

VILLAGE OF RUIDOSO  
DEPARTMENT OF PUBLIC WORKS UTILITIES DIVISION

# WATER CONSERVATION PLAN

Prepared for the Village of Ruidoso, New Mexico

Village of Ruidoso, NM  
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**ABBREIATIONS AND ACRONYMS**

AWWA	American Water Works Association
BMP	Best Management Practice
GPD	Gallons per Day
GPCD	Gallons per Capita per Day
ICI	Industrial, Commercial, and Institutional
HZI	Huitt-Zollars, Inc.
MG	Million Gallons
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
SCADA	System Control and Data Acquisition
SFR	Single Family Residence
USEPA	Unites States Environmental Protection Agency

## **EXECUTIVE SUMMARY**

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The Village of Ruidoso is a resort community located in the Sacramento Mountains in Southern New Mexico. The Village's population experienced an increase from 1990 to 2000 when a large rise was observed in Lincoln County. The service area for Ruidoso is approximately 16.1 square miles.

The existing distribution system consists of points of diversion, multiple wells, two water treatment plants, mainline distribution system, storage water tanks, and pressure maintaining components including booster stations and pressure reducing valves. Currently the water distribution system is segmented into 42 pressure zones. Due to the terrain, the Village has to utilize booster pumps and pressure reducing valves in order to supply potable water to its customers; thus, ultimately increasing the complexity of an already difficult water system.

The Village has an average of 5,188 residential accounts and 500 commercial active water user accounts throughout the year. There is also an average of 1,500 water accounts that are active but that have zero usage throughout the year.

The Village of Ruidoso (Village) initiated a Water Conservation Plan to develop a sustainable resource of potable water that will supply the residents of the Village for the future, help to mitigate drought conditions, and provide stewardship of available water supplies.

Overall, the Water Conservation Plan purpose is to promote the efficient use of potable water supplies, reduce customer consumption, identify and reduce system non-revenue water, and propose programs that will aim at the overall reduction in water system meter reading inaccuracies.

The Water Conservation Plan has several key tools for analysis including the American Water Works Association (AWWA) Water Audit Software and the New Mexico Office of the State Engineer (NMOSE) Gallon Per Capita Daily (GPCD) Calculator. The AWWA Water Audit is used to quantify the Village's water system non-revenue water and efficiency while the NMOSE GPCD Calculator tracks long term trends in water usage over time.

Tasks that have been completed to date are listed in Appendix D of this report. In general the projects include the replacement of waterlines where water breaks have occurred, a new water rate structure, water meter replacement project, lining of Grindstone Dam to reduce leakage, installing meters on the Village's public parks and open spaces, and the adoption of General Obligation (GO) Bonds approved by the public to further invest and improve the overall efficiency of the water system infrastructure.

Recent efforts to conserve water started with the development of a revised inclining block rate structure and the development of a water conservation and drought ordinance. After months of effort and conducting numerous public workshops, Ordinance 2014-1 was approved and is discussed further in Section 1 and Appendix A. In addition the Village is developing a formal Process Meter Maintenance Program for the Village's water production meters.

The Village is also pursuing a number of capital projects through available funding which includes; the *Alto Grindstone Interconnect Project*, the *Swallow Waterline and Booster Replacement Project*, the *Phase I Waterline Replacement Project*, the *Grindstone Liner Project*, *River B Well Replacement Project*, the *Cherokee Interconnect Project*, and the *Paradise Canyon Service Connection Project*. These projects are providing the Village greater operational flexibility by replacing aging leak-prone and undersized infrastructure, and putting the Village on track to achieve its water conservation goals.

During the development of the Village's newly adopted water rates, an evaluation of historical and current water use identified customers with the highest consumption for both the residential and commercial categories. The water rates development allowed the Village to determine its baseline usage and identify areas where conservation would be most beneficial. The water audit included historical water production data over the last five years.

Water production in the Village has generally been consistent over the last five years with the exception of 2013 when treated water production fell by approximately 80 million gallons per year when compared to the current 5-year average. This drop is likely due to the loss of tourism after the Little Bear Fire burned large portions of the forest surrounding the Village the previous summer.

Preliminary results from performing the AWWA Water Audit software tell us that the Village has a Water Audit Data Validity Score/ Level of 73 or level 4. In general the three priority areas identified through the water audit for attention are customer metering inaccuracy, volume from own resources, and variable production costs.

Customer meter inaccuracies issues are known to the Village and are considered the top priority leading to the Village to fund and award the Water Meter Replacement Project which is currently proceeding and is expected to be completed by May 2016.

Analysis using the NMOSE GPCD Calculator indicates that the Village had a residential GPCD of 61.87 in 2014 with a calculated growth rate of -0.5%. The industrial, commercial and institutional (ICI) and other metered GPCD for the Village was 29.18 GPCD in 2014 which is down from 33.55 GPCD observed in 2008. The overall system in 2014 had a value of 192.67 GPCD which is a reduction over the 2008 figure of 220.22 GPCD.

The overall goal for the Village of Ruidoso is to reduce overall system consumption to 150 GPCD by 2025. In order to accomplish this goal the Village intends to determine the best strategies to increase the overall efficiency of the system.

The Village has identified several priorities to enact as part of this water conservation plan which include:

- Dedicate a budget for water conservation programming and staff in fiscal year 2016,
- Develop a leak detection and repair program,
- Finish the water meter replacement project scheduled for completion in May 2016,
- Initiate a toilet retrofit program,
- Develop a xeriscape and landscape ordinance,
- Provide education materials to the tourism industry and include an early education program in conjunction with the Ruidoso Municipal School District,
- Audit large water users of both residential and commercial water categories,
- Promote rainwater harvesting and grey water use,
- Promote use of efficient water-based appliances,
- Develop a new Village ordinance that specifies water conservation measures in all new subdivisions,
- Develop an ordinance to mandate water conservation measures in construction operations.

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## SECTION 1: DATA COLLECTION

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### 1.1 Purpose

Huitt-Zollars, Inc. (HZI) has been contracted by the Village of Ruidoso (Village) to develop a Water Conservation Plan for the Village's water utility. The scope of work is to evaluate the Village's water utility system's efficiency and identify steps to reduce the Village's overall consumption and non-revenue water.

This report is part of an overall Water Resource Management Plan that will examine the Village of Ruidoso's water system as a whole for inefficiencies and recommend corrective steps to improve the water system.

The Water Conservation Plan is developed to achieve the following objectives:

- Identify a consumption baseline for the Village's water utility,
- Develop and adopt water conservation goals,
- Determine most beneficial conservation programs,
- Set measurement goals and criteria to evaluate program success.

### 1.2 Planning team

To prepare this Water Conservation Report, the Village of Ruidoso staff and staff at Huitt-Zollars have worked together to gather information and to set conservation goals for the Village.

Team members for the Village include the Village Manager Debi Lee, Deputy Village Manager Ron Sena, Community Development Director Greg Cory, Director of Public Works J.R. Baumann, Water Department Manager Adam Sanchez, Water Production Manager Randy Koehn, and Water Billing Supervisor Victoria (Toy) Chavez. Huitt-Zollars team includes Senior Vice President Kim Kemper, P.E., Project Manager Wes Vote, P.E., Project Engineer Raymond De La Vega, P.E., and Senior Design Engineer James Brauer, P.E.

### 1.3 Local conditions

The Village of Ruidoso is a resort community located in the Sacramento Mountains in Southern New Mexico with an average altitude of 6,920 feet. The Village's population experienced an increase from 1990 to 2000 when a large rise was observed in Lincoln County. In 2014 the Village had an average of 5,188 active residential accounts and approximately 500 commercial active water user accounts throughout the year. The service area for Ruidoso is approximately 16.1 square miles.



### 1.3.1 Map

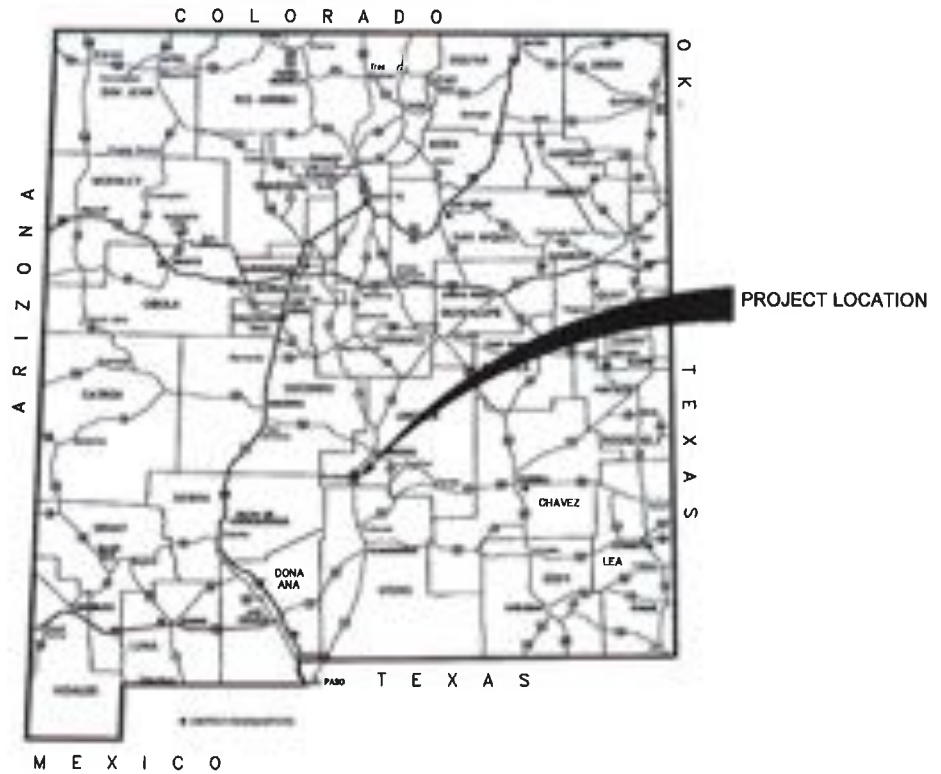


Figure 1: Ruidoso, NM Location

### 1.3.2 Water supply overview

In 2014 the Village had an average of 5,188 active residential accounts and approximately 500 commercial active water user accounts throughout the year. The average water usage within the system has fluctuations depending on time of the year, weekends, and holidays.

This is due to the Village being a resort town and one of the most southern ski resorts in the country. Therefore, water usage increases in the summer time when the population increases and also on weekends during ski season and at other times with events related to tourism. This high usage peaks in July when there are approximately 33 million gallons consumed for the month. Compared to the month of November, lowest usage, where 21 million gallons are consumed.

Huitt-Zollars, Inc. (HZI) along with Village staff have compiled information on the water system production, water consumption, and operating expenses. This information has been used to calculate results using the AWWA Audit Software and the New Mexico Office of the State Engineer (NMOSE) Gallon per Capita Daily Calculator. Full results are presented in Appendix A and B and are discussed in Section 2 of this report.

#### 1.3.2.1 Water service areas

The majority of the Village's water supply comes from the Rio Ruidoso and Eagle Creek watersheds. The Eagle Creek system serves the northern part of the Village and uses a combination of surface water and well water. The Rio Ruidoso system also uses a combination of surface and well water to supply the southern section of the Village. The remaining portion of the Village is served by the Cherokee Well system which relies only on well water.

The watersheds are a part of the Hondo Basin in the upper reach of the Pecos River watershed and the boundaries of the water service areas are shown on Figure 2 below. The availability of surface water varies seasonally and year to year depending on precipitation and mandated river flows for surface water diversion.

Ground water is crucial to augment surface water during times when the surface water sources do not have sufficient flow to allow for diversion to the water treatment plants. The Eagle Creek and the Rio Ruidoso systems are connected and dependent on surface water runoff for recharge of the system.

The Village has recently installed a new booster station, called the Alto-Grindstone Interconnect project, which connects treated water produced at both Grindstone and Alto and is planning a booster station project to connect with the Cherokee service area. These two projects will help with operational flexibility and help protect against water shortages in the three basins.

The Village of Ruidoso has 16 above ground water storage tanks and 2 wet wells at the water treatment plants. Most of the tanks are used for water distribution with some of the tanks used for water transfer only. Overall, the Village has that capacity to store 18 million gallons in the existing water tanks with an additional 1,520 ac-ft. or 495.3 MG of storage at Grindstone Reservoir and 240 ac-ft. or 78.2 MG of storage in Alto Lake. This storage capacity combined with the average daily consumption of 1.8 MG/Day accommodate 326 days of regular water usage.



FIGURE 2

EXISTING WATER SERVICE AREAS  
VILLAGE OF RUIDOSO

Project: 02/2016 11:30:05 AM

Designed For:



Designed By:

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- *Eagle Creek and Alto Lake*

The Eagle Creek and Alto Lake supply system is located to the north and west of the village. It uses a combination of surface water and groundwater supplies. There are no flow conditions at the Eagle Creek diversion only limits on diversion of a maximum of 6 cfs. The wells that feed into the system are in general referenced as the North Fork Wells (H-1979 et al, H-1980, H-1981, H-1982) and the Brown (H-1497-S) and Green (H-1497-POD4) Wells. The yields from these wells can vary during extended periods of drought the water level can drop significantly below pre-developed levels (Shoemaker, 2005).

- *Rio Ruidoso and Grindstone Reservoir*

The Rio Ruidoso and Grindstone Reservoir serve the southern portion of the Village. The Rio Ruidoso runs through the heart of the Village and parallels Suddreth Dr. The Grindstone Reservoir is on the southwest side of the Village below Resort Dr. This portion of the water supply system largely relies on return flow credit from the Eagle Creek system which is applied as return flow credit, effluent, at the regional wastewater treatment plant to the Rio Ruidoso.

- *Cherokee Well*

The Cherokee Well system is unique in the Village of Ruidoso. The distribution area is supplied by groundwater only and does not receive water from the Village's two water treatment plants. The proposed Cherokee Interconnect Project will connect the system with the Village's water treatment plants which will increase the systems flexibility and also serve as a backup supply to the well, with a completion date of July 2016.

### 1.3.2.2 Distribution system

The existing distribution system consists of points of diversion, multiple wells, two water treatment plants, mainline distribution system, storage water tanks, and pressure maintaining components including booster stations and pressure reducing valves. The overall water system is illustrated on Figure 3 below and water distribution line lengths presented in Table 1 below.

Currently the water distribution system is segmented into 42 pressure zones. Due to the terrain, the Village has to utilize booster pumps and pressure reducing valves in order to supply potable water to its customers; thus, ultimately increasing the complexity of an already difficult water system.

The Village's distribution system is currently experiencing a non-revenue water amount in the distribution system, of approximately 52.75%, which is higher than industry standards. As an overall picture, the non-revenue water experienced by the Village could be the most significant impact on the amount of water consumed and

thus the required amount of water rights needed, operational cost, financial stability, and environmental stewardship. Appendix D has a list of scheduled water projects that the Village has identified from 2015 thru 2020.

Table 1: Village of Ruidoso water mains by size (2014)

Water Mains

Diameter (inch)	Linear Feet
1	710
2	370,959
3	5,330
4	16,000
6	1,055,650
8	140,930
10	57,600
12	42,320
14	29,640
Total	1,719,139

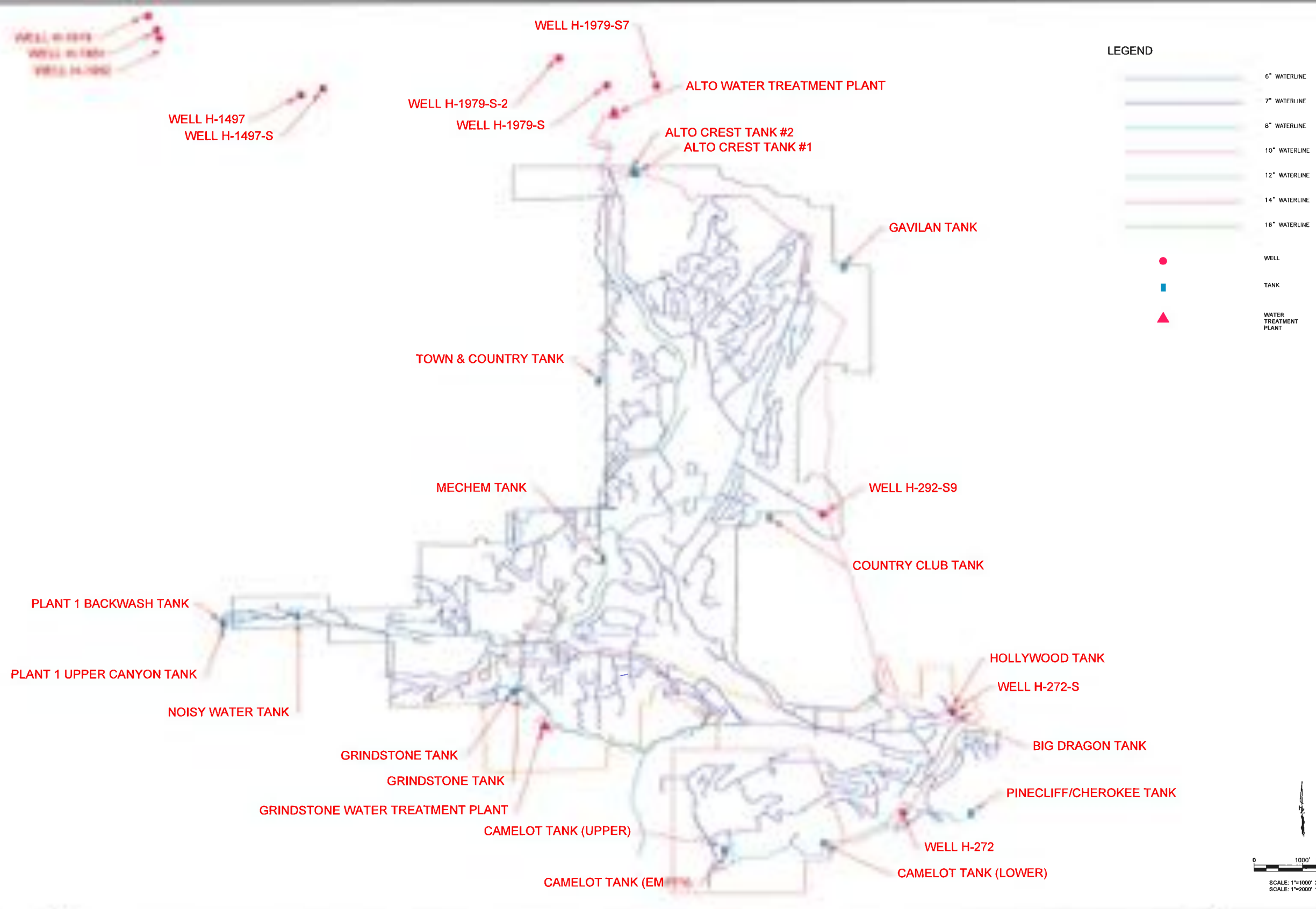


FIGURE 3

OVERALL EXISTING WATER DISTRIBUTION SYSTEM  
VILLAGE OF RUIDOSO

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### 1.3.2.3 Water usage

The evaluation of the Village of Ruidoso water usage is a key component to the overall formulation of the water conservation plan. The Village has two customer classes that are used for billing which include residential and commercial accounts. Steps are now being taken to further diversify the billing system in order to account for single family housing and multi-unit housing in conjunction with the water meter replacement program. Figure 4 below illustrates the percentage of overall system use based on total consumption.

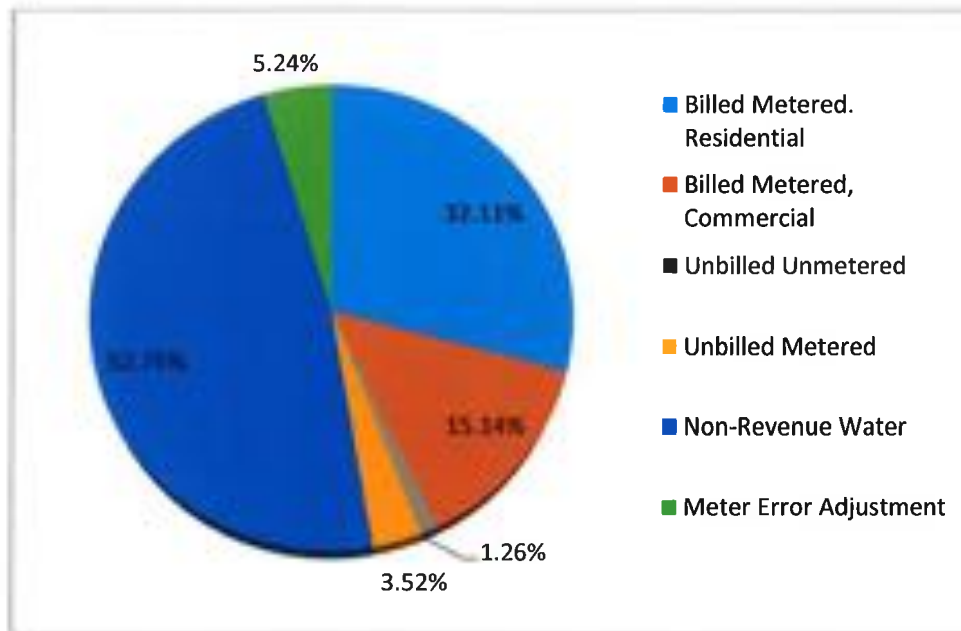


Figure 4: Village of Ruidoso water usage per sector (2014)

Currently, the system is experiencing non-revenue water that is requiring the Village to treat more water than consumed. Non-revenue water includes unbilled unmetered, unbilled metered, and water lost within the distribution system including water from theft. As an overall part of the long term maintainability, the water system needs to seek reductions in overall consumption per capita, reduction of non-metered water, and reduce the amount of non-revenue water through a leak detection program by reinvesting in the water system infrastructure.

