	595,050	595,050	595,050	595,050	595,050
Golf Course Irrigation (GPD)	1,550,000	1,550,000	1,550,000	1,550,000	1,550,000	1,550,000
Self-Supply Large Industry (GPD)						
Total Water Demand, All Sectors (GPD)	201,924,381	204,330,041	205,880,883	208,105,340	210,152,726	212,120,836

Hickory - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	3,937	4,189	4,337	4,389	4,460	4,539
Self-Supplied Population	5,240	5,575	5,772	5,842	5,936	6,041
Employment, Total						
11 Agriculture, forestry, fishing and hunting	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	264	257	233	201	169	137
31 Manufacturing	65	63	57	49	41	33
42 Wholesale trade	153	149	134	116	98	79
44 Retail trade	1,238	1,207	1,090	942	794	641
452 - General Merchandise Stores	47	46	41	36	30	24
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	70	69	62	54	45	36
51 Information	0	0	0	0	0	0
52 Finance and insurance	270	263	238	205	173	140
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	70	69	62	54	45	36
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	246	240	217	188	158	128
71 Arts, entertainment, and recreation	147	143	129	112	94	76
72 Accommodation and food services	927	904	817	706	594	480
81 Other services, except public administration	229	223	202	174	147	119
Local, State and Federal Government	2,089	2,037	1,840	1,590	1,339	1,082
Public-Supply Nonresidential (GPD)	427,381	416,674	376,415	325,320	274,024	221,325
Public-Supply Residential (GPD)	238,430	253,675	262,637	265,810	270,095	274,866
System Losses (GPD)	109,303	110,048	104,911	97,044	89,326	81,458
Self-Supply Residential (GPD)	317,365	337,657	349,586	353,811	359,514	365,864
Projection of Irrigated Lands (in Acres)	379	428	477	526	575	624
Crop Irrigation (GPD)	80,640	91,085	101,531	111,976	122,422	132,868
Livestock (GPD)	419,845	440,368	460,891	481,414	501,934	522,460
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	20,000	20,000	20,000	20,000	20,000	20,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	1,612,965	1,669,508	1,675,971	1,655,375	1,637,316	1,618,839

Hickory - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	3,937	4,102	4,159	4,122	4,101	4,087
Self-Supplied Population	5,240	5,460	5,536	5,842	5,459	5,440
Employment, Total						
11 Agriculture, forestry, fishing and hunting	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	264	252	223	189	156	123
31 Manufacturing	65	62	55	46	38	30
42 Wholesale trade	153	146	129	109	90	71
44 Retail trade	1,238	1,182	1,046	885	730	577
452 - General Merchandise Stores	47	45	40	34	28	22
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	70	67	59	50	42	33
51 Information	0	0	0	0	0	0
52 Finance and insurance	270	258	228	193	159	126
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	70	67	59	50	42	33
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	246	235	208	176	145	115
71 Arts, entertainment, and recreation	147	140	124	105	86	68
72 Accommodation and food services	927	885	783	663	547	432
81 Other services, except public administration	229	219	193	164	135	107
Local, State and Federal Government	2,089	1,995	1,764	1,493	1,232	974
Public-Supply Nonresidential (GPD)	427,381	408,059	360,991	305,507	251,990	199,302
Public-Supply Residential (GPD)	238,430	248,430	251,874	249,621	248,377	247,515
System Losses (GPD)	109,303	107,773	100,612	91,133	82,143	73,352
Self-Supply Residential (GPD)	317,365	330,676	335,261	332,262	330,606	329,458
Projection of Irrigated Lands (in Acres)	364	364	364	364	364	364
Crop Irrigation (GPD)	77,506	77,506	77,506	77,506	77,506	77,506
Livestock (GPD)	413,688	413,688	413,688	413,688	413,688	413,688
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	20,000	20,000	20,000	20,000	20,000	20,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	1,603,674	1,606,133	1,559,932	1,489,718	1,424,311	1,360,821

Hickory - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	3,937	4,017	3,988	3,870	3,771	3,680
Self-Supplied Population	5,240	5,347	5,309	5,152	5,019	4,898
Employment, Total						
11 Agriculture, forestry, fishing and hunting	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	264	247	214	177	143	111
31 Manufacturing	65	60	52	43	35	27
42 Wholesale trade	153	143	124	102	83	64
44 Retail trade	1,238	1,158	1,003	831	671	520
452 - General Merchandise Stores	47	44	38	32	25	20
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	70	66	57	47	38	30
51 Information	0	0	0	0	0	0
52 Finance and insurance	270	252	219	181	146	113
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	70	66	57	47	38	30
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	246	230	200	165	134	103
71 Arts, entertainment, and recreation	147	137	119	98	80	62
72 Accommodation and food services	927	867	751	622	503	389
81 Other services, except public administration	229	214	185	154	124	96
Local, State and Federal Government	2,089	1,953	1,692	1,402	1,132	877
Public-Supply Nonresidential (GPD)	427,381	399,605	346,168	286,862	231,687	179,431
Public-Supply Residential (GPD)	238,430	243,283	241,532	234,387	228,365	222,837
System Losses (GPD)	109,303	105,540	96,480	85,571	75,525	66,039
Self-Supply Residential (GPD)	317,365	323,825	321,494	311,985	303,969	296,610
Projection of Irrigated Lands (in Acres)	364	364	364	364	364	364
Crop Irrigation (GPD)	77,506	77,506	77,506	77,506	77,506	77,506
Livestock (GPD)	413,688	413,688	413,688	413,688	413,688	413,688
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	20,000	20,000	20,000	20,000	20,000	20,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	1,603,674	1,583,448	1,516,868	1,430,000	1,350,740	1,276,110

Jasper - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	99,514	126,275	154,262	185,387	220,416	260,159
Self-Supplied Population	17,890	22,701	27,732	33,328	39,625	46,770
Employment, Total						
11 Agriculture, forestry, fishing and hunting	335	408	479	584	703	839
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	370	451	529	646	778	928
23 Construction	1,821	2,220	2,603	3,177	3,826	4,564
31 Manufacturing	11,783	14,361	16,840	20,549	24,750	29,525
42 Wholesale trade	2,273	2,770	3,248	3,964	4,774	5,695
44 Retail trade	8,836	10,769	12,628	15,410	18,559	22,140
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	7,429	9,054	10,617	12,956	15,604	18,614
51 Information	780	951	1,115	1,361	1,639	1,956
52 Finance and insurance	1,573	1,917	2,248	2,743	3,303	3,941
53 Real estate and rental and leasing	617	751	881	1,075	1,295	1,545
54 Professional and technical services	1,302	1,586	1,860	2,270	2,734	3,261
55 Management of companies and enterprises	830	1,012	1,186	1,447	1,743	2,080
56 Administrative and waste services	4,302	5,243	6,148	7,502	9,036	10,779
61 Educational services	212	259	303	370	446	532
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	393	478	561	685	825	984
72 Accommodation and food services	5,055	6,161	7,225	8,816	10,618	12,667
81 Other services, except public administration	2,023	2,466	2,891	3,528	4,249	5,069
Local, State and Federal Government	7,967	9,710	11,387	13,895	16,735	19,964
Public-Supply Nonresidential (GPD)	5,489,667	6,780,305	8,021,745	9,879,077	11,982,280	14,373,219
Public-Supply Residential (GPD)	6,810,600	8,642,069	10,557,510	12,687,625	15,084,943	17,804,921
System Losses (GPD)	2,028,280	2,543,107	3,063,668	3,721,187	4,463,311	5,306,087
Self-Supply Residential (GPD)	1,224,367	1,553,617	1,897,963	2,280,901	2,711,876	3,200,856
Projection of Irrigated Lands (in Acres)	5,202	5,313	5,425	5,536	5,647	5,758
Crop Irrigation (GPD)	766,147	782,513	798,879	815,246	831,612	847,979
Livestock (GPD)	938,400	964,450	990,501	1,016,551	1,042,602	1,068,652
Aquaculture (GPD)	10,000	10,000	10,000	10,000	10,000	10,000
Mining (GPD)	430,000	430,000	430,000	430,000	430,000	430,000
Thermoelectric, Withdrawals (GPD)	1,670,000	1,670,000	1,670,000	1,670,000	1,670,000	1,670,000
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	420,000	420,000	420,000	420,000	420,000	420,000
Total Water Demand, All Sectors (GPD)	19,787,462	23,796,061	27,860,267	32,930,587	38,646,624	45,131,715

Jasper - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	99,514	120,834	141,233	162,377	184,688	208,531
Self-Supplied Population	17,890	21,723	25,390	29,191	33,202	37,488
Employment, Total						
11 Agriculture, forestry, fishing and hunting	335	390	438	511	589	672
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	370	432	484	565	652	743
23 Construction	1,821	2,124	2,383	2,782	3,206	3,658
31 Manufacturing	11,783	13,742	15,418	17,999	20,738	23,665
42 Wholesale trade	2,273	2,651	2,974	3,472	4,000	4,565
44 Retail trade	8,836	10,305	11,561	13,497	15,551	17,746
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	7,429	8,664	9,720	11,348	13,075	14,920
51 Information	780	910	1,021	1,192	1,374	1,567
52 Finance and insurance	1,573	1,834	2,058	2,402	2,768	3,159
53 Real estate and rental and leasing	617	719	807	942	1,085	1,238
54 Professional and technical services	1,302	1,518	1,703	1,988	2,291	2,614
55 Management of companies and enterprises	830	968	1,086	1,268	1,461	1,667
56 Administrative and waste services	4,302	5,017	5,629	6,571	7,571	8,640
61 Educational services	212	247	278	324	373	426
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	393	458	514	600	691	788
72 Accommodation and food services	5,055	5,896	6,615	7,722	8,897	10,153
81 Other services, except public administration	2,023	2,359	2,647	3,090	3,561	4,063
Local, State and Federal Government	7,967	9,292	10,425	12,170	14,022	16,002
Public-Supply Nonresidential (GPD)	5,489,667	6,470,503	7,309,531	8,601,962	9,973,486	11,439,393
Public-Supply Residential (GPD)	6,810,600	8,269,744	9,665,796	11,112,879	12,639,776	14,271,550
System Losses (GPD)	2,028,280	2,430,626	2,799,185	3,250,923	3,728,865	4,239,664
Self-Supply Residential (GPD)	1,224,367	1,486,683	1,737,656	1,997,803	2,272,299	2,565,649
Projection of Irrigated Lands (in Acres)	5,169	5,169	5,169	5,169	5,169	5,169
Crop Irrigation (GPD)	761,237	761,237	761,237	761,237	761,237	761,237
Livestock (GPD)	930,585	930,585	930,585	930,585	930,585	930,585
Aquaculture (GPD)	10,000	10,000	10,000	10,000	10,000	10,000
Mining (GPD)	430,000	430,000	430,000	430,000	430,000	430,000
Thermoelectric, Withdrawals (GPD)	1,670,000	1,670,000	1,670,000	1,670,000	1,670,000	1,670,000
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	420,000	420,000	420,000	420,000	420,000	420,000
Total Water Demand, All Sectors (GPD)	19,774,737	22,879,378	25,733,989	29,185,388	32,836,248	36,738,079

