# LOS LUNAS
# FORTY YEAR PLAN TO
# ACQUIRE AND HOLD WATER RIGHTS

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## EXECUTIVE SUMMARY

The Village of Los Lunas is a rapidly growing community and is situated such that substantial future growth is expected. By 2050, the Village water system is projected to serve 43,662 residents and 1500 inmates at the Central New Mexico Correctional Facility. Despite many factors that would be expected to increase per capita demand, the Village's effective conservation efforts have result in a modest and stable per capita demand of 140 gpcd. Based on the projected population, the established per capita demand, and the reasonable expectation that at least some nearby water systems will hook up to the Village system, total water demand in 2050 is estimated at 7,146 AFY.

The Village's currently holds approximately 5,800 AFY of water rights, including assumed return flow credits and approval of pending applications. More than 2600 AFY of these rights have been transferred to Village wells by developers, as required by Village ordinance to obtain subdivision approval. This mechanism will be the primary means for the Village to acquire additional rights, which means that increased water rights holdings will be governed by actual growth of the Village.

Now that the Village water system has the capacity to treat the water supply for arsenic, the availability of groundwater is considered more than adequate to supply the projected demand. The Village Plan is consistent with the Middle Rio Grande Regional Water Plan and the Forty Year planning statute and will have no adverse effect on other entities that hold water rights in the vicinity of Los Lunas. Prior transfers and previous comprehensive permits have never identified issues related to impairment, public welfare or conservation; future transfers will be subject to OSE approval after public notice and opportunity for protest.

# 1. INTRODUCTION

The Village of Los Lunas is located 19 miles south of the City of Albuquerque. In recent years the Village has grown rapidly and as of early 2009 the population within the Village limits was about 16,000. Water service is also provided outside of the City limits: to a few residents, an elementary school, the site of the former Hospital and Training School and, since mid-2009, to 1200 inmates at the Central New Mexico Correctional Facility. Growth is expected to continue, and will require the Village to continue its effective programs of water supply development, water conservation, and acquiring water rights.

This Forty Year Plan describes the future water needs of the Village through 2050, 40 years from the date of the plan. Sections 2 and 3 provide the basis for estimating the Village's population and water supply requirements through 2050. Sections 4 and 5 set out the Village's plans for supplying the water demand and acquiring the necessary water rights. The Plan is intended to support the Village's pending application for a comprehensive permit, RG-17065 ENL. that, if approved, will be the repository for rights acquired in the future.

# 2. EXISTING AND PROJECTED POPULATION

## 2.1 Current population and recent trends

Rapid growth in Los Lunas reflects the proximity of the Village to jobs in the greater Albuquerque area, and to the efforts by the Village to develop its own economy, so that its citizens can live and work in a small town environment with extensive urban amenities.

The basis for the estimate of current population is presented in **Table 1**, which considers only residents within the Village limits. The 2000 U.S. Census estimated the population of Los Lunas to be 10,034 at the end of 1999. The estimates for subsequent years in Table 1 were made by the Village planning staff and are based on a careful analysis of building permits. New households represented by permits and actually constructed are assumed to have occupancy equal to the U. S. Census estimate of household size of 2.75 persons per household. These data indicate that between 2000 and 2004, population grew at an average rate of 3.3 percent per year.

Growth then accelerated. In the two year period between January, 2005 and December, 2006, the population increase averaged 11.8 percent per year, due in part to the development of a very large planned community, Huning Ranch, which includes a 1000-home planned active adult community, with an extensive recreation and community center. The growth in water accounts confirms this rapid rate of growth. During the two year period of 2005 and 2006, single family residential water accounts increased by an average of 9.5 percent. In the past three years, 2007-2009, population growth has averaged 3.8 percent, while single family residential water accounts increased at the slightly higher rate of 4 percent.

In addition to the impact of Huning Ranch, growth has been fueled by the location of a number of new businesses in the Los Morros Industrial Park. These include a WalMart SuperCenter and regional distribution facility, a cabinet assembly factory, a center for dialysis equipment distribution and a dialysis clinic. The Village and the University of New Mexico (UNM) are in the early phases of planning the construction of an extension of the Valencia campus of UNM at

Los Morros. In addition to the development associated with the Industrial Park, there are a number of new businesses that have located in the Village. These include a major car dealership, a Lowe's food center and a number of other small regional offices, such as banks and government office buildings. The Village Administrator estimates that these new businesses have created more than 1,500 jobs.