Additional areas of non-revenue water that have been further explored are discussed below:

- Quantifying non-revenue water due to water leaks and water meter inaccuracies from the customer's water system.

- There are cases of water leaks on the customer side of the meter that are reported by customers after receiving a water bill. These leaks often result in significant water bills, >\$1,000, that are reported as non-revenue water.
- Water main flushing program.
  - The Village has a water flushing program that was implemented to try and reduce the amount of trihalomethanes and haloacetic acids that are forming in the distribution system due to the interaction of disinfectants and naturally occurring organic material. This operation is being estimated and tracked starting in fiscal year 2015.
- Customer meter read errors.
  - The majority of existing water meters for both residential and commercial customers are old and are a positive displacement meter. There is a conservative estimate of a 9.99% error in reporting of the consumption.
  - In addition, it is believed that the existing meters are failing to register low and ultralow flow conditions that can be caused by leaking toilets or faucets.
  - The Village is currently installing new meters for all customers which will more accurately reflect water consumption in the Village. Additionally, the Village will be testing production meters in an effort to accurately reflect water production versus consumption.
- Water treatment plant backwash.
  - The current estimation of non-revenue water does not include the backwash used by the water treatment plants. This will be accounted for in the 2016 water audit.
  - Alto Lake treatment plant has plans to install a decant system to minimize the amount of water lost from backwash. Project is scheduled to be completed in 2016.
- Village Street Department water use.
  - Currently the department is not recording water to fill water trucks or water that is used in street sweeping. The department will meter and report this use starting in fiscal year 2016.
- Village Water and Sewer Department water use.
  - Currently the department is not recording water that is used to fill the Vactor Truck, Ditch Witch, or Rodder Truck.
  - These vehicles are filled twice daily and have volumes of 400 gallons, 200 gallons, and 300 gallons, respectively.
  - This usage is estimated for 2014, and will be metered and reported in fiscal year 2015.
- Construction Water
  - Construction water is currently metered but not included in the 2014 water analysis. It will be included in the 2015 water audit which the Village will submit by March 1<sup>st</sup>, 2016.



1.3.2.4 Non-revenue water (2014)

Table 2 below investigates the amount of water leakage that is experienced on the customer side of the water system. Often there are underground water leaks that go unnoticed or the leak may happen to an unoccupied vacation residence and does not realize the leak. The Village has a program for customer leakage credit in place that allows the residential customer to show proof that the issue on the customer side of the meter has been fixed or replaced in order to qualify for the leakage credit.

Table 2: Village of Ruidoso customer leakage credit (2014)

Leakage Credit	
Year Total	13,184,780

The available leakage credit is only available once per year per customer with the installation of a recommended shut off valve before credit is given.

Table 3: Village of Ruidoso additional activities associated with non-revenue water

Activity	Cycle Frequency	Cycle Gallons	Non-Revenue Gallons
<b>Water Main Flushing</b>	3/WK	2,200	343,200
<b>Water Treatment Plant Backwash</b>	2/WK		
Alto - WTP3	Every 3 Days	50,000	6,050,000
Grindstone – WPT4	Every 2 Days	8,000	1,456,000
<b>Village Street Department</b>	Non Winter Months		
Water Trucks	4/WK	500	80,000
<b>Water and Sewer Department</b>			
Vactor Truck	10/WK	400	208,000
Ditch Witch	10/WK	200	104,000
Rodder Truck	10/WK	300	156,000
<b>Construction Water</b>	<b>Estimated</b>	150,000/Project	1,500,000
<b>Total</b>			<b>9,897,200</b>

Also, as a result of perceived issues related to leakage, the Village of Ruidoso, in 2007, commenced a comprehensive leak detection program. This program included video inspection of major transmission lines and installation of monitoring devices (some of which remain active). Considerable work was undertaken in replacing lines that demonstrated leakage. Due to the 2008 flood, which tremendously damaged Village infrastructure and created health and safety issues, the leak detection program was suspended. Efforts are now underway to resume this important program.

### 1.3.3 Demographics and housing

The Village has experienced a population increase from 1990 to 2000 when a large rise was observed in Lincoln County. In 2014 the Village had an average of 5,188 active residential accounts and approximately 500 commercial active water user accounts throughout the year. Table 4 illustrates the overall population and housing availability.

Table 4: Village of Ruidoso US Census, 2010

Subject	Number
<b>Population</b>	
Total Population	8,029
Male Population	3,653
Female Population	4,045
<b>Relationship</b>	
Total Population	8,029
In Households	8,029
In Group Quarters	0
<b>Household</b>	
Average Household Size	2.2
<b>Housing Occupancy</b>	
Total Housing Units	8,593
Occupied Housing Units	3,650
Vacant Housing Units	1,089
For Seasonal, Recreational, or Occasional Use	3,854

It should be noted that for completion of the NMOSE GPCD calculator 1.8 average house hold size was used to more accurately represent the current population of the Village. If the average household size of 2.2 was applied to the calculator then the predicted population is over 11,000 which is significantly more than the 8,209 from the Census data.

### 1.3.4 Temperature and precipitation

The Village of Ruidoso water system is reliant on both surface water and ground water for the water supply. During recent drought conditions the Village has had to rely on a growing amount of ground water that has the combined effect of depleting underground supplies and not replenishing the aquifer from rainfall. Below is the average climate data for Ruidoso from 1981 through 2010 from the U.S. Climate Data available at [www.usclimatedata.com](http://www.usclimatedata.com).

Table 5: Village of Ruidoso average monthly climate data (1981-2010)

Month	Avg. High (°F)	Avg. Low (°F)	Avg. Precipitation (in)	Avg. Snowfall (in)
JAN	49	22	1.14	9
FEB	52	24	1.06	7
MAR	58	28	0.83	3
APR	65	33	0.71	2
MAY	75	40	1.18	0
JUN	81	47	2.05	0
JUL	80	51	3.66	0
AUG	78	51	4.69	0
SEP	75	45	2.6	0
OCT	66	36	1.65	1
NOV	56	27	0.71	2
DEC	49	22	1.57	7

### 1.3.5 Other local conditions

Other local conditions that are a part of this report are a water rights analysis, wastewater analysis, and possible innovative water programs.

#### 1.3.5.1 Water rights analysis

The Village of Ruidoso relies on a combination of surface water and groundwater to provide the Village with potable water. Table 6 below illustrates a summary of the Village's water rights including the Rio Ruidoso and Alto water rights.

Table 6: Village of Ruidoso water rights as of 2014

Permit (Includes Temporary Permitting)	Water Right - Annual Diversion Acre-Feet
Rio Ruidoso & H-272 et al. No Flow Condition	268.91
Rio Ruidoso & H-272 et al. Flow Condition	424.214
H-272 et al Groundwater Only Water Rights	74.69
Eagle Creek Water Right Surface Water	1461.95
Eagle Creek Water Right Groundwater	1975.88
3038 et al Eagle Creek Imported Water Credit	Varies up to 1380.56
Airport Groundwater	24.38
Pending Water Rights (Under Protest)	995.202

Analysis of the existing and future water rights for the Village is aimed to determine if the water rights are sufficient and flexible enough to meet the current and future consumption needs of the Village. Water systems that rely on both surface water and ground water require that water rights are held in excess of actual consumption. General practice recommends that water rights to be a minimum of 125% to 200% of actual consumption because water rights and water supply cannot be precisely matched. Factors such as drought years, operational changes, and emergencies such as the Little Bear Fire, can all have an impact on the availability and consumption of the water supply.

#### 1.3.5.2 Seasonality of water usage

The Village is a seasonal destination and the most southern ski resort in New Mexico. Water usage in the Village follows this seasonal water pattern where we have high usage during ski season and year round during the weekend. The Village has reported as many as 45,000 visitors during holiday weekends. This requires that the amount of water and water infrastructure be able to withstand these peak demands of water usage.

#### 1.3.5.3 Wastewater analysis

An often overlooked component of water conservation is the wastewater component of the system. This is essential because the Village of Ruidoso receives return flow credit for water returned to the Rio Ruidoso from the Regional Wastewater Plant located in Ruidoso Downs. The Village of Ruidoso has initiated a study to determine the amount of water users that rely on septic systems in an effort to increase the amount of wastewater returned to the sewer system. An additional benefit to this program is reduction of the risk of underground contamination of drinking water from septic systems.

#### 1.3.5.4 Innovative water programs

Currently, the Village does not operate an effluent reuse system which could provide relief to the demand on the Village's potable system. Viability of a effluent reuse system largely relies on the capital expenditure required, enough reuse end users and sufficient flow to suggest the benefit of a reuse system, and the impact to the sewer system in relation on having sufficient water to still move solids to the wastewater treatment plant. The largest potential use of a reuse system is for the irrigation of Village parks and golf courses within the Village limit. Further study is required to determine the feasibility of a reuse water system but initial findings suggest the capital cost to move water from the Regional Wastewater Treatment Plant located in Ruidoso Downs back to the Village would be prohibitive. Satellite Treatment Plants,

also known as Scalping Plants, could be an alternative; however, due to the current perceived poor state of the sewer system this option is not recommended. However, the Village is currently seeking regional water solutions and reuse could be a component of a water right movement from a downstream user in exchange for the effluent available at the regional wastewater treatment plant.

## SECTION 2: DATA RESULTS AND ANALYSIS

### 2.1 Data results and analysis, American Water Works Association (AWWA) Water Loss Control Committee (WLCC) Free Water Audit Software Reporting Worksheet

In the sections below are the results of the AWWA water audit software and reporting worksheet.

#### 2.1.1 Performance Indicators

HZI along with Village staff have compiled information on the water system production, water consumption, and operating expenses. This information has been used to calculate results using the AWWA Audit Software. The software is used as a standard method of evaluating supply side issues within a water distribution system and indicates the amount of non-revenue water which an estimation of loss due to meter inaccuracies, non-billed authorized consumption and theft.

Based on the results of running the AWWA audit software, the Village has 52.75% (Appendix A) non-revenue water. This is a high value and this plan will describe the necessary steps to reduce this amount of non-revenue water.

##### 2.1.1.1 Financial

The financial evaluation of the water utility estimates the water utility budget and cost of production of water which estimates the amount of revenue loss due to non-revenue water:

Table 7: Village of Ruidoso water utility budget (2014)

Department	Cost
<b>Billing</b>	
Utility Billing	\$235,231
<b>Water Production</b>	
Water Production	\$2,711,079
<b>Water Distribution</b>	
Water Distribution	\$2,124,036
<b>SGRT Water Projects</b>	
Services	\$1,073,125
Capital Projects	\$1,460,083
Debt Service	\$258,188
Administrative Cost Allocation	\$339,393
<b>Total Budget</b>	<b>\$8,201,135</b>
Estimated Monthly Budget	\$683,427

Table 7 above represents the entire utility water budget for the Village of Ruidoso. To determine the cost of the lost revenue water the water audit uses a combination of cost of electricity to run the wells and treatment plants, the cost of the chemicals that are used to treat the water, and the cost of water leases that the Village is currently maintains. Table 8 below illustrates these costs.

Table 8: Village of Ruidoso water production cost (2014)

Description	Cost
Electricity and Gas	\$505,607
Chemical Cost	\$52,495
Water Right Leases	\$228,981
Total Production Cost	\$787,083
<b>Total Production Cost/ Adjusted Water Production Cost per 1MG</b>	<b>\$1,187.22</b>

Based on the production cost presented in Table 8 the water audit indicates that the annual cost of apparent losses is \$167,517 and the annual cost of real losses is \$334,815. The overall cost of non-revenue water is \$539,573 and accounts for 6.58 % of the total budget for the utility. The cost of real water losses is directly attributable to the non-revenue water that was supplied by the Village in 2014 which accounted for 52.75% of the total water sent to the distribution system. For detailed results of the water audit please see Appendix A.

#### 2.1.1.2 Operation efficiency

To evaluate the system efficiency potential the water audit also calculates the Unavoidable Annual Real Losses (UARL) which is an indicator of the system's theoretical maximum efficiency point. The UARL is the low limit of leakage that could be obtained for a utility system by implementing the best technology available. The UARL indicates that the Village's non-revenue water could be reduced to 110.91 MG/Yr which would translate to a rate of 16.7 % for non-revenue water. This percentage is the Village's long term goal for the utility.

Evaluating initial results of the current water conservation ordinance and adoption of a new water rate schedule consisted on focusing on the largest water users' reduction of consumption, frequency of water breaks in the distribution system and the associated non-revenue water, and the overall gallons consumption use per capita. A result attributable to the adoption of the inclining water rate structure efficiency is found in the analysis of the top twenty residential water users. In 2011 the top twenty residential water users consumed 31,031,826 gallons for the year or approximately 10.8% of all the water consumed in the Village. The consumption in 2014 of the top twenty residential water users fell to 20,755,418 gallons for the year, equating to a reduction of 33%.

Reports from Village staff indicate that the number of emergency repairs to distribution pipeline the Village is experiencing is declining. This trend can also be seen in the amount of staff labor the water department is paying to fix after-hours pipeline repair. Over the last two years a reduction in overtime paid is evident, which is a direct result of the investment made in water infrastructure improvements. For example, during calendar year 2014 there was 104 line breaks in the distribution pipeline with a reduction to 49 for calendar year 2015.

### 2.1.2 Data validity score

Results from performing the AWWA Water Audit software reveal that the Village has a Water Audit Data Validity Score/ Level of 73 out of 100 or level 4. The score of 73 will allow the Village to use the performance indicators to set performance goals. Achieving/completing these goals will improve the Village's validity score.

There are several categories that the Village has high scores while there are others that the Village will need to focus on to increase the audit scoring and also improve the evolving water conservation plan.

The categories of volume from own sources were given 8 out of 10 because all of the produced water is from the Village's own sources and are metered. Continued meter testing will allow the Village to increase this score to a 10.

The categories of billed metered, billed unmetered, and unbilled unmetered were all given a 10. This is due to 100% of the Village's customers are metered on a volume basis and the ongoing meter replacement program with automatic readers will include 100% of all customers, there is no billed unmetered water use, and the unbilled and metered usage is now closely monitored.

The remaining scores were between 7 and 5 and are described in detail in Appendix A. The lowest scoring were for the length of main distribution lines and for the variable production costs. The length of line is difficult to control, however the water distribution replacement process, funded by the Village and Go Bond program, will increase the efficiency of the system which will also help reduce the variable production costs.

The category that affected the audit results the most were from the customer meter inaccuracies. The category received a score of 6 of 10 but the inaccuracy was estimated to be approximately 10%. The estimation is believed to be conservative due to the age of the meters and the suspicion that the meters are not recording any low to ultralow flow that could occur due to small water leaks from the toilet and faucets that are not repaired and from setting a "drip" to help prevent water lines from freezing.



### 2.1.3 Priority areas for attention

In general the three priority areas identified by the AWWA Water Audit for improvements are as follows:

- Volume from own resources for water production,
- Variable production cost (applied to real losses),
- Customer metering inaccuracies,
- Repair and or replacement of leaking distribution lines.

## 2.2 Data results and analysis, GPCD calculator table

### 2.2.1 Period of study

The Office of the State Engineer gallon per capita per day (GPCD) was completed using data from the previous five years, 2008 to 2014, of production data, water usage per residential and commercial accounts, and with published census information.

### 2.2.2 Average size of household

The average size of household according to the census information that is available is 2.2 people per household. However, when you apply this to the calculator the estimated population that it projects is 11,406 in 2014 which is far above the census data for population reported in Section 1.1.3 of 8,209 residents. In order to more accurately predict the usage per person an average house hold population of 1.8 has been used in the calculator.

### 2.2.3 Monthly residential GPCD

Monthly residential GPCD is illustrated on a monthly basis below. In general it follows the same usage trend that we see in overall system production discussed earlier where we see a rise in summer months and during ski season.

Table 9: Village of Ruidoso average residential gallons per person per capita per day (GPCD) 2014

Monthly GPCD	
JAN	68.26
FEB	68.87
MAR	56.2
APR	56.56
MAY	66.5
JUN	72.81
JUL	73.06
AUG	64.06
SEP	56.22
OCT	54.01
NOV	52.69
DEC	51.29

Overall the residential GPCD is higher than the general standard used in the engineering field to estimate required water rights of 50 GPCD. The water conservation plan and the inclining block rate water structure will help reduce this to the Village's goal to obtain 50 GPCD for residential customers.

#### 2.2.4 Estimated residential indoor and outdoor water use

The estimated indoor and outdoor water use is determined by looking at the difference from low use months compared to the summer months where outdoor use will be inferred as the difference. It is estimated that the residential indoor water use is approximately 53.5 GPCD and the estimated outdoor water use is estimated at 15.5 GPCD. Tourists and seasonal home occupants

#### 2.2.5 Industrial, commercial, institutional and other metered

The industrial, commercial and institutional (ICI) use is illustrated below. The ICI use for the Village consists of only commercial usage and is estimated to be 29.18 for 2014.

Table 10: Village of Ruidoso average commercial gallons per capita per day (GPCD) 2014

Monthly GPCD	
2014	29.18
2013	28.60
2012	30.89
2011	34.91
2010	32.39
2009	32.66
2008	33.55

2.2.6 Annual system total GPCD

Figure 5 below illustrates the overall GPCD for the Village we can see that with the exception of 2014 there is an overall decrease in overall system per capita consumption starting in 2008. The increase experienced in 2014 is likely due to an increase in tourism during January, February, June and July which corresponds to peak tourism seasons.

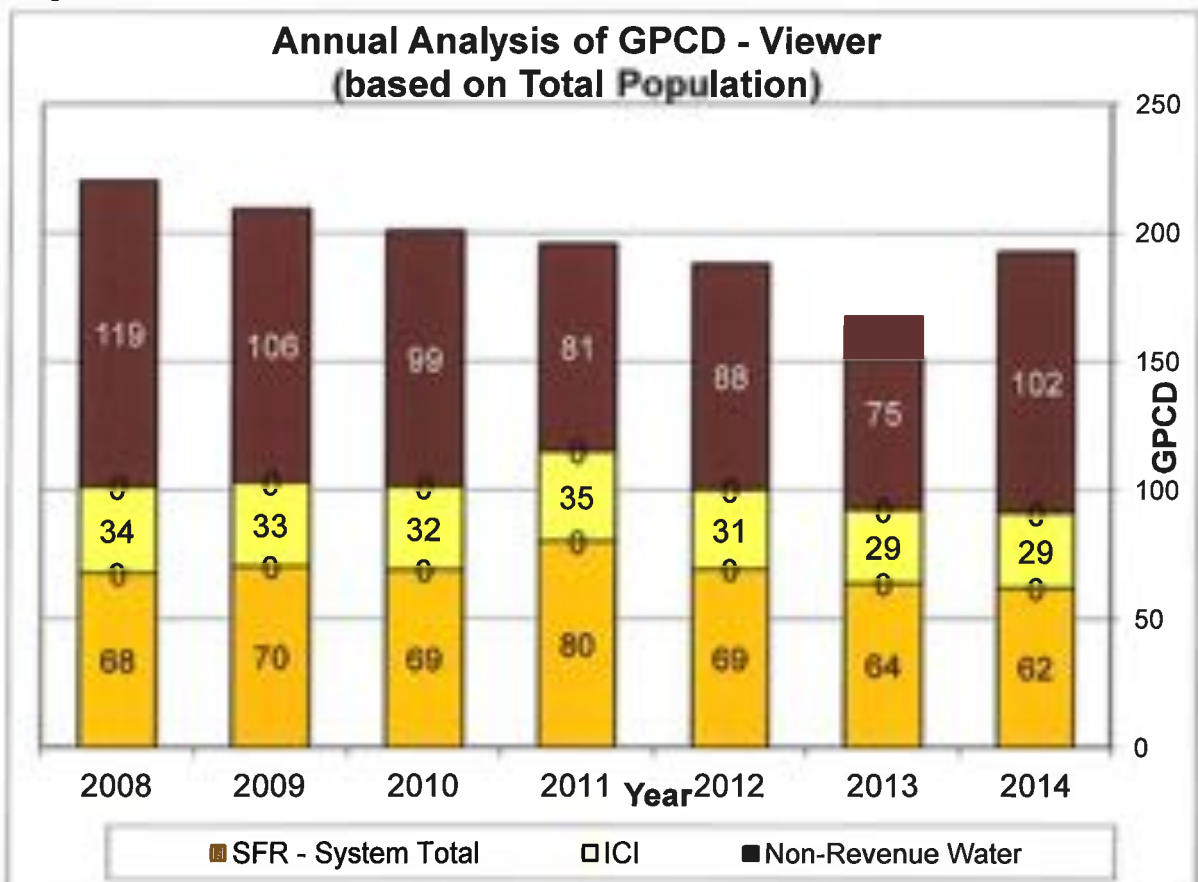


Figure 5: Village of Ruidoso annual system total gallons per capita per day (GPCD)

Analysis of the system gallon per capita daily shows that there has been a general reduction of consumption starting in 2009 through 2013. The lowest value observed was in 2013 with a consumption of 168 GPCD. In 2014 there was an increase in consumption which could be accounted for by an increase in summer residents and an overall increase in tourism for the Village as underscored by a 12% increase in Lodger Tax collection. The overall system GPCD includes residential and commercial consumption and the non-revenue water amount that the utility is experiencing. It is important to note that the new, volume-based water rate structure was not implemented until mid-year, 2014.