Jasper - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	99,514	115,606	129,254	142,140	154,630	166,984
Self-Supplied Population	17,890	20,783	23,236	25,553	27,798	30,019
Employment, Total						
11 Agriculture, forestry, fishing and hunting	335	374	401	448	493	538
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	370	413	443	495	545	595
23 Construction	1,821	2,032	2,181	2,436	2,684	2,929
31 Manufacturing	11,783	13,148	14,110	15,756	17,363	18,950
42 Wholesale trade	2,273	2,536	2,722	3,039	3,349	3,656
44 Retail trade	8,836	9,859	10,581	11,815	13,020	14,211
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	7,429	8,289	8,896	9,933	10,947	11,948
51 Information	780	871	935	1,044	1,150	1,255
52 Finance and insurance	1,573	1,755	1,883	2,103	2,317	2,529
53 Real estate and rental and leasing	617	688	738	824	909	992
54 Professional and technical services	1,302	1,452	1,559	1,740	1,918	2,093
55 Management of companies and enterprises	830	926	994	1,110	1,223	1,335
56 Administrative and waste services	4,302	4,800	5,151	5,752	6,339	6,919
61 Educational services	212	237	254	284	313	341
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	393	438	470	525	578	631
72 Accommodation and food services	5,055	5,641	6,054	6,760	7,449	8,130
81 Other services, except public administration	2,023	2,257	2,423	2,705	2,981	3,254
Local, State and Federal Government	7,967	8,890	9,541	10,653	11,740	12,814
Public-Supply Nonresidential (GPD)	5,489,667	6,172,765	6,654,710	7,478,718	8,283,473	9,078,450
Public-Supply Residential (GPD)	6,810,600	7,911,919	8,845,938	9,727,863	10,582,640	11,428,135
System Losses (GPD)	2,028,280	2,322,526	2,556,014	2,837,318	3,110,970	3,381,480
Self-Supply Residential (GPD)	1,224,367	1,422,355	1,590,267	1,748,814	1,902,480	2,054,478
Projection of Irrigated Lands (in Acres)	5,169	5,169	5,169	5,169	5,169	5,169
Crop Irrigation (GPD)	761,237	761,237	761,237	761,237	761,237	761,237
Livestock (GPD)	930,585	930,585	930,585	930,585	930,585	930,585
Aquaculture (GPD)	10,000	10,000	10,000	10,000	10,000	10,000
Mining (GPD)	430,000	430,000	430,000	430,000	430,000	430,000
Thermoelectric, Withdrawals (GPD)	1,670,000	1,670,000	1,670,000	1,670,000	1,670,000	1,670,000
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	420,000	420,000	420,000	420,000	420,000	420,000
Total Water Demand, All Sectors (GPD)	19,774,737	22,051,387	23,868,750	26,014,534	28,101,385	30,164,363

Lawrence - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	18,136	24,232	31,578	40,808	52,190	66,242
Self-Supplied Population	20,498	27,388	35,690	46,123	58,987	74,869
Employment, Total						
11 Agriculture, forestry, fishing and hunting	1,022	1,312	1,617	2,124	2,755	3,538
21 Mining, quarrying, and oil and gas extraction	95	122	150	197	256	328
22 Utilities	0	0	0	0	0	0
23 Construction	0	0	0	0	0	0
31 Manufacturing	3,897	5,004	6,168	8,103	10,508	13,493
42 Wholesale trade	627	805	992	1,303	1,690	2,171
44 Retail trade	3,819	4,904	6,046	7,942	10,299	13,225
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	0	0	0	0	0	0
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	2,302	2,956	3,645	4,787	6,209	7,973
81 Other services, except public administration	629	807	995	1,308	1,696	2,177
Local, State and Federal Government	6,957	8,934	11,013	14,467	18,762	24,093
Public-Supply Nonresidential (GPD)	1,704,939	2,203,327	2,727,608	3,598,431	4,681,293	6,025,386
Public-Supply Residential (GPD)	1,022,712	1,366,479	1,780,713	2,301,228	2,943,035	3,735,455
System Losses (GPD)	466,377	610,369	770,837	1,008,730	1,303,615	1,668,918
Self-Supply Residential (GPD)	1,155,908	1,544,446	2,012,630	2,600,936	3,326,330	4,221,954
Projection of Irrigated Lands (in Acres)	2,416	2,416	2,416	2,416	2,416	2,416
Crop Irrigation (GPD)	210,256	210,256	210,256	210,256	210,256	210,256
Livestock (GPD)	1,888,127	1,918,117	1,948,107	1,978,097	2,008,087	2,038,076
Aquaculture (GPD)	850,000	850,000	850,000	850,000	850,000	850,000
Mining (GPD)	20,000	20,000	20,000	20,000	20,000	20,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	714,250	714,250	714,250	714,250	714,250	714,250
Self-Supply Large Industry (GPD)	50,000	50,000	50,000	50,000	50,000	50,000
Total Water Demand, All Sectors (GPD)	8,082,569	9,487,243	11,084,401	13,331,927	16,106,865	19,534,296

Lawrence - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	18,136	22,195	26,486	31,341	36,698	42,644
Self-Supplied Population	20,498	25,086	29,935	35,423	41,478	48,198
Employment, Total						
11 Agriculture, forestry, fishing and hunting	1,022	1,202	1,356	1,631	1,937	2,277
21 Mining, quarrying, and oil and gas extraction	95	112	126	151	180	211
22 Utilities	0	0	0	0	0	0
23 Construction	0	0	0	0	0	0
31 Manufacturing	3,897	4,583	5,174	6,223	7,389	8,687
42 Wholesale trade	627	737	832	1,001	1,189	1,397
44 Retail trade	3,819	4,492	5,071	6,099	7,242	8,514
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	0	0	0	0	0	0
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	2,302	2,708	3,057	3,677	4,366	5,133
81 Other services, except public administration	629	740	835	1,004	1,192	1,402
Local, State and Federal Government	6,957	8,183	9,237	11,111	13,193	15,510
Public-Supply Nonresidential (GPD)	1,704,939	2,013,951	2,279,818	2,752,182	3,277,108	3,861,355
Public-Supply Residential (GPD)	1,022,712	1,251,600	1,493,564	1,767,358	2,069,451	2,404,744
System Losses (GPD)	466,377	558,347	645,177	772,755	914,160	1,071,384
Self-Supply Residential (GPD)	1,155,908	1,414,607	1,688,083	1,997,535	2,338,972	2,717,934
Projection of Irrigated Lands (in Acres)	2,416	2,416	2,416	2,416	2,416	2,416
Crop Irrigation (GPD)	210,256	210,256	210,256	210,256	210,256	210,256
Livestock (GPD)	1,879,130	1,879,130	1,879,130	1,879,130	1,879,130	1,879,130
Aquaculture (GPD)	850,000	850,000	850,000	850,000	850,000	850,000
Mining (GPD)	20,000	20,000	20,000	20,000	20,000	20,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	714,250	714,250	714,250	714,250	714,250	714,250
Self-Supply Large Industry (GPD)	50,000	50,000	50,000	50,000	50,000	50,000
Total Water Demand, All Sectors (GPD)	8,073,572	8,962,142	9,830,278	11,013,467	12,323,327	13,779,054

Lawrence - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	18,136	20,313	22,180	24,014	25,724	27,345
Self-Supplied Population	20,498	22,959	25,069	27,141	29,075	30,907
Employment, Total						
11 Agriculture, forestry, fishing and hunting	1,022	1,100	1,136	1,250	1,358	1,460
21 Mining, quarrying, and oil and gas extraction	95	102	105	116	126	136
22 Utilities	0	0	0	0	0	0
23 Construction	0	0	0	0	0	0
31 Manufacturing	3,897	4,194	4,333	4,768	5,179	5,570
42 Wholesale trade	627	675	697	767	833	896
44 Retail trade	3,819	4,111	4,246	4,673	5,076	5,460
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	0	0	0	0	0	0
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	2,302	2,478	2,560	2,817	3,060	3,291
81 Other services, except public administration	629	677	699	769	836	899
Local, State and Federal Government	6,957	7,489	7,736	8,513	9,248	9,946
Public-Supply Nonresidential (GPD)	1,704,939	1,839,027	1,901,192	2,097,222	2,282,424	2,458,399
Public-Supply Residential (GPD)	1,022,712	1,145,488	1,250,767	1,354,166	1,450,629	1,542,036
System Losses (GPD)	466,377	510,295	538,925	590,122	638,281	683,998
Self-Supply Residential (GPD)	1,155,908	1,294,675	1,413,664	1,530,530	1,639,556	1,742,868
Projection of Irrigated Lands (in Acres)	2,416	2,416	2,416	2,416	2,416	2,416
Crop Irrigation (GPD)	210,256	210,256	210,256	210,256	210,256	210,256
Livestock (GPD)	1,879,130	1,879,130	1,879,130	1,879,130	1,879,130	1,879,130
Aquaculture (GPD)	850,000	850,000	850,000	850,000	850,000	850,000
Mining (GPD)	20,000	20,000	20,000	20,000	20,000	20,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	714,250	714,250	714,250	714,250	714,250	714,250
Self-Supply Large Industry (GPD)	50,000	50,000	50,000	50,000	50,000	50,000
Total Water Demand, All Sectors (GPD)	8,073,572	8,513,121	8,828,184	9,295,675	9,734,526	10,150,938

McDonald - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	9,707	12,782	16,614	21,557	27,995	36,411
Self-Supplied Population	13,376	17,613	22,893	29,705	38,576	50,173
Employment, Total						
11 Agriculture, forestry, fishing and hunting	397	514	647	847	1,107	1,449
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	0	0	0	0	0	0
31 Manufacturing	4,555	5,891	7,423	9,716	12,699	16,624
42 Wholesale trade	313	405	511	668	874	1,144
44 Retail trade	2,449	3,167	3,991	5,224	6,828	8,938
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	0	0	0	0	0	0
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	560	724	913	1,194	1,561	2,044
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	584	756	952	1,246	1,629	2,132
81 Other services, except public administration	0	0	0	0	0	0
Local, State and Federal Government	2,208	2,855	3,598	4,709	6,155	8,057
Public-Supply Nonresidential (GPD)	950,717	2,110,399	3,439,341	5,428,811	8,017,569	11,422,827
Public-Supply Residential (GPD)	618,463	814,388	1,058,520	1,373,467	1,783,635	2,319,854
System Losses (GPD)	255,645	476,496	732,775	1,108,202	1,596,776	2,238,907
Self-Supply Residential (GPD)	852,227	1,122,206	1,458,614	1,892,603	2,457,804	3,196,700
Projection of Irrigated Lands (in Acres)	328	343	359	374	390	405
Crop Irrigation (GPD)	60,600	63,462	66,323	69,185	72,047	74,908
Livestock (GPD)	1,241,374	1,341,751	1,442,129	1,542,507	1,642,885	1,743,263
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	130,000	130,000	130,000	130,000	130,000	130,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	3,020,000	3,020,000	3,020,000	3,020,000	3,020,000	3,020,000
Total Water Demand, All Sectors (GPD)	7,129,027	9,078,703	11,347,703	14,564,776	18,720,716	24,146,459

McDonald - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	9,707	11,741	14,015	16,701	19,919	23,794
Self-Supplied Population	13,376	16,178	19,312	23,014	27,448	32,787
Employment, Total						
11 Agriculture, forestry, fishing and hunting	397	472	546	656	788	947
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	0	0	0	0	0	0
31 Manufacturing	4,555	5,411	6,262	7,527	9,036	10,863
42 Wholesale trade	313	372	431	518	622	747
44 Retail trade	2,449	2,909	3,367	4,047	4,858	5,841
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	0	0	0	0	0	0
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	560	665	770	925	1,111	1,335
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	584	694	803	966	1,159	1,394
81 Other services, except public administration	0	0	0	0	0	0
Local, State and Federal Government	2,208	2,623	3,035	3,648	4,380	5,265
Public-Supply Nonresidential (GPD)	950,717	1,693,853	2,431,832	3,529,781	4,838,821	6,424,431
Public-Supply Residential (GPD)	618,463	748,026	892,939	1,064,074	1,269,094	1,515,961
System Losses (GPD)	255,645	397,822	541,659	748,414	995,079	1,293,619
Self-Supply Residential (GPD)	852,227	1,030,761	1,230,447	1,466,267	1,748,779	2,088,956
Projection of Irrigated Lands (in Acres)	323	323	323	323	323	323
Crop Irrigation (GPD)	59,742	59,742	59,742	59,742	59,742	59,742
Livestock (GPD)	1,211,260	1,211,260	1,211,260	1,211,260	1,211,260	1,211,260
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	130,000	130,000	130,000	130,000	130,000	130,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	3,020,000	3,020,000	3,020,000	3,020,000	3,020,000	3,020,000
Total Water Demand, All Sectors (GPD)	7,098,055	8,291,464	9,517,879	11,229,539	13,272,774	15,743,968