As indicated in Table 1, the Village estimates that at the end of 2009, the in-town population was 16,208. In addition to the population within the Village limits, the Village serves 101 residential accounts outside the Village. At 2.75 residents per household, this represents an additional 278 residents. Thus, the total service area population in 2009 was 16,486.

## 2.2 Factors expected to impact future growth

As with other communities throughout the country, the recession has resulted in a slowdown in housing development and population growth in Los Lunas. However, recently there has been an increase in the number of building permits issued and the Village Community Development Director anticipates that new construction will accelerate in 2011. The Village is extremely well situated as a growth area, close to Albuquerque with easy access from I-25 and the Railrunner commuter line. In addition, the community has infrastructure, such as water, sewer and road systems, to accommodate extensive growth. Finally, there is a growing commercial base and planned communities that will also serve as catalysts to growth. Once the economy begins to recover from the recession, it is likely that Los Lunas could experience growth in the next 10 years that is similar to the 6.5 percent annual growth experienced by Rio Rancho in the past 10 years.

It also appears that the Village may have to extend its service outside the Village limits. For a number of years, the Village has provided service to the 400 student Valencia Elementary School, located a mile from the Village limits. In addition, the Village has provided water to the site of the former Los Lunas Hospital and Training School, which is owned by the State of New Mexico. There are a number of current and potential developments at this site that will increase demand for water. For example, the State has located a silvery minnow refugium at the campus. The Interstate Stream Commission is diverting a portion of the water needed for the

refugium; however, the Village water system serves as a significant secondary source of supply. The State has also broken ground for a drug treatment center on the property. The center will begin as a non-residential center. The Director of Partners in Wellness, which will administer the program, estimates that the program will ultimately serve 500 out-patient clients. In addition, the State has plans to provide residential treatment and family services in the future. These developments will serve as resources for the region and, to a lesser extent, the state as a whole. While they will only slightly increase the number of residents in Los Lunas, they will increase demand for water, perhaps significantly.

Additionally, at the behest of the State, the Village has recently hooked up the Central New Mexico Correctional Facility (CNMCF) to its water and wastewater system. This added 1200 "residents" to the population served by the Village water system. Although the facility was hooked up in June 2009, we have not included this source of demand in the current population, only in projections.

Finally, there exists the possibility that the State will take action that will require Los Lunas to extend its system further beyond Village limits to provide service to areas that are now served by domestic wells and/or mutual domestic water systems. There is evidence that a number of these residences are beginning to experience water quality problems. If these problems increase, these residences will need to be provided water from a high quality source. In effect, the Los Lunas system could potentially become a regional water system in the next forty years.

## 2.3 Population projections relied upon by Village for its planning efforts

Table 1 also presents the projection of in-town, non-inmate population growth from 2010-2020. This projection is based on current population estimates and an extrapolation of the building permit data, based on the average of the past 5 years. These projections indicate that 2020 Village population, exclusive of CNMCF will be 23,894.

The Village believes that the projections contained in Table 1 are the most appropriate to estimate growth for the next 10 years. The Village uses these projections for all planning efforts, including the development of wells and related infrastructure to provide water service,

wastewater plant development, road construction and improvement and development of community facilities, such as parks, community centers and police and fire stations. All state and federal grant and loan programs use these specific projections in their review and evaluation of requests for infrastructure investment.

The Village projections contained in Table 1 have been incorporated into **Table 2**, which contains not only the in-town residents, but also the 278 residents outside the Village limits and the inmates at CNMCF. Ken Sandlin, Deputy Warden at the prison, projects the inmate population will increase by 1.4 percent per year until it reaches 1500. As indicated in Table 2, the total 2010 service area population includes 17,063 Village residents, 278 residents outside the Village limits and 1200 inmates. In 2020, the service area population will include 23,894 Village residents, 278 residents outside the Village limits and 1398 inmates.

## 2.4 Extension of Village population projections through 2050

Table 2 also contains projections of service area population growth between 2021 and 2050. We have projected that the growth rate will slow to 2.5 percent per year from 2021 to 2025. We have used BBER estimates of population growth in Valencia County as the basis for projections of population from 2026 to 2035. BBER projects that Valencia County population will increase at an annual rate of 1.091 percent per year. At this rate, the Village will add 574 new residents per year. Therefore, we are projecting that population will increase by 574 residents each year from 2036 to 2050. We assume that the inmate population will increase to 1500 in 2025, then remain constant after that time.