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## **SECTION 3: SETTING WATER CONSERVATION GOALS**

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### 3.1 Objective

The Village of Ruidoso (Village) initiated a Water Conservation Plan to develop a sustainable resource of potable water that will supply the residents of the Village for the future, help to mitigate drought conditions, and provide stewardship of available water supplies. Overall, the Water Conservation Plan purpose is to promote the efficient use of potable water supplies, reduce customer consumption, and identify sources of non-revenue water.

This report is part of an overall Water Resources Management Plan that will examine the Village's water system as a whole for inefficiencies and recommend corrective steps to improve the water system.

The Water Conservation Plan is developed to achieve the following objectives:

- Identify a consumption baseline for the Village's water utility,
- Develop and adopt water conservation goals,
- Determine most beneficial conservation programs,
- Set measurement goals and criteria to evaluate program success.

### 3.2 Reason why the public water system (PWS) is developing a water conservation plan

The Village of Ruidoso is developing the Water Conservation Plan in order to meet the requirements of the NMOSE on several of the Village's leased water and to provide stewardship for the water supply.

### 3.3 Identify water conservation goals

In general the objectives and goals that the Village will be pursuing prioritized as follows:

1. Reduction in the overall average per capita consumption to 150 GPCD within the next ten years (2025),
  - This goal will be tracked each year, with the ultimate goal of a 5 year average of 150 GPCD starting in 2025.
2. Encourage outdoor savings programs.
  - Starting in 2016 and updated/evaluated every two years,
3. Reduce non-revenue water to the unavoidable annual real losses (UARL) AWWA audit calculated value of 18.75% by 2030,
  - This is an aggressive schedule and will be tracked yearly with the water audit.
4. Reduce non-revenue water by 15% within the next ten years (2025).

- Non-revenue water in the Village system is expected to drop with the replacement of the automatic water meters and continuing replacement of infrastructure. After completion of the water meter replacement project monthly data will be analyzed to determine the impact of the new water meters. The water meter replacement project is scheduled to be completed in early 2016.
5. Develop conservation programs that are participatory in nature and do not include a fine to the consumer for non-compliance. This goal is ongoing and was started in 2013 with the adoption of the conservation ordinance found in Appendix C, per the requirements of the NMOSE updates to the conservation program are scheduled every two years,
  6. Reduce the annual cost of non-revenue water. Continued water system upgrades/replacement of aging infrastructure. Timeline for this goal is ongoing and has been aggressively active since 2013 as illustrated in Appendix D and has projects identified through 2020,
  7. System operation efficiency program including leak detection. The installation of the new automatic water meter readers is the first step in the program and is currently under construction. Additional leak detection programs including active and passive systems will be developed and implemented in 2016.

### 3.4 Prioritize goals

The Village of Ruidoso has a higher than average overall non-revenue water, the Village is prioritizing the accurate metering of possible sources of non-revenue water with a goal of reducing non-revenue water by 15% in the next 10 years to 37.75%.

### 3.5 Evaluate goals

In order to evaluate goals the Village proposes to update the AWWA Water Audit on a monthly basis in order to determine the impact of new meter installation on the amount of non-revenue water. In addition, the current and planned GO Bond projects will continue to replace water infrastructure if approved by the voters. The Village will continue this effort and will report on an annual basis the results of the water audit to the NMOSE.

### 3.6 Best management practices

Table 11: Village of Ruidoso best management practices

Best Management Practice	Program	Water Savings Impacts
Customer Metering	Installing new customer water meters with leak detection and real time usage information	Currently estimating water meters to have an error of at least 10%
	Program new meters to establish different customer classes	No water savings potential is known but will improve results from water audit
System Non-Revenue Water Control	Develop a system water audit practice to monitor non-revenue reduction.	Identify sections of the Village that have the highest amount of non-revenue water and prioritize infrastructure replacement.
	Implement an active water leak detection program	
Conservation Coordinator		Essential to the successful implementation of conservation plan
Public Information and Education Program	Develop outreach program with the Village school system	Develop a culture of wise water stewardship to influence behavior change
Water Waste Ordinance	Develop ordinance that prohibits waste of water detailing enforcement and penalties	Provide a legal basis for enforcement. Also, helps with peak demand management

Table 11 above illustrates the identified the overall best management practices that the Village is considering. Each will be further evaluated to determine the impact in improving the water conservation effort.

The overall main issue identified from the water audit is the amount of unaccounted water after the production of potable water. Customer meter inaccuracy issues are known to the Village and a major reason for the Village to take on the Water Meter Replacement Project. The Village recognized the importance of this area of need and as of June 2015 already implemented this program. In addition, the Village has begun replacement of water distribution lines through a publicly approved GO Bond program that will focus on areas that are identified by the leak detection program.

#### 3.6.1 List BMPs selected

Based on the results of the water audit and the Village's water conservation goals the following are the BMPs that are selected:

- Continue to test water production meters,
- Replace all of the existing customer meters, as of June 2015, commenced implementation of this program,

- Work with large residential and commercial water users to perform water audits to look for water savings,
- Implement an active water leak detection program,
- Develop outreach program with the Ruidoso Municipal School District,
- Develop a Village ordinance that prohibits waste of water with penalties,
- Develop an incentive program for water conservation measures.



## **SECTION 4: PUBLIC INVOLVEMENT, EDUCATION AND OUTREACH**

### 4.1 Describe public involvement during planning process

The Village of Ruidoso developed a customer questionnaire that was sent out in the monthly billings to ask general questions about the proposed conservation measures, current level of water conservation measures being implemented and the willingness to implement water conservation measures in their household.

During the development of the Water Conservation Plan the Village has proposed new programs for public input. The new programs will be designed to target outdoor use savings and further residential and commercial savings. The proposed programs and goals are listed below:

- Define an escalating budget for water conservation,
  - The investment into water conservation programs will be offset by the amount of water savings from the reduction of treatment of potable water and the possible reduction in leased water rights.
- Dedicate a full-time staff position, February 2016, that will be devoted to oversight of the water conservation program and administration of water rights,
  - Position will allow the effective implementation of all identified conservation programs and monitor the progress of each program,
- Outdoor water conservation program, xeriscape incentive program,
  - Outdoor xeriscaping is an opportunity to reduce demand on the Village's potable water system during the summer months where peak demand occurs,
- Wastewater reuse,
  - Wastewater reuse, along with other water innovation programs has the potential to have an impact especially in the summer months when irrigation is occurring.
- Low income assistance with residential retrofit of toilet and showerheads,
  - The largest water use within a household is the toilet. Development of a low income assistance program will allow additional retrofitting of residences that would otherwise not be able to afford the replacement of a toilet,
- Set a conservation goal for the overall system of 150 GPCD
  - A conservation goal of 150 gpd is a standard goal that the Village is seeking to obtain in the next ten years,
- Discourage future installation of evaporative air conditioning systems,
  - Evaporative air conditioning use occurs in the summer time where the largest population is in the Village. The use of air conditioning units will reduce the water consumption that is seen with evaporative cooling. An incentive program will be developed in 2016.

- Encourage rainwater harvesting, and gray water use,
  - The use of rainwater harvesting and gray water use can reduce the consumption of potable water for outside watering. An information handout will be created and distributed with water billing in 2016,
- Develop an incentive program for the use of efficient water-based appliances,
  - Similar to the information above for toilet retrofit and use of xeriscaping, the replacement of household appliances with energy and water efficient models can reduce the water consumption for residential and commercial users. Further incentive programs will be developed by the Village in 2016.

#### 4.1.1 Results from public questionnaire

The Village received 359 responses to the questionnaire that was mailed out in the monthly billings to all active accounts. Responses were generally positive in nature and indicate that the public is well informed and realize the need to implement this conservation plan. Results from the questionnaire were used to guide the Village in determining which conservation goals and measures to implement. Results are listed below.

The following questions were asked to determine the general level of awareness of the Village’s residents and their support of the proposed water conservation initiatives and are presented in Table 12, 13, 14 and 15 below.

Table 12: Results to question 1 of the Village of Ruidoso questionnaire

Question 1: For each statement please indicate the amount of concern in the Village	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
- Water is scarce and in demand for many uses	237	103	13	5	1
- Water need to be conserved for future generations.	220	118	12	6	1
- Recent drought has negatively affected the water supply	203	119	22	7	2

Response to question 1 are positive with the lowest percentage of responses of strongly agree or agree, positive responses, in comparison to neutral, disagree and strongly disagree, negative response, of 91% positive response. This seems to indicate that the Village residents do realize the need for a water conservation program be developed and implemented within the Village.

Table 13: Results to question 2 of the Village of Ruidoso questionnaire

Question 2: For each proposed program please indicate how likely you are to participate.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
- Develop an outreach education program.	54	105	139	30	14
- Test leakage in your toilet.	123	139	53	12	10
- Develop rebates for xeriscaping	92	107	91	25	11
- Develop rebates for replacing old appliances.	111	115	69	30	6
- Participate in a water audit.	73	112	104	22	17
- Participate in public forums regarding water conservation.	44	83	152	35	11
- Rainwater harvesting program with at cost rain barrels.	20	99	91	25	11

Results from the second question were more diverse than the previous question with the highest positive response of 77.7% for the proposed test leakage in your toilet program. The lowest positive response of 39% was for participating in public forums regarding water conservation. The willingness to participate in the test for leakage in your toilet is encouraging due to the issues with current water meters not picking up ultra-low flow conditions that are believed to be a major contributor to the amount on non-revenue water the Village is experiencing.

Table 14: Results to question 3 of the Village of Ruidoso questionnaire

Question 3: Please indicate yes or no if your household already conserves water in the following ways.	Yes	No
- I have low flow toilets	266	78
- I have low flow shower heads	246	89
- I have a hot water recirculating system.	53	274
- I do not have an evaporative cooling system	243	95
- I have a rain barrel.	75	264
- I water my lawn once per week or less in the summer	160	95
- I use native or drought tolerant plants in my yard.	276	44
- I have a rain sensor shut-off valve on my irrigation system.	27	167

Results from the third question indicate that there have been upgrades to many water conservation devices with 69.8% indicating that they have low flow toilets, 73.4% have low flow shower heads, 71.8% do not use an evaporative cooler, 62.7% only water the lawn once per week, and 86.2% have native or drought tolerant plants in their yard. The lowest results from the survey question are having a water recirculating system, the use of rain barrels, and rain sensor shutoff for the irrigation system with 16.2%, 22.1%, and 13.9% respectively.

Table 15: Results to question 4 of the Village of Ruidoso questionnaire

Question 4: I am willing to consider implementing the following water conservation measures:	Yes	No
- Replace older appliances with high efficiency appliances.	178	77
- Install low flow toilets	172	72
- Install low flow showerheads.	180	69
- Install a hot water recirculating system.	94	167
- Alter outdoor landscaping to reduce water usage.	173	69
- Invest in a rainwater harvesting system.	157	115
- Set a conservation goal of 150 gallons per person per day	248	31

Results from the final question were also positive which indicate that the Village residents are willing to implement the proposed conservation measures. The lowest positive response, 36%, is for the installation of a hot water recirculating system. The rest of the responses were positive with replacing older appliances with high efficiency ones at 69.8%, install low flow toilets at 70.4%, install low flow shower heads at 72.2%, alter outdoor landscaping at 71.4%, invest in a rain harvesting system at 57.7% and setting a conservation goal of 150 GPCD at 88.8%.

Overall the results indicate that the vast majority of respondents realize that the Village needs to conserve water and that it is scarce with a variety of demands, that the water needs to be conserved for future generations, and that the recent period of drought conditions has affected that water supply.

#### 4.2 Education and outreach programs

From the results of the public questionnaire the Village will focus on the described conservation measures. In addition the Village has already developed a water conservation section on the Village’s website, developed brochures that the public can pick up when they pay their water bill and also the Village holds a “Work After Hours” function where once a year the Village uses the Conference Center to host residents where they can talk with all of the Village’s departments including the water department that will have up to date information on water breakage and results of the AWWA audit.

In addition, the public education program will include information for students in the school system. Programs under development are an annual contest with the school system to see which school can reduce their consumption the most per capita and development of a yearly education festival for fifth graders to learn about various water issues.

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## SECTION 5: WATER CONSERVATION PROGRAM

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### 5.1 Describe challenges

The Village of Ruidoso demographics are the greatest challenge that is perceived in the implementation of a water conservation plan. Specific characteristics of the Village of Ruidoso include a high vacancy rate that the Village experiences, seasonal tourist months, and seasonal residents that do not reside in the Village year round. These challenges will be met with a series of programs including hotels/motels distributing literature offering guests the option of not cleaning linens daily and also pamphlets distributed with water bills reinforcing the water conservation program goals and update results.

### 5.2 Program components

The following subsections are the water conservation program components.

#### 5.2.1 Program title

*Village of Ruidoso Water Conservation Plan.*

#### 5.2.2 Summary of program

The proposed water conservation plan includes measures that are in place such as the current water conservation ordinance. The current ordinance includes general conservation measures and a list of water saving devices and is described in more detail below in Section 5.4.

The program will also use the BMPs that have been identified based on the results of the water audit and the Village's water conservation goals. The following are the BMPs that will be implemented:

- Continue to test water production meters,
- Continue to replace all of the existing customer meters,
- Work with large residential and commercial water users to perform water audits to look for water savings,
- Implement an active water leak detection program,
- Develop outreach program with the Village school system,
- Develop a Village ordinance that prohibits waste of water with penalties.

#### 5.2.3 Targeted user

The targeted users for the water conservation program are the residents of the Village and commercial customers. In addition, the use of water conservation literature will be

important to educate the many tourists and seasonal residents that the Village has every year. Finally, the members of the Ruidoso Municipal School District will be an important sector to educate.

#### 5.2.4 Saturation of target user

The targeted user has been fully contacted through the use of a mailer that has been sent with every water bill notifying the customer of the Village's need to conserve water and through brochures and other literature that has been distributed to the local hotels to educate visitors to the Village.

#### 5.2.5 Implementation dates

Table 16: Village of Ruidoso implementation dates

Water Conservation Measures	2015	2016	2017	2018	2019	2020
Audit Village of Ruidoso Water System	√	√	√	√	√	√
Test Water Production Meters		√		√		√
Replace Existing Customer Water Meters	√	√				
Review New Water Rate Structure			√		√	
Conduct Water Audit with Large Consumers		√	√	√	√	√
Adopt Additional Water Ordinances		√				
Replace Water Distribution Lines	√	√	√	√	√	√

#### 5.2.6 Anticipated cost

Table 17: Village of Ruidoso anticipated cost

Water Conservation Measures	2015	2016	2017	2018	2019	2020
Audit Village of Ruidoso Water System	\$10K	\$10K	\$10K	\$10K	\$10K	\$10K
Test Water Production Meters		\$5K		\$5K		\$5K
Replace Existing Customer Water Meters	\$1.5M	\$1.5M				
Review New Water Rate Structure			\$25K		\$25K	
Conduct Water Audit with Large Consumers		\$2K	\$2K	\$2K	\$2K	\$2K
Adopt Additional Water Ordinances		\$4K				
Replace Water Distribution Lines*	\$1.0+M	\$1.0+M	\$1.0+M	\$1.0+M	\$1.0+M	\$1.0+M

\*Pending approval of GO Bond Program by the voters in Ruidoso.

5.2.7 Anticipated staffing

In addition to the current Village staff that participates regularly with the operations of the Village’s water department, the Village is currently seeking a Water Conservation and Water Rights Specialist. It is scheduled to be staffed by February 2016.

5.2.8 Funding source

The Village of Ruidoso has enacted a new inclining block rate water structure that was adopted to not only encourage conservation but also to generate additional revenue that the Village will use to invest in the existing water distribution system. In addition, the Village residents have previously approved a General Obligations Bond in the amount of \$1,500,000 per year. Elections for the next cycle of bonds are in March 2016 and held every two years. If future additional resources are needed the Village will submit grant applications to the State of New Mexico and to the federal government.

5.2.9 Anticipated results and how they align with goals

Table 18: Village of Ruidoso anticipated results and how they align with goals

Water Conservation Measures	Overall GPCD Reduction	Residential GPCD Reduction	Non-Revenue Water Reduction
Audit Village of Ruidoso Water System	√	√	√
Test Water Production Meters	√		
Replace Existing Customer Water Meters	√	√	√
Review New Water Rate Structure	√	√	
Conduct Water Audit with High Consumers	√	√	√
Adopt Additional Water Ordinances	√	√	√
Replace Water Distribution Lines	√		√

5.2.10 Why the program was chosen

The program of water conservation was chosen because water supply and demand have become a universal issue in the arid region of the southwestern United States. Years of drought have further strained the available resources for municipalities and water utilities. The Village is no exception and is preparing this report to help evaluate the need to upgrade and maintain the existing water system and also to create

conservation programs to ensure drinking water to its resident and commercial accounts in the future.

#### 5.2.11 Estimated lifetime impact of the program

Currently, the Village has non-revenue water that is costing the Village to produce potable water in excess of what is required. Once this non-revenue begins to be reduced the Village will have cost savings from water production and from the leasing of water rights. This is a simple explanation, but considering that the Village will continue to be a resort destination for the foreseeable future it is essential to replace the old distribution system. Some of the results discussed earlier that indicate over the last five year period that the overall system GPCD will be higher than the goal of 150 GPCD. The old distribution system will also continue to deteriorate and if no investment is implemented the system losses will continue to grow.

#### 5.2.12 How the program will be implemented

The conservation program will be implemented through a series of ordinances, education programs and replacement of the ageing water system.

#### 5.2.13 Annual reporting and updates

As described earlier in this report, the Village staff will continue to conduct annual audits with the AWWA audit software and NMOSE GPCD Calculator and deliver them to the NMOSE in the Village's annual report.

### 5.3 Describe process of prioritizing programs

The goal of any water conservation program is to reduce the amount of non-revenue water and the reduction in the overall authorized water consumption and as such this plan has focused on some initial tasks that will not only reduce the amount of non-revenue water but also influence the amount of water consumption. In order to get this plan started the Village decided to implement an inkling block rate water structure and to replace all of the old and inaccurate water meters within the Village.

The next step is to develop a true baseline of consumption and non-revenue water and track the progress that the Village is making. The next priority will be to audit the larges users of water for both the residential and commercial customers to determine if there are steps that these individuals could take to decrease their consumption to save them money and reduce the demand on the water system.

Other tasks that have been enacted are described in detail below with the current conservation measures in place and the proposed water conservation measures.



#### 5.4 Current and past water conservation programs

The Village of Ruidoso adopted ordinance 2014-1 that implemented the current water conservation measures summarized below, the complete ordinance is available in Appendix C:

*General Conservation Measures.* It is recommended that:

- Public, semi-public and governmental restrooms and shower facilities shall post not less than one water conservation sign in each restroom and shower facility,
- Hotels, motels and other lodgings shall provide a water conservation informational card or brochure in a visible location in each guest room.
- Retail plant nurseries shall provide their "end-use" customers with low water-use landscape literature and water efficient irrigation guidelines at the time of sale of any perennial plant.
- Landscape contractors, maintenance companies and architects shall provide their prospective clients with low water-use literature and water efficient irrigation guidelines at the time of presenting a service contract to the prospective client.
- Title companies and others closing real estate transactions shall provide the entity purchasing a home, business or property with indoor and outdoor conservation literature at the time of closing.
- The Village departments shall provide indoor and outdoor conservation literature to all persons applying for a building permit and all persons initiating new water service to the village utility customers.

*Water saving devices.* In any building project, residential, commercial or otherwise, for which a building permit is issued on or after the effective date of the ordinance from which this section derives, the commodes and shower heads shall meet the following specifications:

- Commodes either flush tank, flushometer tank or flushometer valve operated shall have an average consumption of not more than 1.6 gallons per flush;
- Shower heads shall be equipped with flow restrictors, or designed and manufactured to limit the flow in the shower head to 2.5 gallons per minute and shall be installed in strict accordance with manufacturer's instructions to maintain performance;
- Urinals shall have an average consumption of not more than 1.0 gallons of water per flush;
- Lavatory and kitchen faucets shall be equipped with aerators or be designed and manufactured to limit the flow of the faucet to 2.5

gallons per minute and shall be installed in strict accordance with manufacture's instruction to maintain performance;

- No building project for which a building permit is issued on or after the effective date of the ordinance from which this section derives shall receive final approval by the building inspector nor shall a certificate of occupancy for the building project be issued unless the water devices meet the requirements described above.
- Any existing structure within the village which has its water devices replaced on or after the effective date of the ordinance from which this section derives shall be required to make said replacements with water devices meeting the above described requirements, except where the above requirements may threaten health and safety standards;
- Any person installing water devices in violation of this subsection shall be subject to the penalties specified herein.

In addition to Ordinance 2014-1 the Village has also implemented the following conservation programs:

- Developed a conservation water rate analysis that led to the adoption of an inclining water rate structure to promote conservation,
- Invested in water utility infrastructure,
- Passed GO Bonds to invest in water infrastructure,
- Installed a liner for the Grindstone Dam to decrease leakage.

#### 5.4.1 Timeframes

The current water conservation measures are currently in effect.

#### 5.4.2 Results

Evaluating initial results of the current water conservation ordinance and adoption of a new water rate schedule consisted on focusing on the largest water users' reduction of consumption, frequency of water breaks in the distribution system and the associated non-revenue water, and the overall gallons consumption use per capita.