McDonald - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	9,707	10,776	11,805	12,911	14,131	15,492
Self-Supplied Population	13,376	14,849	16,268	17,790	19,473	21,347
Employment, Total						
11 Agriculture, forestry, fishing and hunting	397	433	460	507	559	617
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	0	0	0	0	0	0
31 Manufacturing	4,555	4,967	5,275	5,819	6,410	7,073
42 Wholesale trade	313	342	363	400	441	487
44 Retail trade	2,449	2,670	2,836	3,128	3,447	3,803
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	0	0	0	0	0	0
51 Information	0	0	0	0	0	0
52 Finance and insurance	0	0	0	0	0	0
53 Real estate and rental and leasing	0	0	0	0	0	0
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	560	611	648	715	788	870
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	584	637	677	746	822	907
81 Other services, except public administration	0	0	0	0	0	0
Local, State and Federal Government	2,208	2,407	2,557	2,820	3,107	3,428
Public-Supply Nonresidential (GPD)	950,677	1,308,108	1,575,241	2,047,466	2,560,805	3,135,667
Public-Supply Residential (GPD)	618,463	686,571	752,161	822,573	900,353	987,028
System Losses (GPD)	255,638	324,966	379,172	467,576	563,879	671,654
Self-Supply Residential (GPD)	852,227	946,078	1,036,458	1,133,484	1,240,663	1,360,100
Projection of Irrigated Lands (in Acres)	323	323	323	323	323	323
Crop Irrigation (GPD)	59,742	59,742	59,742	59,742	59,742	59,742
Livestock (GPD)	1,211,260	1,211,260	1,211,260	1,211,260	1,211,260	1,211,260
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	130,000	130,000	130,000	130,000	130,000	130,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	3,020,000	3,020,000	3,020,000	3,020,000	3,020,000	3,020,000
Total Water Demand, All Sectors (GPD)	7,098,007	7,686,725	8,164,034	8,892,100	9,686,702	10,575,451

Newton - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	17,866	23,105	29,902	38,217	48,579	61,525
Self-Supplied Population	40,248	52,050	67,363	86,094	109,437	138,601
Employment, Total						
11 Agriculture, forestry, fishing and hunting	211	259	314	408	526	675
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	203	249	301	392	505	649
23 Construction	1,205	1,476	1,787	2,324	2,999	3,849
31 Manufacturing	5,905	7,234	8,758	11,390	14,694	18,862
42 Wholesale trade	1,047	1,283	1,553	2,019	2,605	3,344
44 Retail trade	2,536	3,106	3,761	4,891	6,309	8,099
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	712	873	1,057	1,374	1,773	2,276
51 Information	559	685	830	1,079	1,392	1,786
52 Finance and insurance	1,730	2,119	2,565	3,336	4,304	5,525
53 Real estate and rental and leasing	479	587	711	925	1,193	1,531
54 Professional and technical services	260	318	385	501	646	829
55 Management of companies and enterprises	221	271	328	427	551	707
56 Administrative and waste services	990	1,213	1,469	1,910	2,464	3,164
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	2,499	3,061	3,707	4,820	6,219	7,983
71 Arts, entertainment, and recreation	196	241	291	379	489	627
72 Accommodation and food services	3,243	3,973	4,810	6,255	8,070	10,359
81 Other services, except public administration	1,709	2,094	2,535	3,297	4,254	5,461
Local, State and Federal Government	4,372	5,356	6,484	8,433	10,879	13,965
Public-Supply Nonresidential (GPD)	2,530,171	3,099,391	3,752,675	4,880,214	6,295,945	8,081,932
Public-Supply Residential (GPD)	933,212	1,206,852	1,561,904	1,996,232	2,537,473	3,213,677
System Losses (GPD)	564,241	701,557	865,832	1,120,285	1,439,108	1,840,239
Self-Supply Residential (GPD)	2,102,312	2,718,760	3,518,611	4,497,052	5,716,344	7,239,677
Projection of Irrigated Lands (in Acres)	1,241	1,543	1,845	2,147	2,449	2,751
Crop Irrigation (GPD)	125,087	155,544	186,001	216,458	246,915	277,372
Livestock (GPD)	1,883,494	1,900,839	1,918,185	1,935,531	1,952,877	1,970,223
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	10,000	10,000	10,000	10,000	10,000	10,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	8,148,516	9,792,944	11,813,207	14,655,772	18,198,662	22,633,119

Newton - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	17,866	21,032	24,777	28,823	33,345	38,435
Self-Supplied Population	40,248	47,380	55,818	64,931	75,119	86,584
Employment, Total						
11 Agriculture, forestry, fishing and hunting	211	236	260	308	361	422
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	203	226	250	295	347	405
23 Construction	1,205	1,344	1,481	1,753	2,058	2,405
31 Manufacturing	5,905	6,585	7,257	8,590	10,086	11,783
42 Wholesale trade	1,047	1,167	1,287	1,523	1,788	2,089
44 Retail trade	2,536	2,827	3,116	3,688	4,331	5,060
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	712	794	876	1,036	1,217	1,422
51 Information	559	624	687	814	955	1,116
52 Finance and insurance	1,730	1,929	2,126	2,516	2,954	3,451
53 Real estate and rental and leasing	479	535	589	697	819	957
54 Professional and technical services	260	290	319	378	444	518
55 Management of companies and enterprises	221	247	272	322	378	442
56 Administrative and waste services	990	1,104	1,217	1,441	1,692	1,976
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	2,499	2,787	3,071	3,635	4,268	4,987
71 Arts, entertainment, and recreation	196	219	241	286	335	392
72 Accommodation and food services	3,243	3,616	3,986	4,718	5,539	6,472
81 Other services, except public administration	1,709	1,906	2,101	2,487	2,920	3,411
Local, State and Federal Government	4,372	4,875	5,373	6,360	7,467	8,724
Public-Supply Nonresidential (GPD)	2,530,171	2,821,310	3,109,520	3,680,593	4,321,593	5,048,789
Public-Supply Residential (GPD)	933,212	1,098,572	1,294,216	1,505,531	1,741,744	2,007,586
System Losses (GPD)	564,241	638,613	717,440	844,904	987,817	1,149,599
Self-Supply Residential (GPD)	2,102,312	2,474,830	2,915,571	3,391,616	3,923,750	4,522,632
Projection of Irrigated Lands (in Acres)	1,150	1,150	1,150	1,150	1,150	1,150
Crop Irrigation (GPD)	115,950	115,950	115,950	115,950	115,950	115,950
Livestock (GPD)	1,878,294	1,878,299	1,878,303	1,878,308	1,878,312	1,878,317
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	10,000	10,000	10,000	10,000	10,000	10,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	8,134,179	9,037,573	10,040,999	11,426,902	12,979,166	14,732,872

Newton - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	17,866	19,128	20,494	21,680	22,807	23,903
Self-Supplied Population	40,248	43,090	46,169	48,839	51,378	53,848
Employment, Total						
11 Agriculture, forestry, fishing and hunting	211	214	215	231	247	262
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	203	206	206	222	237	252
23 Construction	1,205	1,222	1,225	1,319	1,408	1,496
31 Manufacturing	5,905	5,988	6,003	6,461	6,898	7,328
42 Wholesale trade	1,047	1,062	1,064	1,146	1,223	1,299
44 Retail trade	2,536	2,571	2,577	2,774	2,962	3,147
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	712	722	724	780	832	884
51 Information	559	567	569	612	653	694
52 Finance and insurance	1,730	1,754	1,758	1,893	2,021	2,147
53 Real estate and rental and leasing	479	486	487	525	560	595
54 Professional and technical services	260	263	264	284	303	322
55 Management of companies and enterprises	221	225	225	242	259	275
56 Administrative and waste services	990	1,004	1,007	1,084	1,157	1,229
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	2,499	2,534	2,540	2,734	2,919	3,101
71 Arts, entertainment, and recreation	196	199	200	215	229	244
72 Accommodation and food services	3,243	3,289	3,297	3,549	3,789	4,025
81 Other services, except public administration	1,709	1,734	1,738	1,870	1,997	2,121
Local, State and Federal Government	4,372	4,434	4,444	4,784	5,107	5,426
Public-Supply Nonresidential (GPD)	2,530,171	2,565,889	2,571,999	2,768,430	2,955,799	3,139,918
Public-Supply Residential (GPD)	933,212	999,115	1,070,494	1,132,415	1,191,284	1,248,548
System Losses (GPD)	564,241	580,797	593,422	635,511	675,628	714,953
Self-Supply Residential (GPD)	2,102,312	2,250,776	2,411,577	2,551,070	2,683,690	2,812,693
Projection of Irrigated Lands (in Acres)	1,150	1,150	1,150	1,150	1,150	1,150
Crop Irrigation (GPD)	115,950	115,950	115,950	115,950	115,950	115,950
Livestock (GPD)	1,878,294	1,878,299	1,878,303	1,878,308	1,878,312	1,878,317
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	10,000	10,000	10,000	10,000	10,000	10,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	8,134,179	8,400,826	8,651,745	9,091,684	9,510,664	9,920,378

Polk - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	12,677	16,551	20,870	25,295	29,525	33,895
Self-Supplied Population	18,793	24,536	30,939	37,498	43,770	50,248
Employment, Total						
11 Agriculture, forestry, fishing and hunting	210	267	319	360	408	462
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	213	271	324	366	414	468
23 Construction	692	881	1,051	1,187	1,343	1,520
31 Manufacturing	701	893	1,065	1,203	1,361	1,541
42 Wholesale trade	1,457	1,856	2,214	2,502	2,829	3,204
44 Retail trade	2,303	2,934	3,500	3,954	4,472	5,063
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	133	169	202	228	258	292
51 Information	858	1,093	1,304	1,473	1,667	1,887
52 Finance and insurance	753	960	1,145	1,293	1,463	1,656
53 Real estate and rental and leasing	198	252	300	339	384	434
54 Professional and technical services	472	602	718	811	917	1,038
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	411	523	624	705	797	903
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	3,112	3,964	4,729	5,343	6,043	6,842
71 Arts, entertainment, and recreation	167	212	253	286	324	367
72 Accommodation and food services	1,535	1,955	2,332	2,634	2,979	3,373
81 Other services, except public administration	679	865	1,032	1,166	1,319	1,493
Local, State and Federal Government	6,721	8,560	10,212	11,537	13,049	14,774
Public-Supply Nonresidential (GPD)	1,465,089	1,866,056	2,226,052	2,515,028	2,844,502	3,220,654
Public-Supply Residential (GPD)	908,747	1,186,431	1,496,078	1,813,256	2,116,515	2,429,769
System Losses (GPD)	407,076	523,454	638,287	742,233	850,736	968,959
Self-Supply Residential (GPD)	1,347,171	1,758,824	2,217,858	2,688,058	3,137,624	3,602,008
Projection of Irrigated Lands (in Acres)	1,254	1,254	1,254	1,254	1,254	1,254
Crop Irrigation (GPD)	213,982	213,982	213,982	213,982	213,982	213,982
Livestock (GPD)	1,515,369	1,545,313	1,575,257	1,605,201	1,635,145	1,665,090
Aquaculture (GPD)	20,000	20,000	20,000	20,000	20,000	20,000
Mining (GPD)	30,000	30,000	30,000	30,000	30,000	30,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	5,907,435	7,144,060	8,417,514	9,627,758	10,848,505	12,150,462

Polk - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	12,677	15,533	18,377	20,893	22,871	24,621
Self-Supplied Population	18,793	23,026	27,244	30,973	33,905	36,499
Employment, Total						
11 Agriculture, forestry, fishing and hunting	210	251	281	298	316	335
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	213	255	285	302	320	340
23 Construction	692	827	925	981	1,040	1,104
31 Manufacturing	701	838	938	994	1,054	1,119
42 Wholesale trade	1,457	1,742	1,950	2,066	2,192	2,327
44 Retail trade	2,303	2,753	3,082	3,266	3,464	3,678
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	133	159	178	188	200	212
51 Information	858	1,026	1,148	1,217	1,291	1,371
52 Finance and insurance	753	901	1,008	1,068	1,133	1,203
53 Real estate and rental and leasing	198	236	264	280	297	316
54 Professional and technical services	472	565	632	670	710	754
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	411	491	549	582	618	656
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	3,112	3,720	4,164	4,413	4,681	4,970
71 Arts, entertainment, and recreation	167	199	223	236	251	266
72 Accommodation and food services	1,535	1,834	2,053	2,176	2,308	2,450
81 Other services, except public administration	679	812	909	963	1,022	1,085
Local, State and Federal Government	6,721	8,034	8,992	9,530	10,108	10,731
Public-Supply Nonresidential (GPD)	1,465,089	1,751,261	1,960,160	2,077,394	2,203,418	2,339,392
Public-Supply Residential (GPD)	908,747	1,113,445	1,317,378	1,497,735	1,639,502	1,764,916
System Losses (GPD)	407,076	491,252	562,046	613,078	659,001	703,824
Self-Supply Residential (GPD)	1,347,171	1,650,625	1,952,945	2,220,315	2,430,478	2,616,397
Projection of Irrigated Lands (in Acres)	1,254	1,254	1,254	1,254	1,254	1,254
Crop Irrigation (GPD)	213,982	213,982	213,982	213,982	213,982	213,982
Livestock (GPD)	1,506,694	1,506,694	1,506,694	1,506,694	1,506,694	1,506,694
Aquaculture (GPD)	20,000	20,000	20,000	20,000	20,000	20,000
Mining (GPD)	30,000	30,000	30,000	30,000	30,000	30,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	5,898,760	6,777,260	7,563,205	8,179,199	8,703,075	9,195,204

Polk - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	12,677	14,571	16,169	17,237	17,687	17,847
Self-Supplied Population	18,793	21,601	23,970	25,552	26,221	26,457
Employment, Total						
11 Agriculture, forestry, fishing and hunting	210	235	247	246	244	243
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	213	239	251	249	248	247
23 Construction	692	776	814	809	804	801
31 Manufacturing	701	786	825	820	815	811
42 Wholesale trade	1,457	1,634	1,716	1,705	1,695	1,687
44 Retail trade	2,303	2,583	2,711	2,694	2,679	2,666
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	133	149	156	155	154	154
51 Information	858	963	1,010	1,004	998	994
52 Finance and insurance	753	845	887	881	876	872
53 Real estate and rental and leasing	198	222	233	231	230	229
54 Professional and technical services	472	530	556	553	549	547
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	411	460	483	480	478	475
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	3,112	3,490	3,664	3,641	3,620	3,602
71 Arts, entertainment, and recreation	167	187	196	195	194	193
72 Accommodation and food services	1,535	1,721	1,806	1,795	1,785	1,776
81 Other services, except public administration	679	762	800	795	790	786
Local, State and Federal Government	6,721	7,536	7,911	7,862	7,817	7,779
Public-Supply Nonresidential (GPD)	1,465,089	1,642,861	1,724,623	1,713,809	1,704,021	1,695,775
Public-Supply Residential (GPD)	908,747	1,044,525	1,159,079	1,235,602	1,267,915	1,279,350
System Losses (GPD)	407,076	460,845	494,510	505,778	509,640	510,187
Self-Supply Residential (GPD)	1,347,171	1,548,455	1,718,275	1,831,716	1,879,619	1,896,571
Projection of Irrigated Lands (in Acres)	1,254	1,254	1,254	1,254	1,254	1,254
Crop Irrigation (GPD)	213,982	213,982	213,982	213,982	213,982	213,982
Livestock (GPD)	1,506,694	1,506,694	1,506,694	1,506,694	1,506,694	1,506,694
Aquaculture (GPD)	20,000	20,000	20,000	20,000	20,000	20,000
Mining (GPD)	30,000	30,000	30,000	30,000	30,000	30,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	5,898,760	6,467,363	6,867,162	7,057,581	7,131,871	7,152,560

St Clair - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	3,219	3,556	3,870	4,186	4,546	4,948
Self-Supplied Population	6,258	6,912	7,525	8,139	8,839	9,620
Employment, Total						
11 Agriculture, forestry, fishing and hunting	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	153	160	153	143	139	144
31 Manufacturing	153	160	153	143	139	144
42 Wholesale trade	73	76	73	69	67	69
44 Retail trade	917	954	913	858	834	860
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	370	385	368	346	337	347
51 Information	113	118	113	106	103	106
52 Finance and insurance	250	260	249	234	227	235
53 Real estate and rental and leasing	10	10	10	9	9	9
54 Professional and technical services	70	73	70	65	64	66
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	280	291	279	262	255	263
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	970	1,009	966	908	882	910
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	183	191	183	172	167	172
81 Other services, except public administration	233	243	232	218	212	219
Local, State and Federal Government	2,187	2,275	2,178	2,046	1,989	2,052
Public-Supply Nonresidential (GPD)	399,682	415,866	398,085	373,992	363,539	375,148
Public-Supply Residential (GPD)	230,767	254,898	277,471	300,122	325,932	354,724
System Losses (GPD)	102,710	109,278	110,059	109,824	112,326	118,908
Self-Supply Residential (GPD)	448,629	495,542	539,427	583,462	633,638	689,612
Projection of Irrigated Lands (in Acres)	234	320	406	493	579	665
Crop Irrigation (GPD)	37,478	51,296	65,114	78,932	92,750	106,568
Livestock (GPD)	650,795	656,648	662,501	668,354	674,206	680,059
Aquaculture (GPD)	80,000	80,000	80,000	80,000	80,000	80,000
Mining (GPD)	0	0	0	0	0	0
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	1,950,061	2,063,528	2,132,658	2,194,686	2,282,391	2,405,019

St Clair - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	3,219	3,370	3,477	3,564	3,668	3,783
Self-Supplied Population	6,258	6,552	6,759	6,928	7,131	7,355
Employment, Total						
11 Agriculture, forestry, fishing and hunting	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	153	151	137	122	113	110
31 Manufacturing	153	151	137	122	113	110
42 Wholesale trade	73	72	66	58	54	53
44 Retail trade	917	904	820	730	673	658
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	370	365	331	295	271	266
51 Information	113	112	101	90	83	81
52 Finance and insurance	250	247	224	199	183	179
53 Real estate and rental and leasing	10	10	9	8	7	7
54 Professional and technical services	70	69	63	56	51	50
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	280	276	250	223	205	201
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	970	957	868	773	712	696
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	183	181	164	146	135	132
81 Other services, except public administration	233	230	209	186	171	167
Local, State and Federal Government	2,187	2,156	1,956	1,742	1,605	1,569
Public-Supply Nonresidential (GPD)	399,682	394,159	357,584	318,371	293,292	286,837
Public-Supply Residential (GPD)	230,767	241,593	249,241	255,487	262,951	271,220
System Losses (GPD)	102,710	103,574	98,862	93,491	90,621	90,917
Self-Supply Residential (GPD)	448,629	469,676	484,545	496,687	511,199	527,275
Projection of Irrigated Lands (in Acres)	208	208	208	208	208	208
Crop Irrigation (GPD)	33,333	33,333	33,333	33,333	33,333	33,333
Livestock (GPD)	649,039	649,039	649,039	649,039	649,039	649,039
Aquaculture (GPD)	80,000	80,000	80,000	80,000	80,000	80,000
Mining (GPD)	0	0	0	0	0	0
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	1,944,160	1,971,374	1,952,604	1,926,407	1,920,435	1,938,620

St Clair - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	3,219	3,193	3,121	3,031	2,956	2,889
Self-Supplied Population	6,258	6,208	6,068	5,893	5,746	5,615
Employment, Total						
11 Agriculture, forestry, fishing and hunting	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	0	0	0	0	0	0
23 Construction	153	143	123	104	91	84
31 Manufacturing	153	143	123	104	91	84
42 Wholesale trade	73	69	59	50	43	40
44 Retail trade	917	857	736	621	542	502
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	370	346	297	251	219	203
51 Information	113	106	91	77	67	62
52 Finance and insurance	250	234	201	169	148	137
53 Real estate and rental and leasing	10	9	8	7	6	5
54 Professional and technical services	70	65	56	47	41	38
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	280	262	225	190	166	153
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	970	906	779	657	574	531
71 Arts, entertainment, and recreation	0	0	0	0	0	0
72 Accommodation and food services	183	171	147	124	108	100
81 Other services, except public administration	233	218	187	158	138	128
Local, State and Federal Government	2,187	2,043	1,756	1,481	1,293	1,198
Public-Supply Nonresidential (GPD)	399,682	373,477	321,017	270,786	236,344	218,997
Public-Supply Residential (GPD)	230,767	228,916	223,754	217,301	211,895	207,074
System Losses (GPD)	102,710	98,140	88,752	79,517	73,026	69,414
Self-Supply Residential (GPD)	448,629	445,031	434,996	422,451	411,942	402,569
Projection of Irrigated Lands (in Acres)	208	208	208	208	208	208
Crop Irrigation (GPD)	33,333	33,333	33,333	33,333	33,333	33,333
Livestock (GPD)	649,039	649,039	649,039	649,039	649,039	649,039
Aquaculture (GPD)	80,000	80,000	80,000	80,000	80,000	80,000
Mining (GPD)	0	0	0	0	0	0
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	1,944,160	1,907,936	1,830,890	1,752,427	1,695,578	1,660,425

Stone - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	16,893	23,452	30,238	37,881	47,077	57,709
Self-Supplied Population	15,309	21,253	27,403	34,329	42,663	52,298
Employment, Total						
11 Agriculture, forestry, fishing and hunting	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	201	259	288	369	466	581
23 Construction	2,030	2,617	2,911	3,722	4,708	5,866
31 Manufacturing	586	755	840	1,074	1,359	1,693
42 Wholesale trade	0	0	0	0	0	0
44 Retail trade	0	0	0	0	0	0
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	118	152	169	216	274	341
51 Information	0	0	0	0	0	0
52 Finance and insurance	726	936	1,041	1,331	1,683	2,097
53 Real estate and rental and leasing	1,050	1,355	1,506	1,926	2,436	3,036
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	2,112	2,724	3,029	3,873	4,900	6,105
71 Arts, entertainment, and recreation	695	896	997	1,275	1,612	2,009
72 Accommodation and food services	2,927	3,774	4,197	5,366	6,788	8,458
81 Other services, except public administration	1,042	1,344	1,494	1,911	2,417	3,012
Local, State and Federal Government	5,029	6,485	7,212	9,221	11,665	14,534
Public-Supply Nonresidential (GPD)	1,444,232	1,862,313	2,071,010	2,648,093	3,349,857	4,173,706
Public-Supply Residential (GPD)	1,075,795	1,493,503	1,925,672	2,412,351	2,998,026	3,675,084
System Losses (GPD)	410,554	546,717	651,125	824,429	1,034,174	1,278,696
Self-Supply Residential (GPD)	974,921	1,353,462	1,745,108	2,186,153	2,716,911	3,330,483
Projection of Irrigated Lands (in Acres)	80	99	117	136	155	174
Crop Irrigation (GPD)	11,087	13,713	16,340	18,966	21,592	24,218
Livestock (GPD)	428,061	451,619	475,177	498,734	522,292	545,850
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	60,000	60,000	60,000	60,000	60,000	60,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	4,404,650	5,781,328	6,944,431	8,648,725	10,702,851	13,088,037