A result attributable to the adoption of the inclining water rate structure efficiency is found in the analysis of the top twenty residential water users. In 2011 the top twenty residential water users consumed 31,031,826 gallons for the year or approximately 10.8% of all the water consumed in the Village. The consumption in 2014 of the top twenty residential water users fell to 20,755,418 gallons for the year, equating to a reduction of 33%.

Reports from Village staff indicate that the number of emergency repairs to distribution pipeline the Village is experiencing is declining. This trend can also be seen in the amount of overtime the water department is paying to fix after-hours pipeline repair. Over the last two years a significant reduction in overtime paid is evident, which is a direct result of the investment made in water infrastructure improvements.

## 5.5 Proposed water conservation programs

The current water conservation programs enacted through Ordinance 2014-1 have had an impact on the Village's overall water use as demonstrated with the NMOSE GPCD Calculator showing a reduction in overall yearly GPCD. The proposed water conservation plans below will focus on the further reduction of water use over time through a combination of public education and outreach and the further investment in repairing the Village's water utility.

### 5.5.1 Administrative priorities

- Dedicate a budget for water conservation programming and staff in calendar year 2016,
  - This will assist in the Village reaching their water conservation goals and facilitate communication with elected officials and the public.
  - This position will also be responsible for water rights accounting which will have a direct impact of the use of the Village's water resources.

### 5.5.2 Supply side priorities

- Leak detection and repair program
  - A leak detection program has been proposed in conjunction with the ongoing system water model to identify areas of greatest impact to reduce non-revenue water due to underground water leaks. The Village of Ruidoso, in 2007, commenced a comprehensive leak detection program. This program included video inspection of major transmission lines and installation of monitoring devices (some of which remain active). Considerable work was undertaken in replacing lines that demonstrated leakage. Due to the 2008 flood, which tremendously damaged Village infrastructure and created health and safety issues, the leak detection program was suspended. Efforts are now underway to recommence this important program. Program is scheduled to commence in 2016.
- Water meter replacement program
  - The Village of Ruidoso has approved a meter replacement program which will replace all of the existing residential water meters in the Village. The benefit will be an increase in metering accuracies and a

reduction of non-reported low flow consumption. Completion of the project is scheduled for May 2016; extension of time is possible due to winter conditions.

### 5.5.3 Demand side priorities

- Toilet retrofit program
  - The biggest water user in the average household and hotels is the toilet. The Village has a wide variety of hotels, lodges and cabins that were built mostly in the 1970s and 1980s. These older structures likely still utilize the original plumbing which fixtures consumed an average of 5 to 7 gallons per flush. Replacing these fixtures with modern 1.6 gallon flush models will have an immediate impact on water consumption. The potential impact is estimated at nearly 12,000 gallons per person a year per household. Program will start in calendar year 2016.
- Xeriscape and Landscape Ordinance
  - Replacement of high water use grass/turf with xeriscape. Plan will use financial incentives for replacement of high water use turf with low water use plants. Projected incentive is \$0.60 per square foot of high water use turf deducted from the customer's water bill. Program targeted for calendar year 2017.
- Provide education materials to the tourism industry and also include an early education program in conjunction with the Ruidoso Municipal School District. Program is on-going.
- Audit large water users.
  - Commercial water users with over 50,000 gallons consumed a month will be identified and be offered a water audit.
  - Residential water users with over 15,000 gallons consumed a month will be identified and be offered a water audit.
  - Audits will start in 2016/2017.
- Rainwater harvesting and gray water use.
  - Promotion of rainwater harvesting and gray water will reduce the amount of outside water use. This could substantially reduce the use of water during the summer months, thus reducing the system demand during peak usage. Program will start in calendar year 2016.
- Use of efficient water-based appliances.
  - The Village is developing an incentive based approach to encourage the use of water efficient appliances within the home.
  - Targeted appliances include efficient clothes washer, efficient dish washers, and replacing evaporative cooling systems.
  - Program is scheduled for calendar year 2017.
- Develop new Village Ordinance that specifies water conservation measures in all renovation projects in addition to the current requirement for all new

subdivisions and housing. Ordinance will be presented to Council in calendar year 2016.

#### 5.5.4 How water conservation programs meet stated goals and objectives

The existing and proposed water conservation programs will help the Village to meet its goals and objectives by providing a systematic approach listed below:

- Reduction of non-revenue water by 15% by 2025,
- Reduce overall system GPCD to 150 GPCD by 2025,
- Reduce residential GPCD including outdoor residential use to 50 GPCD by 2025,
- Reduce the amount spent on producing potable water,

The first step for the Village is to replace all of the customer meters within the Village distribution system to determine a consumption baseline. This will allow the Village to determine where the most non-revenue water is being created and create programs to further accomplish the stated goals above.

Monitoring with the use of the AWWA water audit software and the NMOSE GPCD calculator will help the Village track the success of the proposed projects and also indicate where additional efforts would be of best benefit.

#### 5.5.5 Timeline of programs as related to objectives

Table 19: Village of Ruidoso timeline of programs as related to objectives

Water Conservation Measures	Start Date	Overall GPCD Reduction	Residential GPCD Reduction	Non-Revenue Water Reduction
Audit Village of Ruidoso Water System	2015	√	√	√
Test Water Production Meters	2016	√		
Replace Existing Customer Water Meters	2015	√	√	√
Review New Water Rate Structure	2017	√	√	
Conduct Water Audit with High Consumers	2016	√	√	√
Adopt Additional Water Ordinances	2016	√	√	√
Replace Water Distribution Lines	2014	√		√

#### 5.5.6 Anticipated/reported results for the entire water conservation plan

The estimated results for the entire water conservation plan are as follows:

- Reduction of non-revenue water by 15% by 2025,
  - This will lead to a decrease in consumption if projected annually by 9.845 million gallons of water a year.
- Reduce overall system GPCD to 150 GPCD by 2025,
- Reduce residential GPCD including outdoor residential use to 50 GPCD by 2025,
- Reduce the amount spent on producing potable water.

**Appendix A: AWWA Water Audit**

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# AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0  
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**Water Audit Report for:** Village of Redwood, NM (31161) (114)  
**Reporting Year:** 2014 - 2014 - 12/31/14

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

**All volumes to be entered as: MILLION GALLONS (US) PER YEAR**

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

### WATER SUPPLIED

Volume from own sources:  MG/Yr  
Water imported:  MG/Yr  
Water exported:  MG/Yr

### Master Meter and Supply Error Adjustments

Pcnt:  Value:  MG/Yr

**WATER SUPPLIED:**  MG/Yr

Enter negative % or value for under-registration  
Enter positive % or value for over-registration

### AUTHORIZED CONSUMPTION

Billed metered:  MG/Yr  
Billed unmetered:  MG/Yr  
Unbilled metered:  MG/Yr  
Unbilled unmetered:  MG/Yr

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

**AUTHORIZED CONSUMPTION:**  MG/Yr

Click here:  for help using option buttons below

Pcnt:  Value:  MG/Yr

Use buttons to select percentage of water supplied OR value

### WATER LOSSES (Water Supplied - Authorized Consumption)

MG/Yr

#### Apparent Losses

Unauthorized consumption:  MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:   MG/Yr  
Systematic data handling errors:  MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

**Apparent Losses:**  MG/Yr

Pcnt:  Value:  MG/Yr

### Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses:  MG/Yr

**WATER LOSSES:**  MG/Yr

### NON-REVENUE WATER

**NON-REVENUE WATER:**  MG/Yr

= Water Losses + Unbilled Metered + Unbilled

### SYSTEM DATA

Length of mains:   miles  
Number of active AND inactive service connections:    
Service connection density:  conn /mile main

Are customer meters typically located at the curbside or property line?

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure:  psi

(length of service line, beyond the property boundary, that is the responsibility of the utility)

### COST DATA

Total annual cost of operating water system:  \$/Year  
Customer retail unit cost (applied to Apparent Losses):  \$/1000 gallons (0.28)  
Variable production cost (applied to Real Losses):  \$/Million gallons  Use Customer Retail Unit Cost to value real losses

### WATER AUDIT DATA VALIDITY SCORE:

\*\*\* YOUR SCORE IS: 73 out of 100 \*\*\*

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

### PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

- 1: Volume from own sources
- 2: Variable production cost (applied to Real Losses)
- 3: Customer metering inaccuracies



Water Audit Report for:   
Reporting Year:  -

\*\*\* YOUR WATER AUDIT DATA VALIDITY SCORE IS: 73 out of 100 \*\*\*

**System Attributes:**

Apparent Losses:	39,416	MG/Yr
+ Real Losses:	282,016	MG/Yr
<b>Water Losses:</b>	<b>321,432</b>	<b>MG/Yr</b>
Unavoidable Annual Real Losses (UARL):	110.91	MG/Yr
Annual cost of Apparent Losses:	\$167,517	
Annual cost of Real Losses:	\$334,915	

Valued at **Variable Production Cost**  
Return to Reporting Worksheet to change this assumption

**Performance Indicators:**

Financial	Non-revenue water as percent by volume of Water Supplied:	53.2%
	Non-revenue water as percent by cost of operating system:	10.6%
Operational Efficiency:	Apparent Losses per service connection per day:	12.70 gallons/connection/day
	Real Losses per service connection per day:	N/A gallons/connection/day
	Real Losses per length of main per day*:	2,370.08 gallons/mile/day
	Real Losses per service connection per day per psi pressure:	N/A gallons/connection/day/psi
From Above, Real Losses = Current Annual Real Losses (CARL)		282.02 million gallons/year
Infrastructure Leakage Index (ILI) [CARL/UARL]		2.54

\* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline





**AWWA Free Water Audit Software:  
User Comments**

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Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used

General Comment:	
Audit Item	Comment
<u>Volume from own sources:</u>	100% of the production water is metered. There is no imported water. Leased water rights enter the system through POD's that the Village uses for diversion of surface water which is sent to the two treatment plants for processing and out for distribution. A score of 8 was selected due to 100% of production water is measured.
<u>Vol. from own sources: Master meter error adjustment:</u>	The Village is initiating a formal Process Meter Maintenance Program in calendar year 2016, which will include meter testing schedules of all production meters.
<u>Water imported:</u>	No water is imported
<u>Water imported: master meter error adjustment:</u>	NA
<u>Water exported:</u>	Water is not exported.
<u>Water exported: master meter error adjustment:</u>	NA
<u>Billed metered:</u>	100% of the Village's customers are metered on a volume base basis. The Village's on-going meter replacement project scheduled for completion by May and will include 100% of the Village's customers. The Village will maintain the new water meters with a independent water audit every three years.
<u>Billed unmetered:</u>	No billed unmetered water use.
<u>Unbilled metered:</u>	There is unbilled and metered usage including water leakage credit, water used for construction, flushing of main distribution lines, and use by the road department due to street cleaning activities.

Audit Item	Comment
Unbilled/unmetered	Unbilled unmetered water use consists of possible water theft, loss due to underground water leaks, known customer water meter errors, meter errors due to ultra low flow conditions, and leaks on the customer side of water meter
Unauthorized consumption	Unauthorized consumption is not allowed per Village statute. All cases of unauthorized consumption is investigated. The Village will continue this effort.
Customer metering inaccuracies	Customer metering inaccuracies are believed to be high due to old meters that do not accurately meter water. The estimation of 9.99% is believed to be conservative. In addition, current meters are suspected of not recording low flow and ultra low flow conditions that could occur due to water leaks from the toilet and faucets that are not repaired and from setting a drip to help prevent water lines from freezing. The under progress total system AMR replacement program is expected to significantly increase meter accuracy.
Systematic data handling errors	The Village has a published water rate structure. Computer based billing software is used and evaluated for inaccuracies. The new AMR meter read software will further reduce any data handling errors.
Length of mains	The Village maintains an ARCGIS system and is currently using GIS and GPS data to calibrate the water model. The Village has miles of main distribution line that needs replaced and has a current GO Bond program to replace aging water infrastructure.
Number of active AMR installed meter connections	There is a written policy that is in place that requires a specific procedure to activate and inactivate any water service.
Average length of customer service line	Water meters are being replaced at the property line. The Village will not maintain beyond the water meter
Average operating pressure	The Village uses an array of pressure reducing stations and booster stations to deal with the varying elevation changes within the Village limits. The pressure reducing stations settings are well documented and any stations in need of rehabilitation are scheduled.
Total annual cost of operating water infrastructure	Total annual cost of operation is reported annually in the Village Managers Report to Council. Annual cost of production is expected to continue to decline with the replacement of known areas of failing infrastructure and the installation of a completed AMR system that will reduce the amount of meter inaccuracy
Customer retail unit cost (needed to Assess Losses)	The Village has a newly adopted inclining block rate structure that allows for a self sustaining utility. The Village will revise this rate structure every three years to examine if rate structure is continuing to fund the utility and allow for reinvestment in the infrastructure.
Variable production cost (needed to Assess Losses)	The goal for the Village is to reduce the amount of non-revenue water that will have the effect of lowering production costs.

# AWWA Free Water Audit Software: Water Balance

WAS v5.0  
American Water Works Association

Water Audit Report for: Village of Ruidoso, NM (NIM3513114)

Reporting Year: 2014

1/2014 - 12/2014

Data Validity Score: 73

Water Exported		Billed Water Exported		Revenue Water	
0.000		Billed Metered Consumption (water exported is removed)		0.000	
Own Sources (Adjusted for known errors)	Authorized Consumption	Billed Authorized Consumption	Billed Unmetered Consumption	Revenue Water	
	341.505	310.136	310.136	310.136	
System Input	Water Supplied	Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-Revenue Water (NRW)	
		31.369	0.000	352.800	
	662.936	Apparent Losses	Unauthorized Consumption		
		39.416	8.287		
Water Imported	Water Losses	Customer Metering Inaccuracies	Customer Metering Inaccuracies		
		321.432	36.983		
	0.000	Systematic Data Handling Errors	Systematic Data Handling Errors		
			0.775		
	Real Losses	Leakage on Transmission and/or Distribution Mains			
	282.016	Not broken down			
		Leakage and Overflows at Utility's Storage Tanks			
		Not broken down			
		Leakage on Service Connections			
		Not broken down			



# AWWA Free Water Audit Software Dashboard

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Water Audit Report for: Village of Ruidoso, NM (NM1513114)

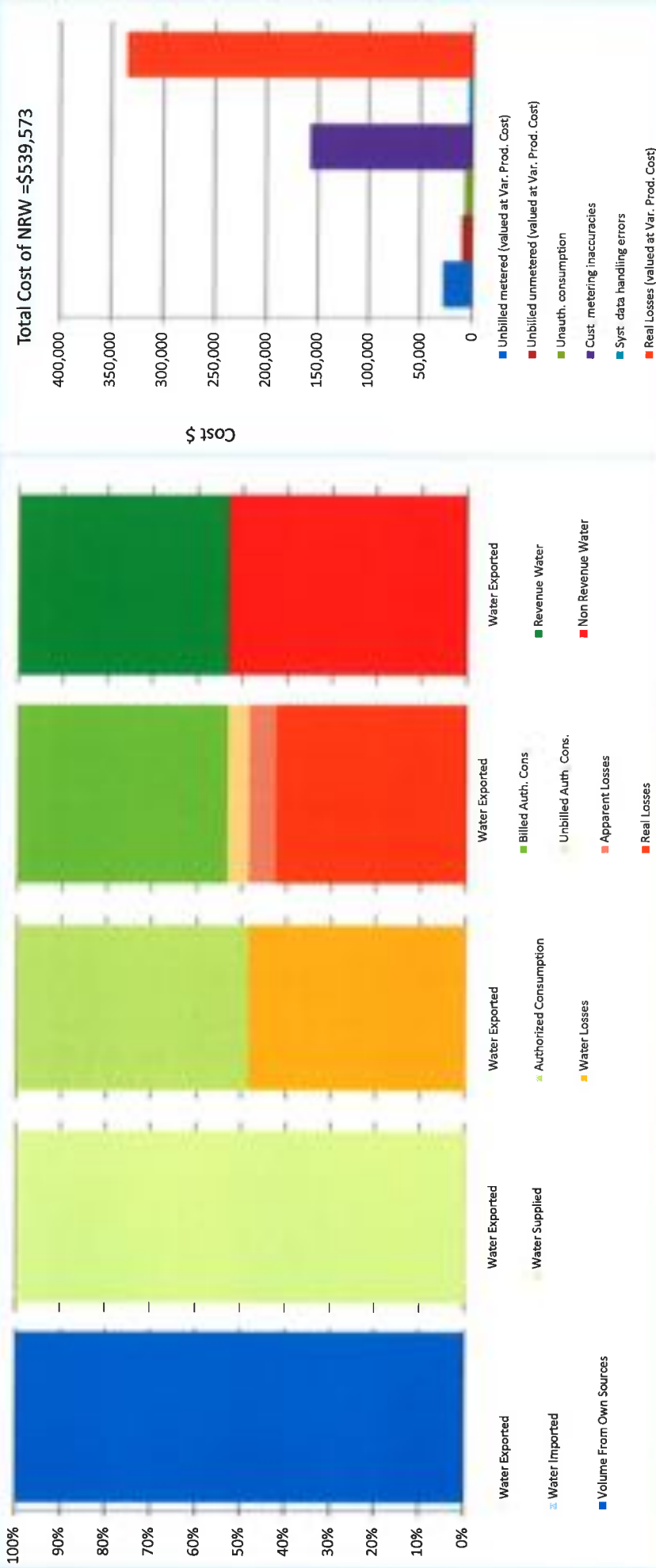
Reporting Year: 2014

1/2014 - 12/2014

Data Validity Score: 73

The graphic below is a visual representation of the Water Balance with bar heights proportional to the volume of the audit components

- Show me the VOLUME of Non-Revenue Water
- Show me the COST of Non-Revenue Water



Gradino >>>	The following are recommended in Audit										10
	1	2	3	4	5	6	7	8	9		
<p>Select this grading only if the water utility purchases/imported water resources (i.e. own)</p> <p><b>Volume from own</b></p>	<p>Less than 25% of water production sources are metered, remaining meter accuracy testing or electronic calibration conducted</p>	<p>25% - 50% of treated water production sources are metered; other meter accuracy testing or electronic calibration conducted</p>	<p>Conditions between 2 and 4</p>	<p>50% - 75% of treated water production sources are metered; Occasional meter accuracy testing or electronic calibration conducted</p>	<p>Conditions between 4 and 6</p>	<p>At least 75% of treated water production sources are metered; at least 90% of the source flow is defined accuracy testing and/or electronic calibration of all meter accuracy testing conducted annually. Less than 25% +/- 6% accuracy</p>	<p>Conditions between 6 and 8</p>	<p>100% of treated water production sources are metered; meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy</p>	<p>Conditions between 8 and 10</p>	<p>100% of treated water production testing and electronic related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology</p>	
<p>Improvements to attain high data grading for "Volume from own Sources" component</p>	<p><b>To qualify for 1:</b> Organize and launch efforts to from own sources</p>	<p><b>To qualify for 2:</b> Locate all water production sources in the field, launch meter accuracy testing for existing meters and begin to install meters on unmetered water production sources and replace any obsolete/defective meters</p>	<p><b>To qualify for 3:</b> Formalize annual meter accuracy testing for all sources and specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters</p>	<p><b>To qualify for 4:</b> Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tank/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary</p>	<p><b>To qualify for 5:</b> Hourly production meter data is logged automatically and reviewed on a weekly basis. Data is adjusted to correct gross error when meter/instrumentation malfunction is detected, and/or error is confirmed by meter accuracy testing changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis</p>	<p><b>To qualify for 6:</b> Conduct annual meter accuracy testing on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy</p>	<p><b>To qualify for 7:</b> Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology, pilot one or more replacements with innovative meters in attempt to further improve meter accuracy</p>	<p><b>To qualify for 8:</b> Continuous production meter data is logged automatically &amp; reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation malfunction. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis</p>	<p><b>To qualify for 9:</b> Standardize meter accuracy testing frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/improving metering technology</p>	<p><b>To qualify for 10:</b> Computerized system (SCADA or similar) automatically balances flows from all sources and storages; result are reviewed each business day. Rigorously accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters</p>	
<p>Improvements to attain high data grading for "Master meter and supply error adjustment"</p>	<p><b>To qualify for 1:</b> Develop a plan to restructure recording system to capture all flow data on a daily basis to detect errors. Obtain more reliable information about metering by conducting field inspections of meters and related instrumentation and obtaining manufacturer literature</p>	<p><b>To qualify for 2:</b> Install automatic datalogging equipment on production meters. Complete installation of level instrumentation on all tank/storage facilities and include tank level data in automatic calculation routine in a computerized system. Complete testing or spreadsheet to archive input volumes, tank/storage level, and import/export flows in order to determine the correct "Water Supplier" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps</p>	<p><b>To qualify for 3:</b> Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. "Water Supplier" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps</p>	<p><b>To qualify for 4:</b> Link all production and tank/storage facility elevation change data to a Supervisory Control &amp; Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters</p>	<p><b>To qualify for 5:</b> Link all production and tank/storage facility elevation change data to a Supervisory Control &amp; Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters</p>	<p><b>To qualify for 6:</b> Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage level variations are employed in calculating balanced "Water Supplier" component. Adjust production meter data for gross error and inaccuracy confirmed by testing</p>	<p><b>To qualify for 7:</b> Link all production and tank/storage facility elevation change data to a Supervisory Control &amp; Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters</p>	<p><b>To qualify for 8:</b> Link all production and tank/storage facility elevation change data to a Supervisory Control &amp; Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters</p>	<p><b>To qualify for 9:</b> Monitor meter innovations for development of more accurate and less expensive flow meters. Continue to perform outside of desired accuracy requirements level instruments to better record tank/storages with achieve the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-maintained</p>	<p><b>To qualify for 10:</b> 100% of imported water sources are metered; meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy</p>	
<p>Water imported</p>	<p>Less than 25% of imported water sources are metered, remaining meter accuracy testing</p>	<p>25% - 50% of imported water sources are metered; other source accuracy testing</p>	<p>Conditions between 2 and 4</p>	<p>50% - 75% of imported water sources are metered; Occasional meter accuracy testing conducted</p>	<p>Conditions between 4 and 6</p>	<p>At least 75% of imported water sources are metered; meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy</p>	<p>Conditions between 6 and 8</p>	<p>100% of imported water sources are metered; meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy</p>	<p>Conditions between 8 and 10</p>	<p>100% of imported water sources are metered; meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy</p>	

	1	2	3	4	6	7	8	9	10
<p>Improvements to attain high data grading for "Water Imported Volume" component</p> <p>(Note: usually the water supplier selling the water - the Exporter - is the utility being audited is responsible for maintaining the metering infrastructure. The importer should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.)</p>	<p>n/a</p>	<p>To qualify for 2: Review bulk water purchase agreements with partner supplier; confirm requirements for use and maintenance of accurate metering infrastructure; identify needs for new or replacement meters with goal to</p>	<p>To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters; begin to install meters on unmetered imported water interconnections and replace obsolete/defective meter</p>	<p>To qualify for 6: Formalize annual meter accuracy testing for all imported water meters; planning for both regular meter accuracy testing and calibration of the related instrumentation; Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters</p>	<p>To qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters; conduct calibration of related instrumentation at least annually. Repair or replace meters in attempt to improve meter accuracy</p>	<p>To qualify for 9: Conduct meter accuracy testing for all meters on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy</p>	<p>To qualify for 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 3% accuracy. Investigate new metering technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy</p>	<p>Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 3% accuracy. Investigate new metering technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy</p>	<p>Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 3% accuracy. Investigate new metering technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy</p>
<p>Water Imported meter and supply error adjustment</p>	<p>Select n/a if the imported water supply is unmetered, with imported on the billing invoices sent by the Exporter to the purchasing Utility</p>	<p>Inventories information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing</p>	<p>No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any controls to confirm data accuracy. Conditions between 2 and 4</p>	<p>Imported supply metered flow data is logged automatically &amp; reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment for error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility</p>	<p>Hourly imported supply metered data is logged automatically &amp; reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment for error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility</p>	<p>Continuous imported supply metered flow data is logged automatically &amp; reviewed each business day by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment for error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility at least once every five years</p>	<p>Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. Provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years</p>	<p>Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. Provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years</p>	<p>Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. Provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years</p>
<p>Improvements to attain high data grading for "Water Imported master meter and supply error adjustment" component</p>	<p>To qualify for 2: Develop plan for structure recordkeeping system to capture all flow data; set a procedure to review input errors</p>	<p>Install automatic datalogging equipment on imported supply meters. Set a procedure to review this data on monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary</p>	<p>Refine computerized data collection and archive to include hourly imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data</p>	<p>Ensure that all imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and updated of the contractual language in the written agreement between the selling and the purchasing Utility, at least every five years</p>	<p>Ensure that all imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and updated of the contractual language in the written agreement between the selling and the purchasing Utility, at least every five years</p>	<p>Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify metering technology that meets the deep communication lines with Exporters with clear and explicit language that meets the ongoing needs of all parties</p>	<p>Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify metering technology that meets the deep communication lines with Exporters with clear and explicit language that meets the ongoing needs of all parties</p>	<p>Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify metering technology that meets the deep communication lines with Exporters with clear and explicit language that meets the ongoing needs of all parties</p>	<p>Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify metering technology that meets the deep communication lines with Exporters with clear and explicit language that meets the ongoing needs of all parties</p>
<p>Water Exported:</p>	<p>Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)</p>	<p>Less than 25% of exported water sources are metered; remaining meter accuracy testing</p>	<p>25% - 50% of exported water sources are metered; other estimated. No regular meter accuracy testing</p>	<p>50% - 75% of exported water sources are metered; other source estimated. Occasional meter accuracy testing conducted</p>	<p>At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% +/- 6% accuracy</p>	<p>100% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 10% of meters are found outside of +/- 6% accuracy</p>	<p>100% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 10% of meters are found outside of +/- 6% accuracy</p>	<p>100% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 10% of meters are found outside of +/- 6% accuracy</p>	<p>100% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 10% of meters are found outside of +/- 6% accuracy</p>
<p>Improvements to attain high data grading for "Water Exported Volume" component:</p> <p>(Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering infrastructure measuring the Exported volume. The utility exporting adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.)</p>	<p>To qualify for 2: agreements with purchasing utilities; confirm requirements for use &amp; upkeep of accurate metering infrastructure; identify needs to install new, or replace obsolete/defective meter needed</p>	<p>Locate all imported water sources on maps and in the field; launch meter accuracy testing for existing meters; begin to install meters on unmetered exported water interconnections and replace obsolete/defective meter</p>	<p>Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters</p>	<p>Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters; conduct calibration of related instrumentation at least annually. Repair or replace meters in attempt to improve meter accuracy</p>	<p>Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new metering technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy</p>	<p>Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new metering technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy</p>	<p>Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new metering technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy</p>	<p>Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new metering technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy</p>	<p>Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new metering technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy</p>

Gradino >>>	1	2	3	4	5	6	7	8	9	10
Water exported master meter and supply error adjustment	Inventory information on exported meters and paper records of incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) are missing or written in vague language concerning meter management and testing	No automatic datalogging of exported supply volumes; daily records without any accountability	Exported metered flow data is logged automatically & reviewed at least on a monthly basis, with necessary corrective actions. Data is adjusted (exporting) the water when gross data errors are detected. A process to protect both the utility exporting the water and the purchasing utility. Written agreement exists and clearly state requirements and roles for meter accuracy testing and data management	Hourly exported supply metered data is logged automatically & reviewed at least on a weekly basis by the utility selling the water. Data is adjusted (exporting) the water when gross data errors are detected and corrected on a daily basis. A coherent data trail exists for the process to protect both the selling (exporting) utility and the purchasing utility	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Utility accountability controls ensure that all error/data gaps that occur in the archived flow data are reliably detected and corrected. A provisions for meter testing and data management are reviewed by the selling utility and purchasing utility at least once every five years	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Utility accountability controls ensure that all error/data gaps that occur in the archived flow data are reliably detected and corrected. A provisions for meter testing and data management are reviewed by the selling utility and purchasing utility at least once every five years	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Utility accountability controls ensure that all error/data gaps that occur in the archived flow data are reliably detected and corrected. A provisions for meter testing and data management are reviewed by the selling utility and purchasing utility at least once every five years	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Utility accountability controls ensure that all error/data gaps that occur in the archived flow data are reliably detected and corrected. A provisions for meter testing and data management are reviewed by the selling utility and purchasing utility at least once every five years	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Utility accountability controls ensure that all error/data gaps that occur in the archived flow data are reliably detected and corrected. A provisions for meter testing and data management are reviewed by the selling utility and purchasing utility at least once every five years	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Utility accountability controls ensure that all error/data gaps that occur in the archived flow data are reliably detected and corrected. A provisions for meter testing and data management are reviewed by the selling utility and purchasing utility at least once every five years
Water data grading for "Water supply error adjustment" component:	Select n/a only if the water utility fails to have meters on its exported supply interconnections	to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review input errors. Obtain more reliable information about existing meter by conducting field inspections of and obtaining manufacturer agreement between the utility selling (exporting) meter and the purchasing utility	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on monthly basis to detect gross anomalies and data gap accuracy testing and data management; revise the terms as necessary	to qualify for 5: Refine computerized data collection and archive to supply metered flow data that is at least on a weekly basis to detect specific data errors on a weekly basis	to qualify for 6: Conduct accountability checks to confirm that all exported metered flow data is accurate and the purchasing utility contractual language in the written agreements with the purchasing utilities; at least every five years	to qualify for 7: Conduct accountability checks to confirm that all exported metered flow data is accurate and the purchasing utility contractual language in the written agreements with the purchasing utilities; at least every five years	to qualify for 8: Conduct accountability checks to confirm that all exported metered flow data is accurate and the purchasing utility contractual language in the written agreements with the purchasing utilities; at least every five years	to qualify for 9: Conduct accountability checks to confirm that all exported metered flow data is accurate and the purchasing utility contractual language in the written agreements with the purchasing utilities; at least every five years	to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is accurate and the purchasing utility contractual language in the written agreements with the purchasing utilities; at least every five years	to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is accurate and the purchasing utility contractual language in the written agreements with the purchasing utilities; at least every five years

**AUTHORIZED CONSUMPTION**

Gradino >>>	1	2	3	4	5	6	7	8	9	10
Billed metered:	n/a (not applicable) Select n/a only if the entire customer population is not metered on a flat or fixed rate basis. In such a case, the population to be zero	Manual meter reading is conducted with less than 50% meter read success rate; remaining accounts; consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing	At least 75% of customers with volume-based billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reads; consumption for at least 50% meter read success rate; rate, consumption for others is estimated. Purchases failed reads is estimated. Good customer meter records exist, but limited meter accuracy testing is conducted for the oldest meters upon complete failure. Computerized billing records exist but only sporadic internal auditing conducted by utility personnel	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 90% accuracy. Purchases failed reads is estimated. Good customer meter records exist, but limited meter accuracy testing is conducted for the oldest meters upon complete failure. Computerized billing records exist but only sporadic internal auditing conducted by utility personnel	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 90% accuracy. Purchases failed reads is estimated. Good customer meter records exist, but limited meter accuracy testing is conducted for the oldest meters upon complete failure. Computerized billing records exist but only sporadic internal auditing conducted by utility personnel	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 90% accuracy. Purchases failed reads is estimated. Good customer meter records exist, but limited meter accuracy testing is conducted for the oldest meters upon complete failure. Computerized billing records exist but only sporadic internal auditing conducted by utility personnel	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 90% accuracy. Purchases failed reads is estimated. Good customer meter records exist, but limited meter accuracy testing is conducted for the oldest meters upon complete failure. Computerized billing records exist but only sporadic internal auditing conducted by utility personnel	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 90% accuracy. Purchases failed reads is estimated. Good customer meter records exist, but limited meter accuracy testing is conducted for the oldest meters upon complete failure. Computerized billing records exist but only sporadic internal auditing conducted by utility personnel	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 90% accuracy. Purchases failed reads is estimated. Good customer meter records exist, but limited meter accuracy testing is conducted for the oldest meters upon complete failure. Computerized billing records exist but only sporadic internal auditing conducted by utility personnel	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 90% accuracy. Purchases failed reads is estimated. Good customer meter records exist, but limited meter accuracy testing is conducted for the oldest meters upon complete failure. Computerized billing records exist but only sporadic internal auditing conducted by utility personnel
Improvements to attain high data grading for "Billed Metered Consumption" component:	the customer meter population is unmetered; consider establishing a new policy to meter the customer population and upon metered volumes	Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/condition of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system	Purchase and install meters on unmetered accounts. Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 85% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing auditing by utility personnel and conduct third party auditing at least once every three years	Purchase and install meters on unmetered accounts. Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 85% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing auditing by utility personnel and conduct third party auditing at least once every three years	Purchase and install meters on unmetered accounts. Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 85% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing auditing by utility personnel and conduct third party auditing at least once every three years	Purchase and install meters on unmetered accounts. Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 85% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing auditing by utility personnel and conduct third party auditing at least once every three years	Purchase and install meters on unmetered accounts. Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 85% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing auditing by utility personnel and conduct third party auditing at least once every three years	Purchase and install meters on unmetered accounts. Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 85% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing auditing by utility personnel and conduct third party auditing at least once every three years	Purchase and install meters on unmetered accounts. Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 85% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing auditing by utility personnel and conduct third party auditing at least once every three years	Purchase and install meters on unmetered accounts. Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 85% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing auditing by utility personnel and conduct third party auditing at least once every three years





Grading >>>	1	2	3	4	5	6	7	8	9	10
<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p> <p>Water utility policies require metering and volume based billing for all customer accounts. However, less than 20% of unbilled accounts exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent of consumption are obtained at these accounts via site specific estimation methods</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>	<p>Water utility policy doesn't require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from metering. Average future count multiplied by approach</p> <p>Water utility policy doesn't require metering and volume based billing in general. Exemptions and a lack of clearly written and communicated procedures exist in up to 20% of unbilled accounts being, or the water utility is in transition to becoming fully metered, and a large portion of accounts such as municipal buildings. As many as 15% of unbilled accounts are metered. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts</p>
<p>Improvements to attain high data grading for "Billed Unmetered Consumption" component.</p>	<p>to qualify for 2</p> <p>Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters over one, three, or seven day periods.</p>	<p>to qualify for 2</p> <p>Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters over one, three, or seven day periods.</p>	<p>to qualify for 3</p> <p>Implement a new water utility metering. Launch or expand pilot metering study to include several different meter types, which will provide options. Assess sites with access means to obtain water consumption volumes. Begin</p>	<p>to qualify for 4</p> <p>Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify erroneous unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce consumption estimates for the accounts awaiting meter installation.</p>	<p>to qualify for 5</p> <p>Refine metering policy and procedures to ensure that a sufficient number of meters are installed in areas with unmetered accounts. Implement process to estimate consumption for unmetered accounts awaiting meter installation.</p>	<p>to qualify for 6</p> <p>Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that a sufficient number of meters are installed in areas with unmetered accounts. Implement process to estimate consumption for unmetered accounts awaiting meter installation.</p>	<p>to qualify for 7</p> <p>Refine metering policy and procedures to ensure that a sufficient number of meters are installed in areas with unmetered accounts. Implement process to estimate consumption for unmetered accounts awaiting meter installation.</p>	<p>to qualify for 8</p> <p>Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Support the effort to investigate accounts with access difficulties, and develop means to install water meters or otherwise measure water consumption.</p>	<p>to qualify for 9</p> <p>Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Support the effort to investigate accounts with access difficulties, and develop means to install water meters or otherwise measure water consumption.</p>	<p>to maintain 10</p> <p>Continue to refine estimation method for unmetered consumption and explore means to establish metering for as many billed remaining unmetered accounts as is economically feasible.</p>
<p>Unbilled metered:</p>	<p>Billing practices exempt certain buildings, but only scattered, date written directives exist to justify the practice. A reliable count of unbilled unmetered accounts is unavailable. Meter upkeep and meter reading on these accounts rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption is guesstimated.</p>	<p>Billing practices exempt certain buildings, but only scattered, date written directives exist to justify the practice. A reliable count of unbilled unmetered accounts is unavailable. Meter upkeep and meter reading on these accounts rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption is guesstimated.</p>	<p>Billing practices exempt certain buildings, but only scattered, date written directives exist to justify the practice. A reliable count of unbilled unmetered accounts is unavailable. Meter upkeep and meter reading on these accounts rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption is guesstimated.</p>	<p>Dated written procedures permit billing exemptions for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is considered. Meter reading is sporadic where available, but the consumption is estimated.</p>	<p>Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is considered. Meter reading is sporadic where available, but the consumption is estimated.</p>	<p>Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is considered. Meter reading is sporadic where available, but the consumption is estimated.</p>	<p>Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for auditing of billing records. Ensures that accurate readings from accurate meters</p>	<p>Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for auditing of billing records. Ensures that accurate readings from accurate meters</p>	<p>Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for auditing of billing records. Ensures that accurate readings from accurate meters</p>	<p>Clearly written policy identifies the types of accounts given a billing exemption with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters</p>
<p>Improvements to attain high data grading for "Unbilled Metered Consumption" component.</p>	<p>to qualify for 2</p> <p>Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any account should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.</p>	<p>to qualify for 3</p> <p>Review historic written directives and policy document allowing certain accounts to be billed-exempt. Draft an outline of a new written policy for billing exemptions, identifying criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually</p>	<p>to qualify for 4</p> <p>Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the reading routes</p>	<p>to qualify for 5</p> <p>Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the reading routes</p>	<p>to qualify for 6</p> <p>Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter reading. Increase the number of unbilled metered accounts to the reading routes</p>	<p>to qualify for 7</p> <p>Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter reading. Increase the number of unbilled metered accounts to the reading routes</p>	<p>to qualify for 8</p> <p>Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed account. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process</p>	<p>to qualify for 9</p> <p>Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed account. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process</p>	<p>to maintain 10</p> <p>Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged is waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized</p>	





Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10	
Improvements to attain high data grading for "Customer meter inaccuracy volume" component:	the customer meter population is unmet new policy to meter the customer population and employ water rates based upon metered volumes	to qualify for 2 Cashier available meter records. Conduct testing on a group and budget for the metering staffing needs of the metering group and budget for necessary resources to better organize meter management	to qualify for 4 Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters	to qualify for 6 Standardize the procedures for meter recordkeeping with an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results	to qualify for 8 Expand annual accuracy testing to evaluate a statistically significant number of meters. Expand meter replacement program to replace a significant number of poor performing meters each year	to qualify for 9 Continuous efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughout	to qualify for 10 Increase the number of meters tested and replaced as justified by meter accuracy test data. Continuously monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering or water flow and management of customer consumption data	to qualify for 10 Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is reduced year-by-year	to qualify for 10 Stay abreast of customer management developments and integrate customer endpoint information is monitored and errors/lapses are at economic minimum	to qualify for 10 Sound written policy exists for managing water mains extensions. System management database agree and random field validation proves truth databases. Records of annual field validation should be available for review	to qualify for 10 Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.	
Systematic Data Handling Errors:	new amount of this error. Even in water utilities with unmet customer populations and fixed rate billing, errors occur in annual billing process. An unknown number of customers escape process oversight	Policy and procedures for activation of new customer accounts and oversight of billing records exist but maintained on paper records or databases. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess	Policy and procedures for new account activation and oversight of billing operations exist but need refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic confirm with approximate accuracy the consumption volumes lost to billing lapses	Policy and procedures for new account activation and oversight of billing operations include an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year	Policy and procedures for new account activation and oversight of billing operations include an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year	Policy and procedures for new account activation and oversight of billing operations include an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year	Policy and procedures for new account activation and oversight of billing operations include an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year	Policy and procedures for new account activation and oversight of billing operations include an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year	Policy and procedures for new account activation and oversight of billing operations include an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year	Policy and procedures for new account activation and oversight of billing operations include an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year	Policy and procedures for new account activation and oversight of billing operations include an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year	Policy and procedures for new account activation and oversight of billing operations include an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year
Improvements to attain high data grading for "Length of Water Mains" component:	for computerized accounts and billing records. Length of pipe (and therefore volume) is underestimated	Finalize written policy and procedures for activation of new billing accounts and overall billing operations system. Conduct internal audit of billing records as part of this process	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.	Refine new account activation and billing operations procedures and ensure consistency with the regarding billing, and minimize billings. Upgrade or replace needed functionality to ensure that billing adjustments corrupt the volume of billing process.
Length of mains:	Poorly assembled and accurate determination of pipe length. Length of pipe is underestimated	Paper records in poor or condition (no annual tracking of installations & abandonments) ensure that water mains installed by are accurately documented	Policy and management result in an uncertain tabulation length	Policy and management result in an uncertain tabulation length	Policy and management result in an uncertain tabulation length	Policy and management result in an uncertain tabulation length	Policy and management result in an uncertain tabulation length	Policy and management result in an uncertain tabulation length	Policy and management result in an uncertain tabulation length	Policy and management result in an uncertain tabulation length	Policy and management result in an uncertain tabulation length	Policy and management result in an uncertain tabulation length
Improvements to attain high data grading for "Length of Water Mains" component:	Assign personnel to inventory current as-built records and compare with customer billing system records and highway plan in order to verify poorly documented pipelines. Assemble policy documents regarding permitting building developers; identify gaps in procedures that result in poor installations	Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions	Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
service connections:		Vague permitting of new service connections policy and poor paper records, procedural gaps, are weak oversight result in suspect determination of the connections, which may vary 5-10% of actual count.	General permitting policy exists but paper records, procedural gaps, are weak oversight result in suspect determination of the connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedure periodically reviewed. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of abandonments; but count can be up to 5% in error from actual total.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Courts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well managed computerized information management system, Customer Billing System (GIS) information system, field checks and internal system audits are conducted. Courts of connections are no more than 1% of the entire population.
Improvements to attain Connections' component:	Note: The number of Service Connections does not include fire hydrant leads/lines to the water main	to qualify for 2	to qualify for 4	to qualify for 3	to qualify for 5	to qualify for 6	to qualify for 7	to qualify for 8	to qualify for 9	to qualify for 10	
Average length of service line:	Note: If customer water meters are located outside of the customer building next to the stop or boundary responsibility, then the answer is Yes, the grading description under the Grading of 10(a) will be followed.	to qualify for 2	to qualify for 4	to qualify for 3	to qualify for 5	to qualify for 6	to qualify for 7	to qualify for 8	to qualify for 9	to qualify for 10	
data grading for "Average Length of Customer Service Line" component:	Diagram worksheet for visual presentation of distance	to qualify for 2	to qualify for 4	to qualify for 3	to qualify for 5	to qualify for 6	to qualify for 7	to qualify for 8	to qualify for 9	to qualify for 10	
Average operating pressure:		to qualify for 2	to qualify for 4	to qualify for 3	to qualify for 5	to qualify for 6	to qualify for 7	to qualify for 8	to qualify for 9	to qualify for 10	