Stone - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	16,893	21,467	25,319	29,006	32,964	36,946
Self-Supplied Population	15,309	19,454	22,945	26,286	29,873	33,482
Employment, Total						
11 Agriculture, forestry, fishing and hunting	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	201	237	241	282	327	372
23 Construction	2,030	2,396	2,437	2,850	3,297	3,756
31 Manufacturing	586	691	703	822	951	1,084
42 Wholesale trade	0	0	0	0	0	0
44 Retail trade	0	0	0	0	0	0
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	118	139	142	166	192	218
51 Information	0	0	0	0	0	0
52 Finance and insurance	726	857	871	1,019	1,179	1,343
53 Real estate and rental and leasing	1,050	1,240	1,261	1,475	1,706	1,943
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	2,112	2,493	2,536	2,966	3,431	3,908
71 Arts, entertainment, and recreation	695	820	835	976	1,129	1,286
72 Accommodation and food services	2,927	3,454	3,514	4,109	4,753	5,415
81 Other services, except public administration	1,042	1,230	1,251	1,463	1,693	1,928
Local, State and Federal Government	5,029	5,936	6,039	7,061	8,168	9,305
Public-Supply Nonresidential (GPD)	1,444,232	1,704,656	1,734,065	2,027,698	2,345,589	2,672,082
Public-Supply Residential (GPD)	1,075,795	1,367,069	1,612,373	1,847,186	2,099,235	2,352,855
System Losses (GPD)	410,554	500,434	545,189	631,282	724,134	818,644
Self-Supply Residential (GPD)	974,921	1,238,883	1,461,186	1,673,981	1,902,397	2,132,235
Projection of Irrigated Lands (in Acres)	74	74	74	74	74	74
Crop Irrigation (GPD)	10,300	10,300	10,300	10,300	10,300	10,300
Livestock (GPD)	420,994	420,994	420,994	420,994	420,994	420,994
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	60,000	60,000	60,000	60,000	60,000	60,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	4,396,795	5,302,336	5,844,107	6,671,440	7,562,649	8,467,109

Stone - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	16,893	19,634	21,166	22,157	23,008	23,559
Self-Supplied Population	15,309	17,793	19,181	20,080	20,850	21,350
Employment, Total						
11 Agriculture, forestry, fishing and hunting	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	201	217	202	216	228	237
23 Construction	2,030	2,191	2,037	2,177	2,301	2,395
31 Manufacturing	586	632	588	628	664	691
42 Wholesale trade	0	0	0	0	0	0
44 Retail trade	0	0	0	0	0	0
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	118	127	118	127	134	139
51 Information	0	0	0	0	0	0
52 Finance and insurance	726	783	728	778	823	856
53 Real estate and rental and leasing	1,050	1,134	1,054	1,127	1,191	1,239
54 Professional and technical services	0	0	0	0	0	0
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	0	0	0	0	0	0
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	2,112	2,280	2,120	2,266	2,395	2,492
71 Arts, entertainment, and recreation	695	750	698	745	788	820
72 Accommodation and food services	2,927	3,160	2,938	3,139	3,318	3,453
81 Other services, except public administration	1,042	1,125	1,046	1,118	1,181	1,230
Local, State and Federal Government	5,029	5,429	5,048	5,394	5,701	5,933
Public-Supply Nonresidential (GPD)	1,444,232	1,559,115	1,449,632	1,548,932	1,637,142	1,703,863
Public-Supply Residential (GPD)	1,075,795	1,250,350	1,347,901	1,411,041	1,465,195	1,500,307
System Losses (GPD)	410,554	457,708	455,764	482,228	505,421	522,011
Self-Supply Residential (GPD)	974,921	1,133,109	1,221,513	1,278,733	1,327,809	1,359,628
Projection of Irrigated Lands (in Acres)	74	74	74	74	74	74
Crop Irrigation (GPD)	10,300	10,300	10,300	10,300	10,300	10,300
Livestock (GPD)	420,994	420,994	420,994	420,994	420,994	420,994
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	60,000	60,000	60,000	60,000	60,000	60,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	0	0	0	0	0	0
Total Water Demand, All Sectors (GPD)	4,396,795	4,891,575	4,966,102	5,212,227	5,426,860	5,577,102

Taney - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	40,110	55,677	77,460	105,270	140,570	184,919
Self-Supplied Population	11,565	16,053	22,334	30,353	40,531	53,318
Employment, Total						
11 Agriculture, forestry, fishing and hunting	10	14	19	26	34	46
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	164	221	292	401	540	717
23 Construction	766	1,035	1,365	1,876	2,529	3,357
31 Manufacturing	678	916	1,208	1,660	2,237	2,971
42 Wholesale trade	304	411	542	745	1,004	1,333
44 Retail trade	5,708	7,715	10,174	13,984	18,848	25,025
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	572	773	1,019	1,401	1,889	2,508
51 Information	357	483	637	875	1,180	1,567
52 Finance and insurance	544	736	970	1,333	1,797	2,386
53 Real estate and rental and leasing	788	1,065	1,404	1,930	2,601	3,454
54 Professional and technical services	540	729	962	1,322	1,781	2,365
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	1,814	2,452	3,234	4,444	5,991	7,954
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	4,649	6,284	8,286	11,389	15,351	20,382
72 Accommodation and food services	9,003	12,169	16,047	22,056	29,729	39,471
81 Other services, except public administration	881	1,190	1,570	2,157	2,908	3,861
Local, State and Federal Government	2,723	3,680	4,853	6,670	8,991	11,937
Public-Supply Nonresidential (GPD)	1,996,048	2,700,738	3,563,892	4,901,618	6,609,474	8,778,178
Public-Supply Residential (GPD)	3,807,657	5,285,393	7,353,305	9,993,356	13,344,363	17,554,388
System Losses (GPD)	959,462	1,320,258	1,804,819	2,462,420	3,298,745	4,353,270
Self-Supply Residential (GPD)	1,097,870	1,523,948	2,120,194	2,881,405	3,847,608	5,061,493
Projection of Irrigated Lands (in Acres)	115	115	115	115	115	115
Crop Irrigation (GPD)	16,253	16,253	16,253	16,253	16,253	16,253
Livestock (GPD)	198,164	223,133	248,101	273,070	298,039	323,007
Aquaculture (GPD)	23,810,000	23,810,000	23,810,000	23,810,000	23,810,000	23,810,000
Mining (GPD)	360,000	360,000	360,000	360,000	360,000	360,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	1,049,400	1,049,400	1,049,400	1,049,400	1,049,400	1,049,400
Self-Supply Large Industry (GPD)	10,000	10,000	10,000	10,000	10,000	10,000
Total Water Demand, All Sectors (GPD)	33,304,855	36,299,124	40,335,964	45,757,523	52,643,882	61,315,990

Taney - Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	40,110	50,615	64,019	79,080	95,964	114,706
Self-Supplied Population	11,565	14,594	18,459	22,801	27,670	33,074
Employment, Total						
11 Agriculture, forestry, fishing and hunting	10	13	15	19	24	28
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	164	201	241	301	369	445
23 Construction	766	941	1,128	1,409	1,726	2,083
31 Manufacturing	678	833	998	1,247	1,527	1,843
42 Wholesale trade	304	374	448	559	685	827
44 Retail trade	5,708	7,014	8,408	10,505	12,867	15,523
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	572	703	843	1,053	1,289	1,556
51 Information	357	439	526	658	806	972
52 Finance and insurance	544	669	802	1,001	1,227	1,480
53 Real estate and rental and leasing	788	968	1,160	1,450	1,776	2,142
54 Professional and technical services	540	663	795	993	1,216	1,467
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	1,814	2,229	2,672	3,339	4,090	4,934
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	4,649	5,713	6,848	8,556	10,480	12,643
72 Accommodation and food services	9,003	11,063	13,262	16,569	20,295	24,484
81 Other services, except public administration	881	1,082	1,297	1,621	1,985	2,395
Local, State and Federal Government	2,723	3,346	4,011	5,011	6,138	7,405
Public-Supply Nonresidential (GPD)	1,996,048	2,454,494	2,944,099	3,680,142	4,509,584	5,442,115
Public-Supply Residential (GPD)	3,807,657	4,804,923	6,077,384	7,507,115	9,109,902	10,889,131
System Losses (GPD)	959,462	1,200,118	1,491,421	1,849,464	2,251,558	2,699,863
Self-Supply Residential (GPD)	1,097,870	1,385,413	1,752,305	2,164,542	2,626,677	3,139,686
Projection of Irrigated Lands (in Acres)	115	115	115	115	115	115
Crop Irrigation (GPD)	16,253	16,253	16,253	16,253	16,253	16,253
Livestock (GPD)	190,674	190,674	190,674	190,674	190,674	190,674
Aquaculture (GPD)	23,810,000	23,810,000	23,810,000	23,810,000	23,810,000	23,810,000
Mining (GPD)	360,000	360,000	360,000	360,000	360,000	360,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	1,049,400	1,049,400	1,049,400	1,049,400	1,049,400	1,049,400
Self-Supply Large Industry (GPD)	10,000	10,000	10,000	10,000	10,000	10,000
Total Water Demand, All Sectors (GPD)	33,297,364	35,281,275	37,701,537	40,637,590	43,934,048	47,607,122

Taney - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	40,110	45,972	52,814	59,242	65,272	70,826
Self-Supplied Population	11,565	13,255	15,228	17,082	18,820	20,422
Employment, Total						
11 Agriculture, forestry, fishing and hunting	10	12	13	14	16	18
21 Mining, quarrying, and oil and gas extraction	0	0	0	0	0	0
22 Utilities	164	183	199	226	251	275
23 Construction	766	855	931	1,056	1,174	1,286
31 Manufacturing	678	756	823	934	1,039	1,138
42 Wholesale trade	304	339	369	419	466	510
44 Retail trade	5,708	6,370	6,937	7,870	8,752	9,585
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	572	638	695	789	877	961
51 Information	357	399	434	493	548	600
52 Finance and insurance	544	607	661	750	834	914
53 Real estate and rental and leasing	788	879	957	1,086	1,208	1,323
54 Professional and technical services	540	602	656	744	827	906
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	1,814	2,025	2,205	2,501	2,782	3,046
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	0	0	0	0	0	0
71 Arts, entertainment, and recreation	4,649	5,189	5,650	6,410	7,128	7,807
72 Accommodation and food services	9,003	10,048	10,941	12,412	13,804	15,118
81 Other services, except public administration	881	983	1,070	1,214	1,350	1,479
Local, State and Federal Government	2,723	3,039	3,309	3,754	4,175	4,572
Public-Supply Nonresidential (GPD)	1,996,048	2,228,581	2,427,380	2,754,935	3,064,711	3,357,194
Public-Supply Residential (GPD)	3,807,657	4,364,124	5,013,655	5,623,912	6,196,295	6,723,582
System Losses (GPD)	959,462	1,089,899	1,230,143	1,385,181	1,531,019	1,666,542
Self-Supply Residential (GPD)	1,097,870	1,258,317	1,445,598	1,621,554	1,786,591	1,938,625
Projection of Irrigated Lands (in Acres)	115	115	115	115	115	115
Crop Irrigation (GPD)	16,253	16,253	16,253	16,253	16,253	16,253
Livestock (GPD)	190,674	190,674	190,674	190,674	190,674	190,674
Aquaculture (GPD)	23,810,000	23,810,000	23,810,000	23,810,000	23,810,000	23,810,000
Mining (GPD)	360,000	360,000	360,000	360,000	360,000	360,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	1,049,400	1,049,400	1,049,400	1,049,400	1,049,400	1,049,400
Self-Supply Large Industry (GPD)	10,000	10,000	10,000	10,000	10,000	10,000
Total Water Demand, All Sectors (GPD)	33,297,364	34,377,248	35,553,103	36,821,909	38,014,942	39,122,271