>>>	n/a								10
<p>Operating component</p>	<p>to qualify for 2</p> <p>Employ pressure gauging and datalogging equipment to obtain pressure</p> <p>topographical maps in order to confirm ground sheets to find pump</p>	<p>to qualify for 4</p> <p>Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure and flow data at different flow regimes, pressure controls (pressure reducing valves, partially open boundary valves) and plan to properly configure pressure zones. Make all data from these efforts available to generate average pressure</p>	<p>to qualify for 5</p> <p>Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure areas, include pump pressure and flow data to determine pressure zone or subdistrict. Correct any faulty valves, partially open boundary valves, ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate wide average pressure</p>	<p>to qualify for 6</p> <p>Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize</p>	<p>to qualify for 8</p> <p>Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data</p>	<p>to qualify for 9</p> <p>to qualify for 10</p> <p>Continue to refine the hydraulic model of the system and compare it with SCADA data for time pressure data calibration, and averaging</p>			

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Improvements to obtain high data grading for "Total Annual Cost of Operating the Water System" component:	Incomplete paper records and iso of financial accounting water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs	Electronic, industry-standard accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel, and at least once every three years by third-party CPA	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel, and at least once every three years by third-party CPA	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel, and at least once every three years by third-party CPA	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel, and at least once every three years by third-party CPA	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel, and at least once every three years by third-party CPA	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel, and at least once every three years by third-party CPA	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel, and at least once every three years by third-party CPA	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel, and at least once every three years by third-party CPA
Improvements to obtain high data grading for "Customer Retail Unit Cost" component (applied to Apparent Losses):	poorly documented and implemented, resulting in classes of charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified	Establish process for periodic internal audits of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs	Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	Standardize the process to conduct a third-party financial audit by a CPA on an annual basis
Improvements to obtain high data grading for "Customer Retail Unit Cost" component:	to qualify for 2: Gather available records, institute new procedures to regularly collect audit basic cost data of most important operations functions	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities	to qualify for 6: Establish process for periodic internal audits of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs	to qualify for 8: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	to qualify for 8: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	to qualify for 8: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	to qualify for 8: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	to qualify for 8: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	to qualify for 8: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	to qualify for 8: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis	to qualify for 8: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis
Variable production cost (applied to Real Losses):	Note: If the water utility purchases/import its equipment, enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders	to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure	to qualify for 6: Launch effort to full meter the customer population and institute charge rates based upon water volumes	to qualify for 6: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure	to qualify for 6: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure	to qualify for 6: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure	to qualify for 6: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure	to qualify for 6: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure	to qualify for 6: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure	to qualify for 6: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure
Improvements to obtain high data grading for "Production Cost" component:	to qualify for 2: Gather available records, institute new procedures to regularly collect important operations functions	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities	to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residual management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost	to qualify for 6: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residual management, etc.). Arrange to conduct audits by a knowledgeable third-party at least once every three years	to qualify for 6: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residual management, etc.). Arrange to conduct audits by a knowledgeable third-party at least once every three years	to qualify for 6: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residual management, etc.). Arrange to conduct audits by a knowledgeable third-party at least once every three years	to qualify for 6: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residual management, etc.). Arrange to conduct audits by a knowledgeable third-party at least once every three years	to qualify for 6: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residual management, etc.). Arrange to conduct audits by a knowledgeable third-party at least once every three years	to qualify for 6: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residual management, etc.). Arrange to conduct audits by a knowledgeable third-party at least once every three years	to qualify for 6: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residual management, etc.). Arrange to conduct audits by a knowledgeable third-party at least once every three years	to qualify for 6: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residual management, etc.). Arrange to conduct audits by a knowledgeable third-party at least once every three years

# AWWA Free Water Audit Software:

## Determining Water Loss Status

Water Audit Report for:

Reporting Year: 2014

Data Validity Score: 73

Village of Pueblo, NM (Audit 3116)

WAS v5.0

American Water Works Association  
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### Water Loss Control Planning Guide

		Water Audit Data Validity Level / Score			
Functional Focus Area	Level I (0-25)	Level II (26-50)	Level III (51-70)	Level IV (71-90)	Level IV (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

*For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.*

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities in gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

**Note:** this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

### General Guidelines for Setting a Target ILI (without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0			If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.



**Appendix B: NMOSE GPCD Calculator**

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# NMOSE GPCD CALCULATOR

Gallons per Capita - v2.04 Beta

Release Date: Mar, 16, 2009

This spreadsheet-based GPCD calculator is designed to help quantify and track water uses associated with water distribution systems. The spreadsheet contains several separate sheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons on the left below. Descriptions of each sheet are also given below.

**It should be noted that all the recorded data should be from actual metered results and should not include any estimates.**

THE FOLLOWING KEY APPLIES  
THROUGHOUT:



Value to be entered by user  
Dropdown box, pick from list  
Value calculated based on input data  
No longer available for input

Look for the following boxes that provide additional information

Additional Information

Please begin by providing the following information, then proceed through each sheet:

NAME OF CITY OR UTILITY:

REPORTING YEARS: Enter the most recent reporting year:  Data can be entered back to:

NAME OF CONTACT PERSON:  E-MAIL:  TELEPHONE:  Ext.

SELECT THE REPORTING UNITS FOR VOLUME DATA:  Gallons per Capita - v2.04 Beta

- Introduction & Overview
- General Data
- Single-Family
- Multi-Family
- Other Data
- Reuse
- Total Diverted
- Reported Data
- Annual Performance
- Monthly Performance
- Terms

This sheet
Census data and the portal to get the data from the Census website
Single-Family residential gallons and population
Multi-Family residential gallons and population
Other data including Commercial, Industrial and Institutional [1.3] and Other metered [1.4] categories
Data related to water reuse projects
Total Production and Diverted Water
The calculated data graphical review of most common performance indicators
The calculated data graphical review of annual performance indicators
The calculated data graphical review of monthly performance indicators
Use this sheet to understand terms used in the audit process

**All parties reserve the right to validate the data recorded in this document. This does not bind the OSE or the Utility to the results. It is a tool used for planning purposes.**

If you have questions or comments regarding the software please contact us at [rdelavega@tt-zollars.com](mailto:rdelavega@tt-zollars.com)

## Census Information Data Table 2.1

[Click here to access the census Web site](#)

OR

[Click here for instructions on how to find the data on the Census website](#)

2014 TO 2008

Use the most recent census data

[Return to Instructions](#)

### DATA

US Census Table	Description	CENSUS YEAR	INPUT
P37	Group Quarters Population	Total	0
H3	Occupancy Status	Total	8,593
from H3		Occupied	3,650
from H3		Vacant	4,943
H12	Ave. Household Size of Occupied Housing Units	Total	1.8

Formula: Household Size = Total Population / Total Number of Housing Units

Vacancy Rate % **57.5%**

### COMMENTS

This information is based on the 2010 US Census Data

**3. SINGLE-FAMILY RESIDENTIAL (SFR)**

**MONTHLY DATA**

2014      TO      2014

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	22,361,358	15,052,174	15,273,158	19,123,335	26,671,547	21,287,812	23,126,850	21,899,062	18,379,700	19,194,595	14,447,223	15,302,700
2012	18,986,861	13,767,828	17,956,890	19,123,335	26,671,547	21,287,812	23,126,850	21,899,062	18,379,700	19,194,595	14,447,223	15,302,700
2011	22,014,740	18,654,194	30,157,719	23,393,168	19,072,931	23,044,469	34,732,430	25,818,454	20,068	15,844,939	16,612,368	16,513,404
2010	21,371,027	16,757,549	14,664,362	15,051,853	17,305,563	22,175,825	25,270,094	24,005,825	20,212,875	31,303,221	13,733,656	20,427,106
2009	15,389,425	17,231,157	14,309,268	14,492,055	17,077,363	20,339,814	20,000	24,824,117	20,058,496	20,716,630	14,638,982	13,890,345
2008	4,458	4,416	4,284	4,392	4,460	4,817	4,941	5,186	5,197	5,597	5,000	4,777
2007	4,164	4,231	4,076	4,216	4,147	4,707	4,701	4,940	4,764	4,631	4,859	4,574

You have chosen to enter Active Connections Only, enter the monthly values below.

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	5,161	4,790	4,802	4,775	5,202	5,422	5,673	5,719	5,385	5,318	5,0	5,113
2012	5,187	4,785	4,951	4,802	5,230	5,688	5,833	5,485	5,415	5,438	5,011	4,834
2011	5,093	4,811	5,219	5,155	5,261	5,966	5,702	5,438	5,251	5,104	5,251	5,104
2010	4,901	4,600	4,589	4,735	4,742	5,806	5,748	5,914	5,816	5,174	5,000	5,243
2009	4,458	4,416	4,284	4,392	4,460	4,817	4,941	5,186	5,197	5,597	5,000	4,777
2008	4,164	4,231	4,076	4,216	4,147	4,707	4,701	4,940	4,764	4,631	4,859	4,574

You have entered Active Connections Only in Table 3.2; leave the cells below blank

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014												
2012												
2011												
2010												
2009												
2008												

Formula = (No. of Connections - No. of Zero Use Accounts) \* Ave. Household Size

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	8,926	8,822	8,644	9,279	9,364	9,760	10,211	10,294	9,657	9,747	9,140	9,203
2013	9,290	8,577	8,912	9,279	9,414	9,931	10,238	10,489	9,873	9,790	8,726	8,701
2012	9,337	8,660	9,495	9,279	9,472	9,470	10,739	10,346	10,264	10,469	9,452	9,437
2011	9,167	8,280	8,260	8,523	8,687	9,646	10,451	10,172	10,075	10,469	9,313	9,437
2010	7,485	7,949	7,711	7,906	6,228	6,151	8,894	9,335	9,355	8,958	9,000	8,741
2009	7,485	7,616	7,337	7,589	7,465	7,589	8,482	8,892	8,575	8,336	8,741	8,237
2008	7,485	7,616	7,337	7,589	7,465	7,589	8,482	8,892	8,575	8,336	8,741	8,237

Formula = Billed Water Consumption (SFR only) / Calculated Population (SFR only)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	68.26	68.87	68.20	68.87	68.50	68.59	73.06	64.06	56.22	54.01	55.05	51.29
2012	68.26	68.87	68.20	68.87	68.50	68.59	73.06	64.06	56.22	54.01	55.05	51.29
2011	77.65	62.68	55.28	68.70	70.05	90.89	81.07	77.55	62.05	63.53	62.21	57.98
2010	65.60	56.78	61.66	68.70	70.83	63	107.21	74.85	65.18	79.77	96.46	69.82
2009	78.15	72.28	57.27	61.10	65.40	80.77	85.05	83.53	67.05	60.68	54.22	59.26
2008	61.91	77.42	54.84	62.52	66.08	78.19	72.54	85.08	71.47	60.68	69.81	59.90
2007	60.69	83.78	54.84	62.52	66.08	78.19	72.54	85.08	71.47	60.68	69.81	59.90

**ANNUAL DATA**

Year	ANNUAL CONSUMPTION
2014	
2012	
2011	
2010	
2009	
2008	

Year	ANNUAL POPULATION
2014	
2012	
2011	
2010	
2009	
2008	

Year	AVG ANNUAL CONNECTIONS
2014	
2012	
2011	
2010	
2009	
2008	

Year	CALCULATED GROWTH RATE
2014	-1.71%
2012	2.20%
2011	
2010	
2009	
2008	

Year	SIZE OF HOUSEHOLD
2014	1.8
2012	1.8
2011	1.8
2010	1.8
2009	1.8
2008	1.8

Year	SFR POPULATION
2014	9,332
2012	9,379
2011	9,543
2010	9,800
2009	9,081
2008	8,158

Year	ANNUAL SFR GDP
2014	
2012	
2011	
2010	
2009	
2008	



DATA INPUT SHEET

Instructions

4. MULTI-FAMILY RESIDENTIAL (MFR)

Return to Instructions

MONTHLY DATA

TABLE 4.1

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014												
2013												
2012												
2011												
2010												
2009												
2008												

TABLE 4.3

If only Current Number of Units is Known, put this number in Table 4.7

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014												
2013												
2011												
2010												
2008												

TABLE 4.3

Formula = (Number of Units - Vacant MFR Connections) \* Ave. Household Size

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2013	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2012	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2011	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2010	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2009	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2008	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data

TABLE 4.4

Formula = MFR Billed Water Consumption (Monthly) / MFR Population (Monthly)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2013	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2012	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2011	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2010	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2009	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2008	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data

ANNUAL DATA

TABLE 4.5

ANNUAL CONSUMPTION

Year	Consumption
2014	0
2013	0
2012	0
2011	0
2010	0
2009	0
2008	0

TABLE 4.6

ANNUAL CALCULATION

Year	Calculation
2014	N/A
2013	N/A
2012	N/A
2011	N/A
2010	N/A
2009	N/A
2008	N/A

TABLE 4.7

No. Current Units

Year	Units
2014	0
2013	0
2012	0
2011	0
2010	0
2009	0
2008	0

TABLE 4.8

ANNUAL CALCULATION

Year	Calculation
2014	N/A
2013	N/A
2012	N/A
2011	N/A
2010	N/A
2009	N/A
2008	N/A

TABLE 4.9

MFR POPULATION

Year	Population
2014	N/A
2013	N/A
2012	N/A
2011	N/A
2010	N/A
2009	N/A
2008	N/A

TABLE 4.10

VACANT MFR CONNECTIONS

Year	Connections
2014	N/A
2013	N/A
2012	N/A
2011	N/A
2010	N/A
2009	N/A
2008	N/A

TABLE 4.11

ANNUAL MFR GPCD

Year	GPCD
2014	N/A
2013	N/A
2012	N/A
2011	N/A
2010	N/A
2009	N/A
2008	N/A



DATA INPUT SHEET

Village of Ruidoso

### 5. INDUSTRIAL, COMMERCIAL & INSTITUTIONAL (ICI) AND OTHER METERED

### MONTHLY DATA

2014 TO 2008

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	10,846	12,139,571	12,139,571	12,139,571	12,139,571	12,139,571	12,139,571	12,139,571	12,139,571	12,139,571	12,139,571	12,139,571
2013	7,120	7,556,770	7,556,770	7,556,770	7,556,770	7,556,770	7,556,770	7,556,770	7,556,770	7,556,770	7,556,770	7,556,770
2012	7,562,871	9,547,150	9,547,150	9,547,150	9,547,150	9,547,150	9,547,150	9,547,150	9,547,150	9,547,150	9,547,150	9,547,150
2011	6,726,954	9,298,766	9,298,766	9,298,766	9,298,766	9,298,766	9,298,766	9,298,766	9,298,766	9,298,766	9,298,766	9,298,766
2010	11,147,860	11,147,860	11,147,860	11,147,860	11,147,860	11,147,860	11,147,860	11,147,860	11,147,860	11,147,860	11,147,860	11,147,860
2008	8,953,184	8,953,184	8,953,184	8,953,184	8,953,184	8,953,184	8,953,184	8,953,184	8,953,184	8,953,184	8,953,184	8,953,184

### ANNUAL DATA

Table 5.1	Table 5.4	Table 5.6	Table 5.7
ICI ANNUAL CONSUMPTION	ICI GPCD	OTHER ANNUAL CONSUMPTION	OTHER METERED GPCD
	28.60		N/A
	30.39		N/A
	34.91		N/A
	32.39		N/A
	32.66		N/A



**6. REUSE**

**MONTHLY DATA**

2014 TO 2008

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2013												
2012												
2011												
2010												
2009												
2008												

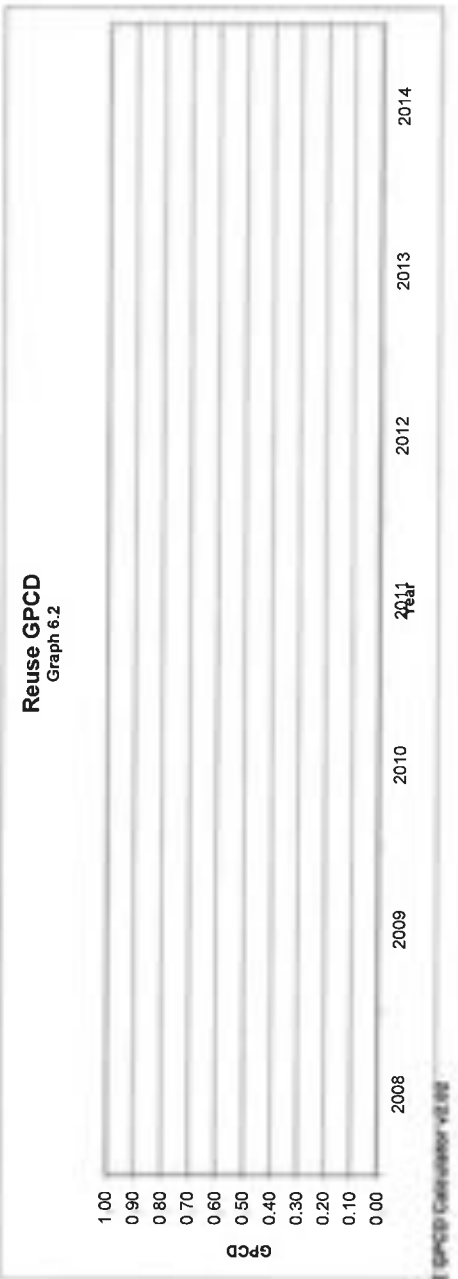
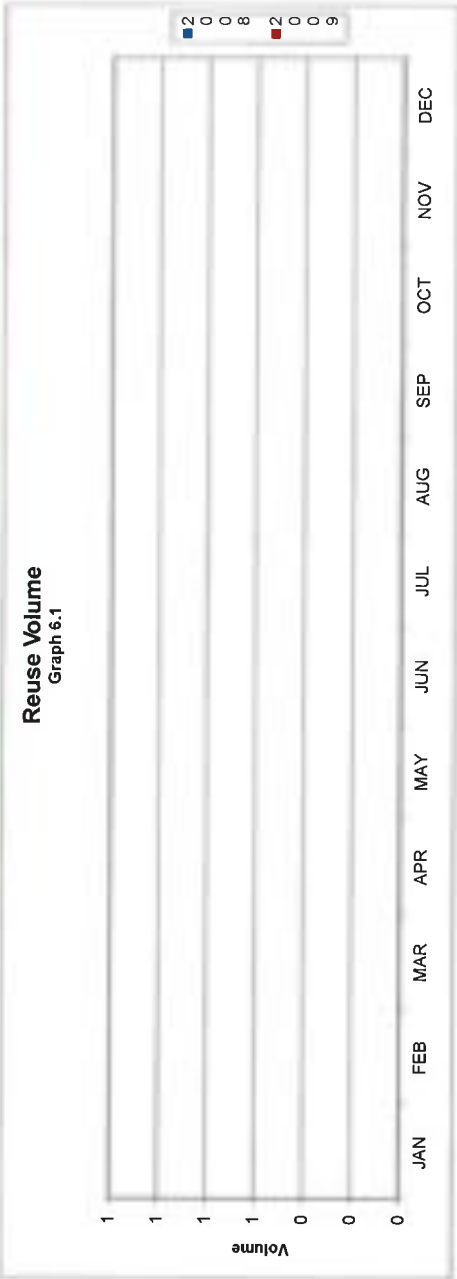
**ANNUAL DATA**

TABLE 6.2

REUSE ANNUAL DIVERSIONS
0
0
0
0
0
0

TABLE 6.1

REUSE GPCD
N/A
N/A
N/A
N/A
N/A
N/A



DATA INPUT SHEET

Village of Ruidoso

### 7. TOTAL WATER DIVERTED AND SUPPLIED

Return to Instructions

### MONTHLY DATA

TABLE 7.1

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	198	199	200	201	202	203	204	205	206	207	208	209
2013	199	200	201	202	203	204	205	206	207	208	209	210
2012	200	201	202	203	204	205	206	207	208	209	210	211
2011	201	202	203	204	205	206	207	208	209	210	211	212
2010	202	203	204	205	206	207	208	209	210	211	212	213
2009	203	204	205	206	207	208	209	210	211	212	213	214
2008	204	205	206	207	208	209	210	211	212	213	214	215

TABLE 7.2

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	198	199	200	201	202	203	204	205	206	207	208	209
2013	199	200	201	202	203	204	205	206	207	208	209	210
2012	200	201	202	203	204	205	206	207	208	209	210	211
2011	201	202	203	204	205	206	207	208	209	210	211	212
2010	202	203	204	205	206	207	208	209	210	211	212	213
2009	203	204	205	206	207	208	209	210	211	212	213	214
2008	204	205	206	207	208	209	210	211	212	213	214	215

TABLE 7.3

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	198	199	200	201	202	203	204	205	206	207	208	209
2013	199	200	201	202	203	204	205	206	207	208	209	210
2012	200	201	202	203	204	205	206	207	208	209	210	211
2011	201	202	203	204	205	206	207	208	209	210	211	212
2010	202	203	204	205	206	207	208	209	210	211	212	213
2009	203	204	205	206	207	208	209	210	211	212	213	214
2008	204	205	206	207	208	209	210	211	212	213	214	215

TABLE 7.4

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	198	199	200	201	202	203	204	205	206	207	208	209
2013	199	200	201	202	203	204	205	206	207	208	209	210
2012	200	201	202	203	204	205	206	207	208	209	210	211
2011	201	202	203	204	205	206	207	208	209	210	211	212
2010	202	203	204	205	206	207	208	209	210	211	212	213
2009	203	204	205	206	207	208	209	210	211	212	213	214
2008	204	205	206	207	208	209	210	211	212	213	214	215

Formula = Total Water Diverted + Imported water - Exported Water

TABLE 7.5

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	198	199	200	201	202	203	204	205	206	207	208	209
2013	199	200	201	202	203	204	205	206	207	208	209	210
2012	200	201	202	203	204	205	206	207	208	209	210	211
2011	201	202	203	204	205	206	207	208	209	210	211	212
2010	202	203	204	205	206	207	208	209	210	211	212	213
2009	203	204	205	206	207	208	209	210	211	212	213	214
2008	204	205	206	207	208	209	210	211	212	213	214	215

### ANNUAL DATA

TABLE 7.6

ANNUAL TOTAL DIVERTED
656,307,000
573,947,000
654,749,000
700,454,000
665,523,000
636,757,000
655,750,000

TABLE 7.7

ANNUAL TOTAL DIVERTED CALC
656,307,000
573,947,000
654,749,000
700,454,000
665,523,000
636,757,000
655,750,000

TABLE 7.8

ANNUAL TOTAL IMPORTED
0
0
0
0
0
0
0

TABLE 7.9

ANNUAL TOTAL EXPORTED CALC
0
0
0
0
0
0
0

TABLE 7.10

ANNUAL TOTAL EXPORTED
0
0
0
0
0
0
0

TABLE 7.11

ANNUAL TOTAL EXPORTED CALC
0
0
0
0
0
0
0

TABLE 7.12

ANNUAL TOTAL EXPORTED CALC
0
0
0
0
0
0
0

TABLE 7.13

TOTAL POP EST	
2013	192,67
2011	167,65
2009	187,88
2008	195,82
2007	200,79
2006	209,25
2005	220,22

TABLE 7.14

Year	SYSTEM TOTAL GPCD
2013	192,67
2011	167,65
2009	187,88
2008	195,82
2007	200,79
2006	209,25
2005	220,22





# 8. GPCD REPORTED DATA

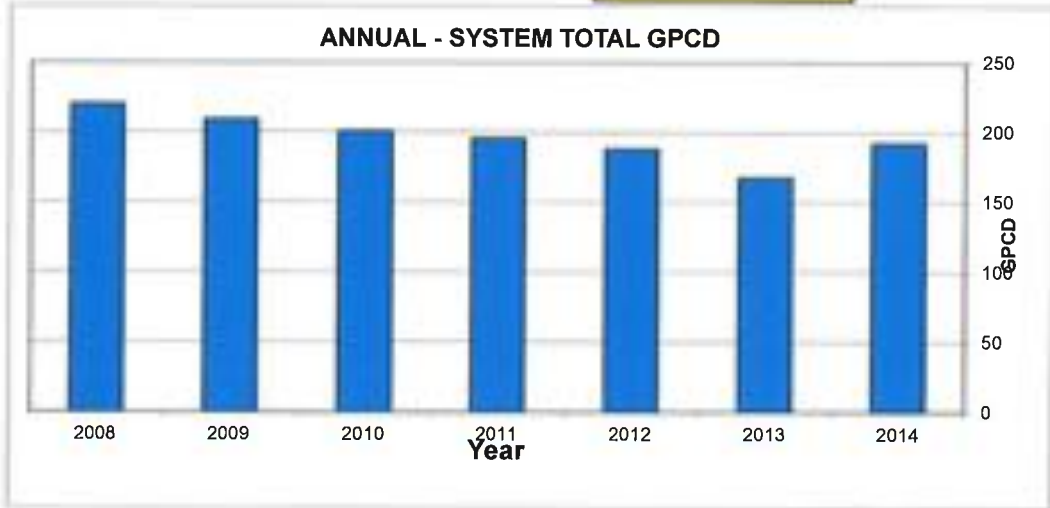
Village of Ruidoso

[Return to Instructions](#)

## ANNUAL

2014 To: 2008

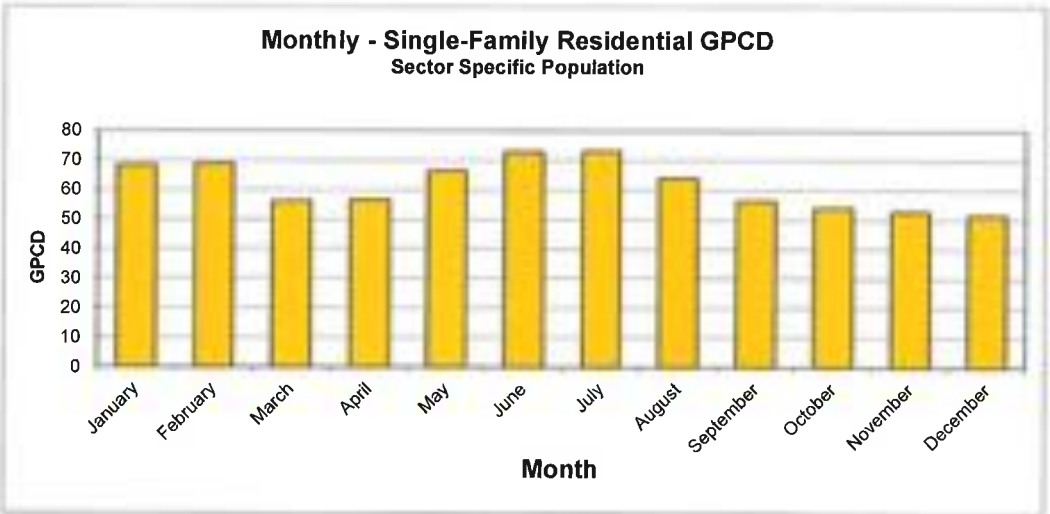
Year	SYSTEM GPCD
2014	192.67
2013	167.65
2012	187.98
2011	198.33
2010	200.79
2009	209.25
2008	220.22



## MONTHLY

### Monthly - Single-Family Residential GPCD Sector Specific Population

Month	SFR GPCD
January	68.26
February	68.87
March	56.25
April	56.56
May	66.50
June	72.81
July	73.96
August	64.06
September	56.22
October	54.01
November	52.69
December	51.29

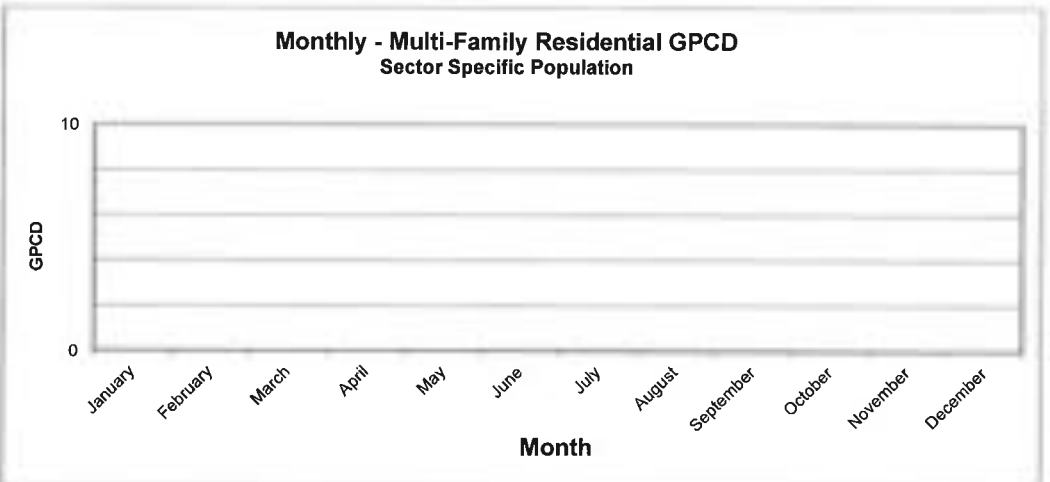


Year: 2014

Peak/Ave: 1.18

### Monthly - Multi-Family Residential GPCD Sector Specific Population

Month	MFR GPCD
January	No Data
February	No Data
March	No Data
April	No Data
May	No Data
June	No Data
July	No Data
August	No Data
September	No Data
October	No Data
November	No Data
December	No Data



Peak/Ave: #DIV/0!

YEAR: 2014

### 9. Annual Reporting Performance

Return to Instructions

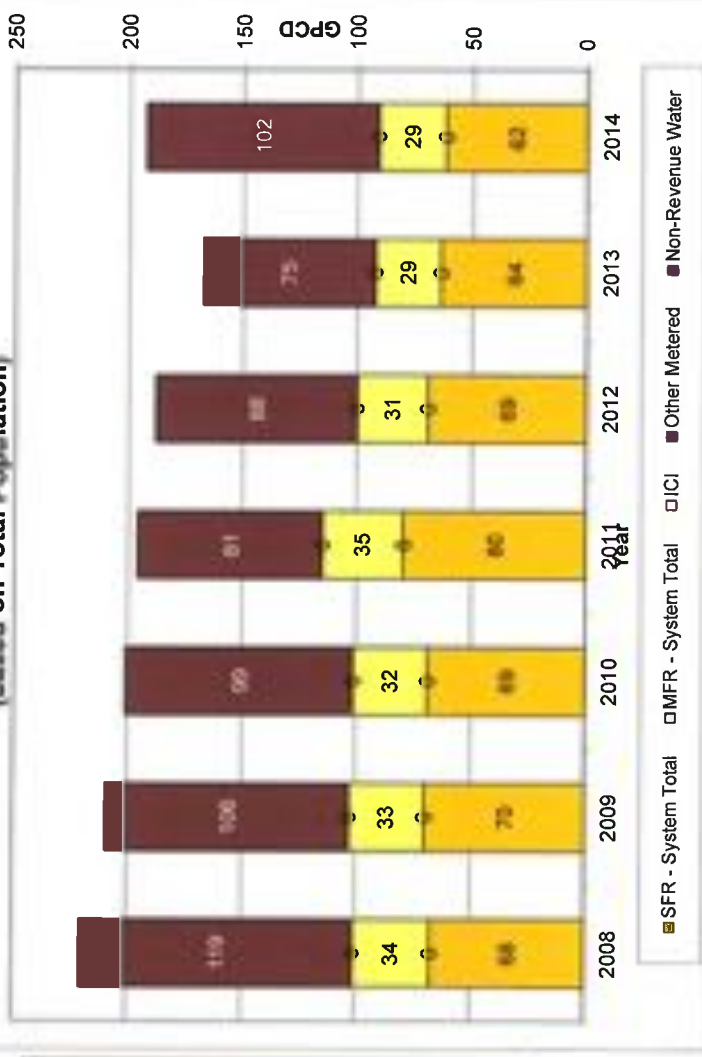
#### Overall Annual GPCD (based on Total Population)

Year	SFR - System Total	MFR - System Total	ICI	Other Metered	Non-Revenue Water	Total Supplied	Non-Revenue Volume Million Gallons (US)
2008	68	70	0	34	100	119	346.17
2009	69	32	0	33	100	102	257.89
2010	80	32	0	32	100	102	306.19
2011	80	35	0	31	100	102	289.58
2012	84	29	0	29	72	102	329.75
2013	84	29	0	29	102	102	323.56
2014	83	29	0	29	102	102	354.52

Village of Ruidoso  
 2014 to 2008

#### Annual Analysis of GPCD - Viewer

(based on Total Population)



10. Monthly Reporting Performance

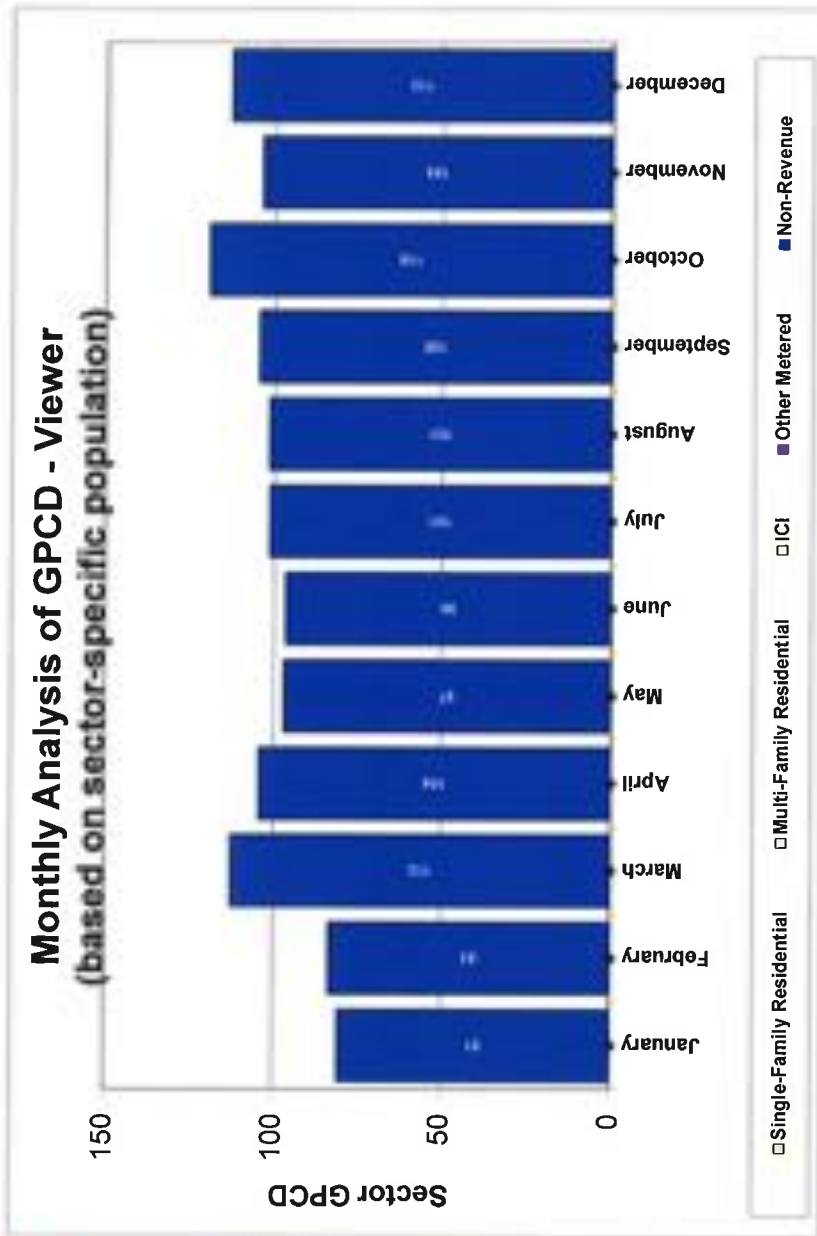
Choose Year for Monthly Analysis

Choose Sector

Monthly GPCD

Month	Single-Family Residential		Multi-Family Residential		ICI		Other Metered		Non-Revenue	
	GPCD	GPCD	GPCD	GPCD	GPCD	GPCD	GPCD	GPCD	GPCD	GPCD
FEB	72.81	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06
MAR	72.81	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06
APR	72.81	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06
MAY	72.81	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06
JUN	72.81	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06
JUL	72.81	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06
AUG	72.81	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06
NOV	72.81	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06
DEC	72.81	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06	73.06

Village of Ruidoso 2014 to 2008



## Appendix C: Conservation Ordinance and Building Code

### Conservation Ordinance

#### • Sec. 86-32. - Water resource management.

The Village of Ruidoso Water Resource Management procedures will be classified into five phases based upon a variety of conditions or triggers, defined at the end of this section. The phases of resource management and the measures to be taken are based upon reservoir levels, well pumping capacities, and the level of treated water in storage in the two, 5,000,000-gallon tanks on Alto Crest and the 3,000,000-gallon tank at Grindstone Reservoir. Snow pack conditions and water rights accounting will also be considered during drought conditions to determine the appropriate phase of water resource management. In emergency situations such as forest fires and mechanical system failure, the governing body and village management may impose any restriction on the use of water to protect public health, safety and welfare or to preserve the public water supply.

- (a)
  - Applicability.* The provisions of the section do not apply to the individual re-use of gray water or captured rain water.
  - (1) All customers of metered water sold and supplied by the village.
  - (2) Any domestic well existing upon the date of the adoption of the ordinance from which this section derives, located within the exterior boundaries of the village shall be exempt from this section, to the extent such well is used as authorized by NMSA 1978, § 3-53-1 et seq. Said user shall identify the property upon which the well sits by signs placed prominently on said property, with signs to be provided by the village water department. Failure to display said sign shall subject the user to all provisions contained in this section.
- (b)
  - General.*
    - (1) The village shall determine the village's water resource management phase based on surface water storage, well production, equipment failure or any other condition that may affect the delivery of water.
    - (2) Public notice of changes in water conservation phase shall be provided to the public at all times.
    - (3) The wasting of water is prohibited. No person, firm, corporation, county, state, federal or municipal facility or operation shall cause or permit to occur any water waste. In general the occurrence of unforeseeable or unpreventable failure or malfunction of plumbing and irrigation system hardware shall not be deemed sufficient grounds for issuance of a citation or other enforcement proceedings unless and until the village issues a formal written notice. For unforeseeable or unpreventable outdoor violations, the village shall generally issue a formal warning notice prior to taking enforcement action. Prior to taking formal enforcement action the village may instruct the water user not to operate the faulty system until it is appropriately repaired. If operating the system is integral to the operation of the facility the village may at its own discretion provide a period of time in which to remedy the violation prior to commencing formal enforcement action. Once a warning notice or an official citation has been issued for an outdoor occurrence, subsequent water waste events shall be subject to strict enforcement. Strict enforcement may include the issuance of citations and other such

activities as the village code enforcement deems necessary to bring the water user into compliance. For indoor water waste events and for those water waste events outdoors caused by a faulty system which is integral to the operation of the facility, the waste must be abated within 15 calendar days of the issuance of a warning notice or initiation of enforcement action. Enforcement action shall be taken if the waste continues beyond the 15-day period and citation shall be retroactive to include the 15 days of non-compliance. The following practices are considered water wasting and shall be punished as provided in this section:

- a. Using treated water for any purpose such that it flows, sprays or is otherwise excessively discharged upon any street, ditch, drain or another property;
- b. Failing to repair leaks in excess of 0.25 gallons a minute in an indoor or outdoor system which delivers water within five working days of the discovery of same;
- c. Watering when wind conditions are such that water being sprinkled blows off the property.

(4)

Wasting of water does not include:

- a. Flow resulting from firefighting or other routine inspection of fire hydrants or other training activities;
- b. Water applied to abate spills of flammable or otherwise hazardous materials;
- c. Water applied to prevent health, safety or accident hazards when alternate methods are not available;
- d. Water that reaches or flows onto adjacent property or public or private right-of-way when caused by vandalism, wind, emergencies or acts of God;
- e. Flow resulting from a routine inspection or maintenance of a water utility system;
- f. Water used by the Village of Ruidoso in the installation, maintenance, repair or replacement of public facilities and structures such as traffic control devices, storm and sanitary sewer structures and road or street improvements;
- g. Water used by contractors or utilities including but not limited to sawcutting of pavement, compaction or other use required under terms of their contract;
- h. Any water that is discharged as a result of well development or a pumping test.

(c)

*Phase 1: Normal conditions.* No outdoor watering between the hours of 10:00 a.m. and 6:00 p.m.

Customers shall be allowed to wash their vehicles and to water lawns, landscaping, etc., depending upon their street addresses as follows: odd numbered addresses water on odd numbered calendar days and even numbered addresses water on even calendar days. Customers are encouraged to limit said watering to a maximum of two hours per day per area.

Both even and odd addresses may hand water or drip irrigate their vegetable gardens and fruit trees, ornamental plants, flowers and tree wells any day of the week. These customers are encouraged to hand water or drip irrigate a maximum of one hour per day per section to be watered or irrigated.

Vegetable gardens and fruit trees, ornamental plants, flowers and tree wells may be watered by the use of hand held buckets or sprinkler cans that have been filled from hose bibs or interior faucets every day of the week.

Watering the soccer fields pursuant to the lease between the Village of Ruidoso and the Ruidoso Municipal School District is permitted in this phase.

Watering Eagle Creek, North Park, Gavilan Canyon, and White Mountain Fields is permitted in this phase.

Drip irrigation will be permitted in this phase.

(d)

*Phase 2: Moderate conditions.* No outdoor watering between the hours of 10:00 a.m. and 6:00 p.m.

Customers shall be allowed to wash their vehicles and to water lawns, landscaping, etc. two days per week with sprinklers as follows:

(1)

Even addresses—Tuesday and Saturday.

(2)

Odd addresses—Wednesday and Sunday.

(3)

Customers are encouraged to limit their watering to two hours daily, per area to be watered.

Both even and odd addresses may hand water or drip irrigate vegetable gardens and fruit trees, ornamental plants, flowers and tree wells any day of the week. Customers using this provision are encouraged to water not more than one hour, per day, per area to be watered.

Vegetable gardens and fruit trees, ornamental plants, flowers and tree wells may be watered by the use of hand held buckets or sprinkler cans that have been filled from hose bibs or interior faucets every day of the week.

Watering the soccer fields pursuant to the lease between the Village of Ruidoso and the Ruidoso Municipal School District is permitted in this phase.

Watering Eagle Creek, North Park, Gavilan Canyon, and White Mountain Fields is permitted in this phase.