Vernon - High Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	20,054	20,394	20,918	21,249	21,659	22,104
Self-Supplied Population	0	0	0	0	0	0
Employment, Total						
11 Agriculture, forestry, fishing and hunting	94	92	92	94	97	100
21 Mining, quarrying, and oil and gas extraction	88	85	85	88	91	93
22 Utilities	39	38	38	40	41	42
23 Construction	309	301	300	309	319	329
31 Manufacturing	2,364	2,304	2,300	2,370	2,447	2,524
42 Wholesale trade	471	459	458	472	487	502
44 Retail trade	1,033	1,007	1,005	1,036	1,069	1,103
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	263	256	256	263	272	280
51 Information	151	147	147	151	156	161
52 Finance and insurance	797	776	775	799	825	851
53 Real estate and rental and leasing	50	49	49	50	52	54
54 Professional and technical services	331	322	322	331	342	353
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	151	147	147	151	156	161
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	1,552	1,512	1,510	1,556	1,606	1,657
71 Arts, entertainment, and recreation	42	41	40	42	43	44
72 Accommodation and food services	1,003	977	975	1,005	1,037	1,070
81 Other services, except public administration	571	557	556	573	591	610
Local, State and Federal Government	3,345	3,259	3,254	3,354	3,461	3,570
Public-Supply Nonresidential (GPD)	726,638	697,722	696,104	729,444	765,611	802,197
Public-Supply Residential (GPD)	1,352,351	1,375,294	1,410,595	1,432,940	1,460,616	1,490,570
System Losses (GPD)	349,956	348,951	354,621	363,994	374,741	385,941
Self-Supply Residential (GPD)	0	0	0	0	0	0
Projection of Irrigated Lands (in Acres)	7,591	7,591	7,591	7,591	7,591	7,591
Crop Irrigation (GPD)	979,943	979,943	979,943	979,943	979,943	979,943
Livestock (GPD)	2,014,996	2,079,858	2,144,720	2,209,582	2,274,443	2,339,305
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	30,000	30,000	30,000	30,000	30,000	30,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	400,000	400,000	400,000	400,000	400,000	400,000
Total Water Demand, All Sectors (GPD)	5,853,884	5,911,768	6,015,983	6,145,903	6,285,355	6,427,956

Vernon- Medium Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	20,054	20,031	20,179	20,133	20,156	20,203
Self-Supplied Population	0	0	0	0	0	0
Employment, Total						
11 Agriculture, forestry, fishing and hunting	94	90	88	89	91	92
21 Mining, quarrying, and oil and gas extraction	88	84	82	83	84	85
22 Utilities	39	38	37	37	38	38
23 Construction	309	295	290	293	297	301
31 Manufacturing	2,364	2,263	2,219	2,246	2,277	2,307
42 Wholesale trade	471	450	442	447	453	459
44 Retail trade	1,033	989	970	982	995	1,008
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	263	251	247	250	253	256
51 Information	151	145	142	143	145	147
52 Finance and insurance	797	763	748	757	767	777
53 Real estate and rental and leasing	50	48	47	48	48	49
54 Professional and technical services	331	316	310	314	318	322
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	151	145	142	143	145	147
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	1,552	1,485	1,457	1,474	1,495	1,514
71 Arts, entertainment, and recreation	42	40	39	40	40	41
72 Accommodation and food services	1,003	959	941	952	965	978
81 Other services, except public administration	571	547	536	543	550	557
Local, State and Federal Government	3,345	3,201	3,139	3,178	3,221	3,263
Public-Supply Nonresidential (GPD)	726,638	678,217	657,513	670,312	684,956	699,124
Public-Supply Residential (GPD)	1,352,351	1,350,779	1,360,776	1,357,689	1,359,249	1,362,406
System Losses (GPD)	349,956	341,541	339,739	341,373	344,101	347,018
Self-Supply Residential (GPD)	0	0	0	0	0	0
Projection of Irrigated Lands (in Acres)	7,591	7,591	7,591	7,591	7,591	7,591
Crop Irrigation (GPD)	979,943	979,943	979,943	979,943	979,943	979,943
Livestock (GPD)	1,995,537	1,995,537	1,995,537	1,995,537	1,995,537	1,995,537
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	30,000	30,000	30,000	30,000	30,000	30,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	400,000	400,000	400,000	400,000	400,000	400,000
Total Water Demand, All Sectors (GPD)	5,834,426	5,776,017	5,763,509	5,774,854	5,793,786	5,814,029

Vernon - Low Growth	2010	2020	2030	2040	2050	2060
Population, Total						
Public-Supplied Population	20,054	19,673	19,465	19,074	18,755	18,463
Self-Supplied Population	0	0	0	0	0	0
Employment, Total						
11 Agriculture, forestry, fishing and hunting	94	88	85	85	84	84
21 Mining, quarrying, and oil and gas extraction	88	82	79	79	78	78
22 Utilities	39	37	36	35	35	35
23 Construction	309	290	279	278	277	275
31 Manufacturing	2,364	2,222	2,140	2,128	2,118	2,108
42 Wholesale trade	471	442	426	424	422	420
44 Retail trade	1,033	971	935	930	926	921
452 - General Merchandise Stores	0	0	0	0	0	0
453 - Misc Store Retailers	0	0	0	0	0	0
48 Transportation and warehousing	263	247	238	236	235	234
51 Information	151	142	137	136	135	135
52 Finance and insurance	797	749	721	717	714	710
53 Real estate and rental and leasing	50	47	46	45	45	45
54 Professional and technical services	331	311	299	297	296	295
55 Management of companies and enterprises	0	0	0	0	0	0
56 Administrative and waste services	151	142	137	136	135	135
61 Educational services	0	0	0	0	0	0
62 Health care and social assistance	1,552	1,459	1,405	1,397	1,391	1,384
71 Arts, entertainment, and recreation	42	39	38	37	37	37
72 Accommodation and food services	1,003	942	908	902	898	894
81 Other services, except public administration	571	537	517	514	512	509
Local, State and Federal Government	3,345	3,144	3,028	3,010	2,997	2,982
Public-Supply Nonresidential (GPD)	726,638	659,024	620,220	614,186	609,768	604,752
Public-Supply Residential (GPD)	1,352,351	1,326,658	1,312,632	1,286,264	1,264,752	1,245,061
System Losses (GPD)	349,956	334,250	325,357	319,903	315,538	311,379
Self-Supply Residential (GPD)	0	0	0	0	0	0
Projection of Irrigated Lands (in Acres)	7,591	7,591	7,591	7,591	7,591	7,591
Crop Irrigation (GPD)	979,943	979,943	979,943	979,943	979,943	979,943
Livestock (GPD)	1,995,537	1,995,537	1,995,537	1,995,537	1,995,537	1,995,537
Aquaculture (GPD)	0	0	0	0	0	0
Mining (GPD)	30,000	30,000	30,000	30,000	30,000	30,000
Thermoelectric, Withdrawals (GPD)	0	0	0	0	0	0
Golf Course Irrigation (GPD)	0	0	0	0	0	0
Self-Supply Large Industry (GPD)	400,000	400,000	400,000	400,000	400,000	400,000
Total Water Demand, All Sectors (GPD)	5,834,426	5,725,413	5,663,689	5,625,834	5,595,539	5,566,673

Appendix C - Conservation Savings

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Barry	Public Supply Residential	Metering	34,029	59,662	73,813	129,413	30,252	44,428	65,620	96,368	26,876	33,025	58,296	71,635
		Education Programs	59,675	104,626	99,459	174,377	53,051	77,910	88,419	129,850	47,130	57,914	78,550	96,524
		Residential Audits	-	-	139,242	244,127	-	-	123,787	181,790	-	-	109,970	135,134
		Subtotal	93,705	164,288	312,513	547,917	83,304	122,338	277,826	408,008	74,006	90,940	246,816	303,293
	Public Supply Non-Residential	Metering	49,357	167,117	107,059	362,493	40,812	117,392	88,526	254,633	33,174	80,175	71,958	173,906
		Education Programs	28,851	97,688	86,554	293,063	23,857	68,621	71,570	205,862	19,392	46,866	58,176	140,597
		Non-Residential Audits	-	-	230,810	781,502	-	-	190,854	548,967	-	-	155,136	374,926
		Subtotal	78,208	264,805	424,422	1,437,059	64,669	186,012	350,951	1,009,462	52,566	127,040	285,271	689,429
	System Losses	Metering	11,371	30,924	20,097	54,656	9,691	22,066	17,127	39,000	8,189	15,436	14,473	27,282
		Leak Detection	146,532	398,513	269,620	733,268	124,880	284,360	229,781	523,226	105,524	198,923	194,166	366,020
		Education Programs	12,072	27,588	20,668	51,938	10,487	19,981	17,777	37,301	9,071	14,288	15,192	26,347
		Residential Audits	-	-	15,471	27,125	-	-	13,754	20,199	-	-	12,219	15,015
		Commercial Audits	-	-	25,646	86,834	-	-	21,206	60,996	-	-	17,237	41,658
		Subtotal	169,974	457,026	351,501	953,821	145,058	326,408	299,645	680,722	122,784	228,647	253,287	476,323
	Total		341,886	886,119	1,088,437	2,938,797	293,031	634,758	928,421	2,098,192	249,356	446,627	785,374	1,469,045

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Barton	Public Supply Residential	Metering	-	-	10,213	13,163	-	-	9,835	11,979	-	-	9,471	10,900
		Education Programs	26,719	34,436	44,531	57,394	25,730	31,338	42,883	52,230	24,776	28,514	41,294	47,523
		Residential Audits	-	-	23,880	30,778	-	-	22,996	28,009	-	-	22,144	25,484
		Subtotal	26,719	34,436	78,624	101,335	25,730	31,338	75,715	92,218	24,776	28,514	72,909	83,907
	Public Supply Non-Residential	Metering	-	-	4,871	6,792	-	-	4,666	6,120	-	-	4,467	5,506
		Education Programs	4,248	5,923	12,743	17,769	4,068	5,336	12,205	16,009	3,895	4,802	11,686	14,405
		Non-Residential Audits	-	-	13,016	18,150	-	-	12,467	16,352	-	-	11,937	14,714
		Subtotal	4,248	5,923	30,630	42,710	4,068	5,336	29,338	38,481	3,895	4,802	28,091	34,625
	System Losses	Metering	-	-	1,676	2,217	-	-	1,611	2,011	-	-	1,549	1,823
		Leak Detection	34,927	46,206	68,144	90,149	33,576	41,906	65,508	81,761	32,273	37,987	62,965	74,114
		Education Programs	4,223	5,504	6,364	8,351	4,063	5,001	6,121	7,582	3,910	4,543	5,887	6,881
		Residential Audits	-	-	2,653	3,420	-	-	2,555	3,112	-	-	2,460	2,832
		Commercial Audits	-	-	1,446	2,017	-	-	1,385	1,817	-	-	1,326	1,635
		Subtotal	39,150	51,709	80,283	106,155	37,639	46,908	77,181	96,283	36,182	42,530	74,187	87,284
	Total		70,116	92,069	189,537	250,200	67,438	83,582	182,233	226,982	64,854	75,845	175,187	205,816

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Cedar	Public Supply Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	11,087	12,288	18,479	20,479	10,506	10,739	17,510	17,898	9,953	9,382	16,588	15,636
		Residential Audits	-	-	25,871	28,671	-	-	24,513	25,057	-	-	23,224	21,891
		Subtotal	11,087	12,288	44,350	49,150	10,506	10,739	42,023	42,955	9,953	9,382	39,812	37,527
	Public Supply Non-Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	4,789	3,960	14,368	11,881	4,538	3,461	13,614	10,384	4,299	3,024	12,898	9,072
		Non-Residential Audits	-	-	38,314	31,683	-	-	36,304	27,690	-	-	34,394	24,191
		Subtotal	4,789	3,960	52,682	43,564	4,538	3,461	49,918	38,073	4,299	3,024	47,292	33,262
	System Losses	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Leak Detection	8,869	8,420	30,296	28,764	8,403	7,359	28,706	25,139	7,961	6,429	27,196	21,962
		Education Programs	2,165	2,216	3,650	3,596	2,051	1,936	3,458	3,142	1,944	1,692	3,276	2,745
		Residential Audits	-	-	2,875	3,186	-	-	2,724	2,784	-	-	2,580	2,432
		Commercial Audits	-	-	4,257	3,520	-	-	4,034	3,077	-	-	3,822	2,688
		Subtotal	11,034	10,636	41,077	39,066	10,455	9,295	38,922	34,142	9,905	8,121	36,875	29,828
	Total		26,910	26,884	138,109	131,780	25,499	23,495	130,863	115,170	24,157	20,527	123,979	100,618

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Christian	Public Supply Residential	Metering	-	-	82,995	157,097	-	-	56,525	85,913	-	-	38,209	46,557
		Education Programs	313,711	593,809	522,852	989,682	213,658	324,742	356,097	541,237	144,426	175,979	240,709	293,299
		Residential Audits	-	-	731,992	1,385,555	-	-	498,536	757,731	-	-	336,993	410,618
		Subtotal	313,711	593,809	1,337,838	2,532,334	213,658	324,742	911,159	1,384,881	144,426	175,979	615,911	750,473
	Public Supply Non-Residential	Metering	-	-	88,292	175,782	-	-	59,320	94,977	-	-	39,272	50,301
		Education Programs	111,244	221,479	333,733	664,438	74,741	119,667	224,222	359,002	49,481	63,377	148,444	190,131
		Non-Residential Audits	-	-	889,954	1,771,834	-	-	597,925	957,338	-	-	395,851	507,016
		Subtotal	111,244	221,479	1,311,979	2,612,053	74,741	119,667	881,467	1,411,316	49,481	63,377	583,567	747,447
	System Losses	Metering	-	-	19,032	36,987	-	-	12,872	20,099	-	-	8,609	10,762
		Leak Detection	573,045	1,113,660	1,118,032	2,172,791	387,563	605,174	756,149	1,180,716	259,216	324,040	505,739	632,213
		Education Programs	57,948	111,176	95,176	183,791	39,327	60,601	64,480	100,026	26,442	32,639	43,239	53,714
		Residential Audits	-	-	81,332	153,951	-	-	55,393	84,192	-	-	37,444	45,624
		Commercial Audits	-	-	98,884	196,870	-	-	66,436	106,371	-	-	43,983	56,335
		Subtotal	630,994	1,224,836	1,412,456	2,744,389	426,890	665,775	955,330	1,491,404	285,657	356,679	639,014	798,649
	Total		1,055,949	2,040,124	4,062,273	7,888,776	715,289	1,110,184	2,747,956	4,287,601	479,564	596,036	1,838,492	2,296,570

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Dade	Public Supply Residential	Metering	4,879	6,586	12,031	16,242	4,313	4,840	10,635	11,936	3,809	3,550	9,394	8,755
		Education Programs	10,729	14,484	17,881	24,140	9,484	10,644	15,806	17,740	8,377	7,807	13,961	13,012
		Residential Audits	-	-	25,034	33,796	-	-	22,129	24,836	-	-	19,546	18,217
		Subtotal	15,607	21,070	54,946	74,179	13,796	15,484	48,570	54,512	12,186	11,358	42,901	39,985
	Public Supply Non-Residential	Metering	4,728	4,718	11,661	11,635	4,180	3,467	10,308	8,550	3,692	2,543	9,105	6,272
		Education Programs	3,466	3,459	10,399	10,376	3,064	2,542	9,192	7,625	2,706	1,864	8,119	5,593
		Non-Residential Audits	-	-	27,729	27,669	-	-	24,512	20,333	-	-	21,651	14,914
		Subtotal	8,195	8,177	49,789	49,680	7,244	6,009	44,011	36,508	6,398	4,408	38,874	26,779
	System Losses	Metering	1,310	1,542	2,632	3,098	1,158	1,133	2,327	2,276	1,023	831	2,055	1,670
		Leak Detection	14,920	17,556	32,704	38,482	13,189	12,902	28,909	28,280	11,650	9,464	25,535	20,743
		Education Programs	1,936	2,447	3,142	3,835	1,711	1,798	2,778	2,818	1,511	1,319	2,453	2,067
		Residential Audits	-	-	2,782	3,755	-	-	2,459	2,760	-	-	2,172	2,024
		Commercial Audits	-	-	3,081	3,074	-	-	2,724	2,259	-	-	2,406	1,657
		Subtotal	18,166	21,545	44,342	52,244	16,058	15,833	39,196	38,393	14,184	11,613	34,621	28,162
		Total	41,968	50,792	149,077	176,104	37,098	37,325	131,778	129,413	32,768	27,379	116,397	94,926

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Greene	Public Supply Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	65,988	124,782	109,981	207,971	55,983	82,633	93,305	137,722	47,430	54,534	79,049	90,890
		Residential Audits	-	-	153,973	291,159	-	-	130,627	192,811	-	-	110,669	127,247
		Subtotal	65,988	124,782	263,953	499,129	55,983	82,633	223,931	330,533	47,430	54,534	189,719	218,137
	Public Supply Non-Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	14,652	30,924	43,955	92,773	12,200	19,967	36,601	59,901	10,105	12,662	30,315	37,986
		Non-Residential Audits	-	-	117,213	247,394	-	-	97,603	159,735	-	-	80,839	101,297
		Subtotal	14,652	30,924	161,167	340,166	12,200	19,967	134,203	219,636	10,105	12,662	111,154	139,283
	System Losses	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Leak Detection	1,367,994	2,706,982	2,303,631	4,558,415	1,151,997	1,773,515	1,939,902	2,986,505	967,353	1,151,210	1,628,972	1,938,577
		Education Programs	10,996	21,233	17,104	33,416	9,298	13,991	14,434	21,958	7,846	9,163	12,152	14,320
		Residential Audits	-	-	17,108	32,351	-	-	14,514	21,423	-	-	12,297	14,139
		Commercial Audits	-	-	13,024	27,488	-	-	10,845	17,748	-	-	8,982	11,255
		Subtotal	1,378,991	2,728,214	2,350,866	4,651,670	1,161,294	1,787,505	1,979,695	3,047,635	975,199	1,160,373	1,662,402	1,978,290
		Total	1,459,631	2,883,921	2,775,987	5,490,966	1,229,478	1,890,106	2,337,829	3,597,804	1,032,733	1,227,569	1,963,275	2,335,710

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Hickory	Public Supply Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	7,879	8,246	13,132	13,743	7,556	7,425	12,594	12,376	7,246	6,685	12,077	11,142
		Residential Audits	-	-	18,385	19,241	-	-	17,631	17,326	-	-	16,907	15,599
		Subtotal	7,879	8,246	31,516	32,984	7,556	7,425	30,225	29,702	7,246	6,685	28,984	26,740
	Public Supply Non-Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	3,764	2,213	11,292	6,640	3,610	1,993	10,830	5,979	3,462	1,794	10,385	5,383
		Non-Residential Audits	-	-	30,113	17,706	-	-	28,879	15,944	-	-	27,693	14,354
		Subtotal	3,764	2,213	41,406	24,346	3,610	1,993	39,709	21,923	3,462	1,794	38,078	19,737
	System Losses	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Leak Detection	17,767	13,795	33,905	26,325	17,039	12,423	32,515	23,706	16,339	11,184	31,180	21,342
		Education Programs	1,588	1,426	2,714	2,265	1,523	1,284	2,603	2,039	1,460	1,156	2,496	1,836
		Residential Audits	-	-	2,043	2,138	-	-	1,959	1,925	-	-	1,879	1,733
		Commercial Audits	-	-	3,346	1,967	-	-	3,209	1,772	-	-	3,077	1,595
		Subtotal	19,355	15,221	42,007	32,695	18,562	13,707	40,286	29,442	17,799	12,340	38,632	26,506
	Total		30,998	25,681	114,929	90,025	29,728	23,125	110,220	81,067	28,507	20,820	105,694	72,984

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Jasper	Public Supply Residential	Metering	-	-	27,681	46,682	-	-	25,343	37,418	-	-	23,193	29,963
		Education Programs	277,925	468,712	463,208	781,187	254,451	375,697	424,085	626,161	232,868	300,844	388,114	501,407
		Residential Audits	-	-	739,026	1,246,344	-	-	676,606	999,009	-	-	619,216	799,969
		Subtotal	277,925	468,712	1,229,915	2,074,214	254,451	375,697	1,126,033	1,662,588	232,868	300,844	1,030,522	1,331,340
	Public Supply Non-Residential	Metering	-	-	21,032	37,685	-	-	19,165	29,993	-	-	17,448	23,803
		Education Programs	70,390	126,124	211,171	378,373	64,141	100,380	192,422	301,140	58,395	79,663	175,184	238,989
		Non-Residential Audits	-	-	641,740	1,149,858	-	-	584,763	915,151	-	-	532,377	726,276
		Subtotal	70,390	126,124	873,943	1,565,916	64,141	100,380	796,350	1,246,285	58,395	79,663	725,009	989,068
	System Losses	Metering	-	-	5,413	9,374	-	-	4,945	7,490	-	-	4,516	5,974
		Leak Detection	530,133	918,159	999,307	1,730,738	484,368	733,626	913,037	1,382,893	442,290	585,127	833,720	1,102,970
		Education Programs	47,498	81,114	74,931	128,840	43,444	64,920	68,501	103,034	39,718	51,887	62,589	82,266
		Residential Audits	-	-	82,114	138,483	-	-	75,178	111,001	-	-	68,802	88,885
		Commercial Audits	-	-	71,304	127,762	-	-	64,974	101,683	-	-	59,153	80,697
		Subtotal	577,631	999,273	1,233,069	2,135,197	527,812	798,546	1,126,636	1,706,101	482,007	637,014	1,028,779	1,360,793
	Total		925,947	1,594,109	3,336,926	5,775,326	846,403	1,274,623	3,049,018	4,614,973	773,270	1,017,522	2,784,310	3,681,200

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Lawrence	Public Supply Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	23,777	49,877	39,628	83,128	19,943	32,109	33,238	53,515	16,701	20,590	27,834	34,316
		Residential Audits	-	-	124,650	261,482	-	-	104,549	168,332	-	-	87,554	107,943
		Subtotal	23,777	49,877	164,278	344,610	19,943	32,109	137,787	221,847	16,701	20,590	115,388	142,259
	Public Supply Non-Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	12,140	26,818	36,420	80,453	10,147	17,186	30,441	51,558	8,462	10,942	25,385	32,825
		Non-Residential Audits	-	-	218,209	482,031	-	-	182,385	308,908	-	-	152,095	196,672
		Subtotal	12,140	26,818	254,629	562,484	10,147	17,186	212,826	360,466	8,462	10,942	177,481	229,497
	System Losses	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Leak Detection	156,066	337,895	269,913	584,381	130,625	216,916	225,912	375,151	109,113	138,485	188,707	239,506
		Education Programs	4,898	10,458	8,450	18,176	4,103	6,722	7,075	11,675	3,431	4,300	5,913	7,460
		Residential Audits	-	-	13,850	29,054	-	-	11,617	18,704	-	-	9,728	11,994
		Commercial Audits	-	-	24,245	53,559	-	-	20,265	34,323	-	-	16,899	21,852
		Subtotal	160,964	348,353	316,458	685,169	134,728	223,638	264,869	439,852	112,544	142,784	221,248	280,812
	Total		196,881	425,048	735,364	1,592,263	164,817	272,933	615,482	1,022,166	137,706	174,316	514,117	652,568

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
McDonald	Public Supply Residential	Metering	66,002	144,650	87,172	191,047	55,677	94,525	73,536	124,844	46,899	61,544	61,943	81,285
		Education Programs	31,756	69,596	52,926	115,993	26,788	45,479	44,647	75,798	22,565	29,611	37,608	49,351
		Residential Audits	-	-	74,096	162,390	-	-	62,506	106,117	-	-	52,651	69,092
		Subtotal	97,757	214,245	214,195	469,429	82,466	140,003	180,689	306,759	69,464	91,155	152,202	199,728
	Public Supply Non-Residential	Metering	214,453	712,247	283,240	940,703	151,632	400,582	200,269	529,071	98,221	195,518	129,726	258,231
		Education Programs	34,393	114,228	103,180	342,685	24,318	64,244	72,955	192,733	15,752	31,357	47,257	94,070
		Non-Residential Audits	-	-	275,147	913,826	-	-	194,547	513,954	-	-	126,019	250,853
		Subtotal	248,846	826,475	661,567	2,197,214	175,950	464,826	467,770	1,235,758	113,973	226,875	303,002	603,155
	System Losses	Metering	38,244	116,850	41,157	125,750	28,269	67,515	30,423	72,657	19,789	35,054	21,296	37,724
		Leak Detection	119,430	364,905	233,013	711,942	88,282	210,839	172,240	411,354	61,799	109,469	120,572	213,577
		Education Programs	9,020	25,067	17,345	50,964	6,969	14,962	13,067	29,837	5,225	8,314	9,429	15,936
		Residential Audits	-	-	8,233	18,043	-	-	6,945	11,791	-	-	5,850	7,677
		Commercial Audits	-	-	30,572	101,536	-	-	21,616	57,106	-	-	14,002	27,873
		Subtotal	166,694	506,821	330,319	1,008,236	123,520	293,315	244,291	582,744	86,813	152,836	171,150	302,786
		Total	513,298	1,547,542	1,206,082	3,674,880	381,936	898,145	892,750	2,125,262	270,251	470,866	626,354	1,105,669