Drip irrigation will be permitted in this phase.

(e)

*Phase 3: Serious conditions.* No outdoor watering between the hours of 10:00 a.m. and 6:00 p.m.

Customers shall be allowed to wash their vehicles and to water lawns, landscaping, etc. one day per week with sprinklers as follows:

(1)

Even addresses on Tuesday.

(2)

Odd addresses on Wednesday.

(3)

Customers are encouraged to limit their water to two hours daily, per area to be watered.

Both even and odd addresses may hand water or drip irrigate vegetable gardens and fruit trees, ornamental plants, flowers and tree wells any day of the week. Customers using this provision are encouraged to water not more than one hour, per day, per area to be watered.

Vegetable gardens and fruit trees, ornamental plants, flowers and tree wells may be watered by the use of hand held buckets or sprinkler cans that have been filled from hose bibs or interior faucets every day of the week.

Watering the soccer fields pursuant to the lease between the Village of Ruidoso and the Ruidoso Municipal School District is permitted in this phase.

Watering Eagle Creek, North Park, Gavilan Canyon, and White Mountain Fields is permitted in this phase.

Drip irrigation will be permitted in this phase.

(f)

*Phase 4: Severe conditions.* No outdoor watering between the hours of 10:00 a.m. and 6:00 p.m.

Outdoor watering with sprinkler systems is prohibited, except for watering vegetable gardens and fruit trees.

Residential washing of vehicles and outdoor watering two days per week, by hand-held hose or drip irrigation shall be allowed as follows:

(1)

Even addresses—Tuesday and Saturday.

(2)

Odd addresses—Wednesday and Sunday.

Vegetable gardens and fruit trees, ornamental plants, flowers and tree wells may be watered by the use of hand held buckets or sprinkler cans that have been filled from hose bibs or interior faucets every day of the week.

Watering the soccer fields pursuant to the lease between the Village of Ruidoso and the Ruidoso Municipal School District is permitted in this phase.

Limited watering Eagle Creek, North Park, Gavilan Canyon, and White Mountain Fields is permitted in this phase.

Drip irrigation will be permitted in this phase.

(g)

*Phase 5: Extreme conditions/declaration of emergency situation by council.*

(1)

The use of sprinkler systems, drip irrigation, and garden hoses is prohibited.

(2)

Vegetable gardens and fruit trees, ornamental plants, flowers and tree wells may be watered by the use of hand held buckets or sprinkler cans that have been filled from hose bibs or interior faucets every day of the week.

(3)

Limited watering the soccer fields pursuant to the lease between the Village of Ruidoso and the Ruidoso Municipal School District is permitted in this phase.

(4)

Limited watering Eagle Creek, North Park, Gavilan Canyon, and White Mountain Fields is permitted in this phase.

(h)

*Triggers for water resource phases.*

Phase 1 Normal:	Year around <i>during</i> normal conditions
Phase 2 Moderate:	3 of 4 conditions below: Alto Lake below fire hydrant Eagle Creek & Wells under 1,500 gpm 5 Million tanks below 46' for a 24-hour period Grindstone Lake 16' below spillway 3 Million tank at Grindstone below 30'
Phase 3 Serious:	2 of 4 conditions below: Alto Lake 3' below fire hydrant Eagle Creek & Wells under 1,200 gpm 5 Million tanks below 46' for a 24-hour period Grindstone Lake 16' below spillway 3 Million tank at Grindstone below 30'
Phase 4 Severe:	2 of 4 conditions below: Alto Lake 10' below fire hydrant Eagle Creek & Wells under 900 gpm 5 Million tanks below 46' for a 24-hour period Grindstone Lake 20' below spillway 3 Million tank at Grindstone below 30'
Phase 5 Extreme:	Declaration of emergency situation by council

(i)

*Miscellaneous.* It is recommended that:

- (1) Eating establishments provide water to their patrons only upon request.
- (2) Shut off nozzles be used on hoses for hand watering.
- (3) Public, semi-public and governmental restrooms and shower facilities shall post not less than one water conservation sign in each restroom and shower facility, the size of which shall not be less than eight and one-half inches by 11 inches. Such entities may use a sign provided by the Village of Ruidoso or develop their own sign using text provided by Village of Ruidoso.
- (4) Hotels, motels and other lodgings shall provide a water conservation informational card or brochure in a visible location in each guest room. Such literature may be available from the Village of Ruidoso upon request.
- (5) Retail plant nurseries shall provide their "end-use" customers with low water-use landscape literature and water efficient irrigation guidelines at the time of sale of any perennial plant. An "end-use customer" is the person or persons who will ultimately own the plant material. A landscape contractor or architect is not an end-use customer. In order to facilitate the purchasing of low water-use plants, nurseries are strongly encouraged to tag or sign their plants that require little or no supplemental water once established. For the sale of all turf or grass seed or sod, the customer shall be given village provided literature indicating the restrictions to planting water consumptive turf. Such literature may be available from the Village of Ruidoso upon request.



- (6) Landscape contractors, maintenance companies and architects shall provide their prospective clients with low water-use literature and water efficient irrigation guidelines at the time of presenting a service contract to the prospective client. Landscape professionals are strongly encouraged to educate their customers regarding the operation of their timed irrigation systems. Such literature may be available from the Village of Ruidoso upon request.
- (7) Title companies and others closing real estate transactions shall provide the entity purchasing a home, business or property with indoor and outdoor conservation literature at the time of closing. Such literature may be available from the Village of Ruidoso upon request.
- (8) The village departments shall provide indoor and outdoor conservation literature to all persons applying for a building permit and all persons initiating new water service to the village utility customers.
- (9) Future water conservation savings measures will be considered to be implemented in the future, including but not limited to, low flow toilets, water saving faucets, water saving appliances, hot water recirculating systems, gray water usage, gray water harvesting, xeriscaping, drip irrigation system and captured rain water. The village will develop an incentive program to be approved by the governing body within six months of adoption of this article. The incentive program may begin with low-flow toilets.
- (j) *Assessment of fees.* Any responsible party who violates the provisions of this section shall be subject to citation. Each day of a violation shall be considered a separate violation. The penalty schedule for violations of this article are as follows:
  - (1) *First violation*—\$50.00.
  - (2) *Second violation*—\$100.00.
  - (3) *Third violation*—\$200.00.
  - (4) *Fourth and additional violations*—\$500.00.
- (k) *Enforcement officers.* Authority to enforce this section shall be assigned to, but is not limited to the Village of Ruidoso Directors, utilities department, the village code enforcement officers, forestry employees, building inspectors, the village police department and the village fire department may enforce any and all of the village water conservation regulations. To the extent that the Village of Ruidoso Council may find it desirable to vest specific enforcement authority in other village personnel or other governmental agency, those individuals so vested shall also have the authority and responsibility to enforce regulations adopted by the Village of Ruidoso Water Conservation.
- (l) *Penalties.* Any person who violates the provisions of this article shall be prosecuted in a court of competent jurisdiction and penalized to the maximum extent allowed by law.
- (m) *Severability.* The provisions of this article shall be severable. If, any provision of this Ordinance is ruled to be invalid by a court of competent jurisdiction:

(1) The effect of such judgment shall be limited to the specific provision or provisions that are expressly stated in the judgment to be invalid; and

(2) Such judgment shall not affect, impair or nullify the validity of application of the remainder of this article that shall continue in full force and effect.

(Code 1985, § 4-1-13; Ord. No. 96-09, 6-21-96; Ord. No. 97-03, 3-25-97; Ord. No. 99-04, 3-30-99; Ord. No. 2000-06, 4-25-00; Ord. No. 2004-08, 5-11-04; Ord. No. 2004-13, 7-13-04; Ord. No. 2004-16, 11-9-04; Ord. No. 2008-07, 7-29-08; Ord. No. 2009-09, 4-28-09; [Ord. No. 2014-01](#), 2-11-14)

**Editor's note**—[Ord. No. 2014-01](#), adopted Feb. 11, 2014, changed the title of [§ 22-32](#) from "Water conservation" to read as herein set out.

### **Building Ordinance**

- **Sec. 22-31. - Building, electrical, plumbing and mechanical codes adopted; amendments.**

(a) There is hereby adopted by the village for the purpose of prescribing regulations governing the erection, construction, enlargement, alteration, repair, moving, removal, conversion, demolition, occupancy, equipment, use, height, area and maintenance of buildings or structures, and providing for the issuance of permits and collection of fees there for, and providing penalties for the violation thereof, the New Mexico Residential Building Code (NMRBC); the New Mexico Commercial Building Code (NMCBC); the New Mexico Electrical Code (NMEC); the New Mexico Electrical Safety Code (NMESC); the New Mexico Plumbing Code (NMPC); the New Mexico Swimming Pool, Spa and Hot Tub Code (NMSSHC); and the New Mexico Mechanical Code (NMMC), as approved and promulgated by the state construction industries commission, including all amendments thereto and all future editions thereof, of which codes not less than one copy has been and now is filed in the office of the planning department. In addition, the village also incorporates the standards set forth in current edition of the International Energy Conservation Code (IECC). Such codes are hereby adopted and incorporated as fully as if set out at length in this chapter, except as to the section of the code relating to building permit fees, which fees shall be in accordance with [section 22-34](#). The NMRBC, the NMCBC, the NMEC, the NMESC, the NMPC, the NMSSHC, the IECC, the NMMC and the building permit fees established by this chapter shall be in force from the date on which this article shall take effect, and the provisions thereof shall be controlling within the limits of the village and the extraterritorial planning and platting jurisdiction of the village as they currently exist or may be modified in the future as provided by law.

(b) The codes adopted by subsection (a) of this section are amended as follows:

(1) Nonrated roof coverings and special purpose roofs, other than mineral aggregate surface built-up roofs, are prohibited. An existing wood shake or wood shingle roof shall be replaced with a roof in compliance with this provision if the cost of repair exceeds \$500.00 or if the area repaired exceeds 20 percent of the area of the roof.

(2)

Water conservation local amendments.

a.

Intent and scope. This section sets forth water conservation requirements for new one- and two-family dwellings and townhouses.

b.

Compliance. Permit applications for new one- and two-family dwellings and townhouses shall include a completed water conservation measures form certifying that at least two of the three alternative approaches listed below will be incorporated into the design and construction of the new dwelling unit.

1.

Alternative number 1. Install a hot water recirculating system with a pump, a timer, and/or a thermostat. Copper water lines, if used in the system, shall be insulated in accordance with the New Mexico Energy Conservation Code.

2.

Alternative number 2. Install any combination of two of the following items:

i.

An Energy Star rated dishwasher.

ii.

An Energy Star rated clothes washing machine.

iii.

A dual flush toilet that uses a maximum of 1.1 gallons of water per flush of liquid waste and a maximum of 1.6 gallons of water per flush of solid waste.

3.

Alternative number 3. Install a cooling system that does not rely on the evaporation of water to produce cooled air.

c.

Inspection. A village-approved copy of the water conservation measures form shall be permanently posted at the water heater by the time of the final inspection.

(3)

Gas piping.

a.

All low pressure gas piping shall be tested with a minimum of 5 psi.

b.

All medium and high pressure gas piping shall be tested with a minimum of 60 psi.

(4)

Water piping. All water piping located under any slab shall be sleeved for its entire length. The sleeve shall extend to a point not less than 30 inches past the structure. Where the sleeve terminates within the structure it shall penetrate the slab. Sleeves shall be installed in basically straight runs and be sized where there is clearance

around the pipe sufficient to allow easy installation and removal of the pipe. Sleeve material shall be approved in advance of installation by the village inspector.

(5)

Room heaters. Unvented fuel-burning room or water heaters shall not be installed in any building, whether new or as a replacement. Unvented fuel-burning room or water heaters shall not be used, maintained or permitted to exist in a Group I or R occupancy.

(Code 1985, § 8-1-1; Ord. No. 2007-04, 4-24-07; Ord. No. 2009-10, 6-9-09; Ord. No. 2010-10, 9-14-10)

**Appendix D: Water System Projects**

Completed Water System Expenditures:



PRIORITY #1 - Adopted by the Ruidoso Village Council- WATER

<b>VILLAGE OF RUIDOSO 2013-2015 WATER PROJECTS</b>			
<b>PROJECTS</b>	<b>APPROXIMATE DATE OF COMPLETION</b>	<b>AMOUNT</b>	<b>STATUS</b>
NORTH FORK WELL FIELD REHAD	5/22/2013	\$122,668.83	Complete
FENCING PLANT # 4	11/30/2013	\$45,101	Complete
FENCING TANKS & 3 WELL HOUSES	11/30/2013	\$16,891	Complete
HVAC PLANT # 3	11/30/2013	\$7,820	Complete
REHAB N FORK WELL # 4	11/30/2013	\$40,137	Complete
PLANT # 3 ROOF REPAIR	1/31/2014	\$55,670	Complete
FENCING 6 TANK SITES	1/30/2014	\$15,379	Complete
EAGLE CREEK BYPASS	2/1/2014	\$1,365,241	Complete
HOLLYWOOD WELL	1/15/2014	\$6,651	Complete
REFURBISH PUMP HOUSES	On going	\$23,159	On going
FENCING A-1 WELL HOUSE	3/21/2014	\$4,575	Complete
FENCING PUMP BACK STATION	4/16/2014	\$7,541	Complete
FENCING UPPER CYN DIVERSION	5/29/2014	\$5,644	Complete
FENCING VARIOUS REPAIRS	5/27/2014	\$3,354	Complete
HOLLYWOOD WELL CONVERSION	5/14/2014	\$27,629	Complete
CHEROKEE WELL SOFT START PANEL	5/28/2014	\$7,701	Complete
SERVICE LINE @ PLANT 4	8/6/2014	\$7,226	Complete
MEDIA REMOVAL FILTER 2 PLANT 4	8/14/2014	\$3,090	Complete
ALTO DECANT CLEANOUT	8/20/2014	\$4,323	Complete
COUNTRY CLUB CONTROL REPAIR	9/4/2014	\$2,092	Complete
REPAR FLOW LOGGERS PANEL	8/27/2014	\$350	Complete
ALTO PUMP REPAIR	9/4/2014	\$1,137	Complete
EAGLE CREEK 14' LINE CLEANOUT	9/4/2014	\$14,399	Complete
GRINDSTONE 1 & 3 TANK	9/4/2014	\$4,998	Complete
BOOSTER PUMPS FOR PUMPHOUSE	9/5/14 & 3/25/15	\$7,259	Complete
EQUIPMENT CALIBRATION	9/25/2014	\$3,786	Complete

HOLLYWOOD WELL FENCE	9/30/2014	\$4,022	Complete
COUNTRY CLUB FENCE	9/30/2014	\$3,459	Complete
BALL PARK FENCE	9/30/2014	\$3,896	Complete
FENCE GATES PLANT 4	10/11/2014	\$1,596	Complete
EAGLECREEK RELIEF & RAW LINE	11/21/2014	\$848	Complete
HELLHOLE CONTROLLER	12/17/2014	\$1,488	Complete
A-1 WELL REPAIRS	In Progress	\$42,822	In Progress
MAG METER INSTALL	1/7/2015	\$1,130	Complete
CHEROKEE WELL INSTALL & REPAIRS	1/15/2015	\$36,239	Complete
HOLLYWOOD WELL HEAD REPAIR	1/13/2015	\$175	Complete
TANK REPIARS GRINDSTONE & LIL D	2/12/2015	\$6,699	Complete
OUTLET METER PROJECT #4	2/13/2015	\$1,495	Complete
TANK INSPECTION & CLEANING	In Progress	\$8,198	In Progress
2013 PLANT EQUIPMENT	2013	\$17,881	Complete
2014 PLANT EQUIPMENT	2014	\$35,352	Complete
2015 PLANT EQUIPMENT	2015	\$15,981	Complete
HOLLYWOOD SOFT STARTER	3/20/2015	\$4,997	In Progress
SCADA METERS - IMG & TRAVEL CENTER	3/20/2015	\$3,135	In Progress
AIR TANKS FOR RESV. PH & BACKUP	3/6/2015	\$3,764	Complete
WATER LINE REPLACEMENT - GO BOND	3/20/2015	\$1,500,000	Complete
ALTO/GRINDSTONE INTERCONNECT	5/31/2015	\$517,284	In Progress
PLANT # 4 RAW WATER TURBIDIMETER	5/8/2015	\$2,873	In Progress
CHEROKEE WELL CHLORINE PUMP	4/30/2015	\$1,161	Complete
RECOAT FILTER 1 & 2 PLANT 4	4/10/2015	\$9,150	Complete
TANK CLEANING & INSPECTION	4/21/2015	\$3,749	Complete
BACKWASH VALVE REPLACEMENT	In Progress	\$22,590	In Progress
PUMP HOUSE SOFT STARTS BIGD,LILD #4	In Progress	\$58,917	In Progress
Water Meter Replacement Project	In Progress	\$3,000,000	In Progress
WATER LINE REPLACEMENT - GO BOND	In Progress	\$1,500,000	Phase II In Progress
River B Well Project	In Progress	\$1,200,000	In Progress
Comprehensive Plant Evaluation	In Progress	\$38,000	In Progress
Back-Up Pump rehab	5/19/2015	\$2,814	Complete
Hollywood Well repairs	5/22/2015	\$16,598	Complete
Sewer Master Plan	In Progress	\$238,695	In Progress
Upper Canyon Diversion Clean-up	5/20/2015	\$4,260	Complete
Bid D Well SCADA installation	In Progress	\$2,708	In Progress
Isaacs Radio Transmitters (tank reads)	In Progress	\$3,660	In Progress
Upper Canyon & Eagle Creek Flume Meters	In Progress	\$7,295	In Progress
		<b>\$10,126,755</b>	

Water System Planned Replacement Schedule and Projects:

VILLAGE OF RUIDOSO 2015-2020 WATER PROJECTS		
PROJECTS	DESCRIPTION	STATUS
Eagle Creek Water Bypass Line	Provide a by-pass to provide water to Alto Lake	Completed
Grindstone Dam Study and Joint Repairs	Repair Grindstone Dam Leakage to Increase Storage	Completed
Water Master Plan	Develop Master Plan to Determine System Improvements	Current/Complete December 2015
Alto/Grindstone Interconnect	Booster Pump to Connect Alto System to Grindstone	Completed 2015
Grindstone Pump Back System	Installation of Pump Behind Chamber of Commerce	Current/Complete May 2015
Swallow Waterline Replacement	Replace Existing 2 Inch Distribution Line	Under Construction
Phase I Water System Improvements	Replace Approximately 5,000 Feet of @ Inch Line	Complete
Water Meter Replacements	Replace Existing Meters with AMR Meters	Under Construction
Alto Lake Intake Structure	Replace Intake Structure	Under Contract
Replace PLC at Grindstone Treatment Plant	Decant System Not Functioning Due to Faulty PLC	Scheduled 2015
Cherokee Interconnect Project	Tie Hollywood Well to Grindstone System	In Progress
High School Well	Install Chlorination System	Scheduled 2015/2016
Hell Hole Well	Install In-Line Booster Pump to Replace Aging Booster Station	In Progress
All Water Tanks	Retrofit Tanks with Passive Cathodic Protection	Scheduled 2016/2017
Pressure Reducing Valves	Rehabilitate/Replace Multiple PRVs	Starting 2015 Thru 2017
Phase II Water System Improvements	Replace Aging Infrastructure to Decrease System Non-Revenue Water	Scheduled 2016
Evaluate Water Rates	Determine Income From Adopted 2014 Water Rates	Scheduled 2016
Alto Treatment Plant Filter Media Replacement	Replace Filter Media	Scheduled 2016
Alto Treatment Plant Decant System Modification	Modify Decant System to Prevent Loss to Seepage	Scheduled 2016
Country Club (Pine Top) Tank Replacement	Replace 500,000 Gallon Water Tank	Scheduled 2016
Eagle Creek Diversion	Install Automatic Bar Screen and Meter Closer to Diversion	Scheduled 2016
Hollywood/Big Dragon Well	Install Variable Frequency Drives to Control Pumping	Scheduled 2016
SCADA System	Update/Standardize SCADA System Including PRVs	Scheduled 2016 Thru 2017
Paradise Canyon	Replacement of Existing 2 Inch Galvanized Stub outs	Scheduled 2016/2017
Sierra Blanca Airport Water Storage Tank	Provide Storage for New Leased Water Rights	Scheduled 2016/2017
Phase III Water System Improvements	Replace Aging Infrastructure to Decrease System Non-Revenue Water	Scheduled 2016/2017
WTP #3 Laboratory Building	Build New Lab for Water Treatment Use	Scheduled 2016/2017

Phase III Water System Improvements	Replace Aging Infrastructure to Decrease System Non-Revenue Water	Scheduled 2016/2017
Little Dragon Pump House	Fix Leak at Well and Correct Pump and Piping Issues	Scheduled 2017
Phase IV Water System Improvements	Replace Aging Infrastructure to Decrease System Non-Revenue Water	Scheduled 2017
Well Replacement	Install/Deepen Wells Including North Fork Well 4	Scheduled 2017 Thru 2019
Country Club Water System Improvements	Replace Aging Infrastructure to Decrease System Non-Revenue Water	Scheduled 2017
Phase V Water System Improvements	Replace Aging Infrastructure to Decrease System Non-Revenue Water	Scheduled 2018
Phase VI Water System Improvements	Replace Aging Infrastructure to Decrease System Non-Revenue Water	Scheduled 2018/2019
Phase VII Water System Improvements	Replace Aging Infrastructure to Decrease System Non-Revenue Water	Scheduled 2020