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Newton	Public Supply Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	46,857	96,410	78,095	160,684	38,826	60,228	64,711	100,379	32,115	37,456	53,525	62,427
		Residential Audits	-	-	109,333	224,957	-	-	90,595	140,531	-	-	74,935	87,398
		Subtotal	46,857	96,410	187,428	385,641	38,826	60,228	155,306	240,910	32,115	37,456	128,459	149,826
	Public Supply Non-Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	37,527	80,819	112,580	242,458	31,095	50,488	93,286	151,464	25,720	31,399	77,160	94,198
		Non-Residential Audits	-	-	300,214	646,555	-	-	248,762	403,903	-	-	205,760	251,193
		Subtotal	37,527	80,819	412,794	889,012	31,095	50,488	342,047	555,367	25,720	31,399	282,920	345,391
	System Losses	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Leak Detection	141,116	299,929	275,323	585,171	116,931	187,366	228,136	365,557	96,718	116,525	188,700	227,345
		Education Programs	11,507	24,168	21,186	44,794	9,535	15,098	17,555	27,983	7,887	9,389	14,521	17,403
		Residential Audits	-	-	12,148	24,995	-	-	10,066	15,615	-	-	8,326	9,711
		Commercial Audits	-	-	33,357	71,839	-	-	27,640	44,878	-	-	22,862	27,910
		Subtotal	152,623	324,096	342,014	726,799	126,466	202,463	283,398	454,032	104,604	125,915	234,409	282,369
	Total		237,007	501,326	942,237	2,001,453	196,387	313,179	780,751	1,250,309	162,439	194,771	645,788	777,586

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Polk	Public Supply Residential	Metering	264,902	430,225	294,824	478,821	233,261	312,504	259,608	347,802	205,232	226,527	228,413	252,114
		Education Programs	44,882	72,893	74,804	121,488	39,521	52,947	65,869	88,246	34,772	38,381	57,954	63,968
		Residential Audits	-	-	104,725	170,084	-	-	92,216	123,544	-	-	81,136	89,555
		Subtotal	309,784	503,119	474,353	770,393	272,782	365,451	417,694	559,592	240,004	264,908	367,503	405,636
	Public Supply Non-Residential	Metering	394,154	570,263	438,675	634,676	347,074	414,223	386,278	461,011	305,369	300,261	339,862	334,177
		Education Programs	22,261	32,207	66,782	96,620	19,602	23,394	58,805	70,182	17,246	16,958	51,739	50,873
		Non-Residential Audits	-	-	178,084	257,652	-	-	156,813	187,151	-	-	137,970	135,662
		Subtotal	416,415	602,469	683,541	988,948	366,676	437,617	601,895	718,344	322,615	317,219	529,570	520,712
	System Losses	Metering	89,871	136,430	81,500	123,722	79,137	99,099	71,765	89,868	69,627	71,835	63,142	65,143
		Leak Detection	130,724	198,447	224,717	341,134	115,109	144,146	197,875	247,790	101,278	104,488	174,098	179,618
		Education Programs	9,156	14,332	15,732	24,234	8,062	10,410	13,853	17,603	7,093	7,546	12,188	12,760
		Residential Audits	-	-	11,636	18,898	-	-	10,246	13,727	-	-	9,015	9,951
		Commercial Audits	-	-	19,787	28,628	-	-	17,424	20,795	-	-	15,330	15,074
		Subtotal	229,751	349,209	353,372	536,616	202,308	253,655	311,163	389,783	177,998	183,869	273,773	282,545
	Total		955,950	1,454,797	1,511,266	2,295,957	841,766	1,056,723	1,330,752	1,667,718	740,618	765,996	1,170,846	1,208,894

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
St Clair	Public Supply Residential	Metering	49,945	63,850	55,494	70,945	44,863	48,820	49,848	54,244	40,276	37,273	44,751	41,415
		Education Programs	8,324	10,642	13,874	17,736	7,477	8,137	12,462	13,561	6,713	6,212	11,188	10,354
		Residential Audits	-	-	19,423	24,831	-	-	17,447	18,985	-	-	15,663	14,495
		Subtotal	58,269	74,492	88,791	113,512	52,341	56,956	79,757	86,791	46,988	43,486	71,601	66,264
	Public Supply Non-Residential	Metering	71,655	67,527	79,617	75,030	64,365	51,631	71,517	57,367	57,783	39,419	64,203	43,799
		Education Programs	3,981	3,751	11,943	11,254	3,576	2,868	10,728	8,605	3,210	2,190	9,631	6,570
		Non-Residential Audits	-	-	31,847	30,012	-	-	28,607	22,947	-	-	25,681	17,520
		Subtotal	75,636	71,278	123,406	116,296	67,941	54,499	110,851	88,919	60,993	41,609	99,515	67,889
	System Losses	Metering	16,582	17,915	15,012	16,219	14,895	13,698	13,485	12,401	13,372	10,458	12,106	9,468
		Leak Detection	17,938	19,380	34,997	37,811	16,113	14,818	31,437	28,910	14,465	11,313	28,222	22,073
		Education Programs	1,678	1,963	2,868	3,221	1,507	1,501	2,577	2,463	1,353	1,146	2,313	1,880
		Residential Audits	-	-	2,158	2,759	-	-	1,939	2,109	-	-	1,740	1,611
		Commercial Audits	-	-	3,539	3,335	-	-	3,179	2,550	-	-	2,853	1,947
		Subtotal	36,198	39,258	58,575	63,345	32,515	30,016	52,615	48,434	29,190	22,917	47,235	36,979
		Total	170,103	185,028	270,772	293,153	152,796	141,472	243,224	224,143	137,171	108,012	218,351	171,131

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Stone	Public Supply Residential	Metering	207,992	396,946	246,506	470,448	174,153	254,132	206,400	301,189	145,587	162,048	172,545	192,054
		Education Programs	57,770	110,253	96,284	183,754	48,371	70,586	80,619	117,643	40,437	45,009	67,395	75,015
		Residential Audits	-	-	69,876	133,356	-	-	58,507	85,377	-	-	48,911	54,441
		Subtotal	265,762	507,199	412,665	787,558	222,524	324,718	345,526	504,209	186,024	207,058	288,851	321,511
	Public Supply Non-Residential	Metering	223,690	450,803	265,110	534,277	187,297	288,612	221,978	342,054	156,575	184,034	185,568	218,112
		Education Programs	20,710	41,737	62,130	125,211	17,341	26,721	52,022	80,162	14,496	17,039	43,489	51,116
		Non-Residential Audits	-	-	85,885	173,084	-	-	71,912	110,812	-	-	60,117	70,660
		Subtotal	244,400	492,540	413,126	832,572	204,637	315,333	345,912	533,028	171,071	201,073	289,173	339,887
	System Losses	Metering	58,866	115,602	56,846	111,636	49,289	74,011	47,598	71,471	41,204	47,193	39,790	45,574
		Leak Detection	106,123	208,406	207,049	406,608	88,857	133,425	173,363	260,318	74,282	85,079	144,927	165,993
		Education Programs	10,702	20,726	17,602	34,329	8,961	13,269	14,738	21,978	7,491	8,461	12,320	14,015
		Residential Audits	-	-	7,764	14,817	-	-	6,501	9,486	-	-	5,435	6,049
		Commercial Audits	-	-	9,543	19,232	-	-	7,990	12,312	-	-	6,680	7,851
		Subtotal	175,690	344,734	298,803	586,623	147,106	220,705	250,189	375,566	122,977	140,733	209,152	239,481
		Total	685,853	1,344,473	1,124,594	2,206,753	574,267	860,756	941,627	1,412,803	480,072	548,864	787,175	900,879

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Taney	Public Supply Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	208,632	498,064	347,721	830,106	172,431	308,953	287,385	514,922	142,250	190,766	237,084	317,943
		Residential Audits	-	-	514,731	1,228,807	-	-	425,417	762,239	-	-	350,956	470,651
		Subtotal	208,632	498,064	862,452	2,058,914	172,431	308,953	712,802	1,277,161	142,250	190,766	588,040	788,593
	Public Supply Non-Residential	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Education Programs	33,706	83,020	101,117	249,060	27,844	51,469	83,532	154,407	22,957	31,751	68,871	95,252
		Non-Residential Audits	-	-	285,111	702,254	-	-	235,528	435,369	-	-	194,190	268,576
		Subtotal	33,706	83,020	386,228	951,314	27,844	51,469	319,060	589,776	22,957	31,751	263,062	363,828
	System Losses	Metering	-	-	-	-	-	-	-	-	-	-	-	-
		Leak Detection	316,110	762,465	591,797	1,427,429	261,219	472,875	489,034	885,280	215,457	291,891	403,362	546,456
		Education Programs	33,046	79,239	49,871	119,907	27,310	49,148	41,213	74,370	22,528	30,343	33,995	45,911
		Residential Audits	-	-	57,192	136,534	-	-	47,269	84,693	-	-	38,995	52,295
		Commercial Audits	-	-	31,679	78,028	-	-	26,170	48,374	-	-	21,577	29,842
		Subtotal	349,156	841,704	730,539	1,761,899	288,529	522,023	603,686	1,092,718	237,985	322,234	497,929	674,503
	Total		591,494	1,422,788	1,979,219	4,772,127	488,804	882,445	1,635,548	2,959,655	403,193	544,751	1,349,030	1,826,924

County	Sub-Sector	Conservation Activity	High Growth				Medium Growth				Low Growth			
			Savings (GPD)				Savings (GPD)				Savings (GPD)			
			Scenario I		Scenario II		Scenario I		Scenario II		Scenario I		Scenario II	
			2030	2060	2030	2060	2030	2060	2030	2060	2030	2060	2030	2060
Vernon	Public Supply Residential	Metering	243,137	256,922	271,349	286,733	234,550	234,831	261,765	262,079	226,251	214,605	252,504	239,506
		Education Programs	40,702	43,010	67,837	71,683	39,265	39,312	65,441	65,520	37,876	35,926	63,126	59,876
		Residential Audits	-	-	98,742	104,340	-	-	95,254	95,368	-	-	91,884	87,154
		Subtotal	283,839	299,932	437,928	462,756	273,815	274,143	422,461	422,967	264,127	250,531	407,514	386,537
	Public Supply Non-Residential	Metering	119,984	138,270	133,906	154,314	113,332	120,504	126,482	134,487	106,904	104,238	119,308	116,333
		Education Programs	6,695	7,716	20,086	23,147	6,324	6,724	18,972	20,173	5,965	5,817	17,896	17,450
		Non-Residential Audits	-	-	55,688	64,176	-	-	52,601	55,930	-	-	49,618	48,380
		Subtotal	126,679	145,986	209,680	241,637	119,656	127,229	198,056	210,590	112,870	110,055	186,822	182,163
	System Losses	Metering	49,516	53,890	45,028	49,005	47,438	48,455	43,139	44,063	45,430	43,479	41,313	39,538
		Leak Detection	67,344	73,292	120,543	131,190	64,518	65,900	115,484	117,959	61,786	59,132	110,596	105,844
		Education Programs	6,463	6,917	9,769	10,537	6,217	6,278	9,379	9,521	5,978	5,692	9,002	8,592
		Residential Audits	-	-	10,971	11,593	-	-	10,584	10,596	-	-	10,209	9,684
		Commercial Audits	-	-	6,188	7,131	-	-	5,845	6,214	-	-	5,513	5,376
		Subtotal	123,323	134,099	192,500	209,456	118,173	120,632	184,431	188,354	113,195	108,303	176,633	169,033
	Total		533,842	580,016	840,107	913,849	511,644	522,004	804,948	821,911	490,192	468,888	770,970	737,733