## 2.5 Statement of population relied upon for forty year plan

We project that the Village water system will serve the following populations in 2050: 41,324 Village residents, 278 non-Village residents and 1500 inmates. This represents a total of 41,602 residents and 1500 inmates in 2050. If development returns to the levels of 2005-2007 and/or if the Village hooks up other non-Village residents, this population will be reached sooner and the 2050 population will be larger. As discussed in Section 3.5, we have added a five percent contingency in our projected demand to account for this possibility. The projection of an

additional 28,000 population in 40 years is considered conservative in that it assumes much slower growth than actually observed between 2000 and 2007 and much less growth than has actually been observed in the most comparable Albuquerque metropolitan community, Rio Rancho, where the population increased by 65,000 residents in the 27 years from 1980 to 2007.

# 3. EXISTING AND PROJECTED WATER DEMAND

## 3.1 Current demand in gallons per capita per day and recent trends

Prior to the development of this Plan, the Village met with the OSE District 1 and WUCB staff. We agreed to use the OSE Calculator to estimate per capita demand for 3 years: 2005, 2006 and 2008. We agreed not to calculate per capita demand for 2007 or 2009 because of obvious data problems. The Calculator, AWWA Audit and Discussion of Grading are attached to this Plan as Attachments 1-3. The method indicates that per capita demand in 2008 was 140 gpcd. The residential component of that demand was 80 gpcd.

Since the OSE Calculator has only recently become available, the best approach to determining recent trends in demand is to evaluate the historic data obtained by the Village, which were based on taking total diversion and dividing it by the estimated service area population. The data for the years between 1996 and 2008 are presented in **Table 3**. Because of a problem with one supply meter in 2009, we have not included the 2009 data. There are some differences between the OSE GPCD calculation and the simpler approach. The OSE Calculator uses Census data to estimate the number of residences and does not take into account the residences outside the Village boundaries that are served by the Village water system. We believe these estimates under-count the number of residences and the number of residents. In addition, the OSE Calculator reduces the number of residences to reflect an estimate of vacant properties. All of these factors tend to inflate the estimate of per capita demand.

Table 3 indicates that per capita demand has decreased from 174.2 gallons per capita in 1996 to 132.6 gallons per capita per day in 2007. The per capita estimate for 2008 is likely somewhat unrealistic, since the supply metering problem probably began during that year. However, the trend is clear. The decrease in per capita demand has occurred even with the growth in the commercial sector described above and the provision of service to commercial accounts outside the Village limits. Reasons for the decrease in per capita use include the Village's water rights transfer ordinance that encourages residential water efficiency, a state-of-the-art water metering program, and a very aggressive approach to infrastructure efficiency, which has resulted in a

very low percentage of non-revenue water. In addition, federal water conservation standards have required that all new residences and businesses install water conserving plumbing fixtures. Since there has been so much growth in the past decade, a large percentage of the housing stock and businesses have such fixtures. Finally, the Village has implemented a number of water conservation programs, which are described in the following section.

## 3.2 Existing conservation programs and documented results

The Village of Los Lunas has an existing water conservation plan that was prepared by the Middle Rio Grande Council of Governments (MRGCOG) through a grant from the New Mexico Office of Natural Resources Trustee. This Plan, which has been filed with the State Engineer, was completed in January 2006 and contains a list of general findings on water conservation, infrastructure and management. The plan also contained a list of nine recommended actions:

- implementation of a water shortage plan;
- adoption of a water waste ordinance;
- administration of an ongoing leak detection and analysis program;
- expansion of water meter inspections; and repair and replacement of old or defective meters;
- review and update of local regulations for water conserving landscapes;
- expanded efforts on public education programs that promote conservation;
- replacement of older or high-flow plumbing fixtures in public buildings;
- implementation of local building codes requiring low water use plumbing fixtures and appliances; and
- initiation of a water rate structure with excess surcharges for high water users.

The Village has taken a number of actions to implement the plan's recommendations. They are described below.

1. The Village adopted an emergency water shortage ordinance in January, 2006: Municipal Code 13.20 (Attachment 4). The ordinance is intended to address emergencies or catastrophic events that disrupt the municipal water supply system. The Ordinance

establishes a process by which the governing body declares and administers one of three stages of a water shortage. These range from a Water Shortage Advisory with voluntary compliance to a Water Shortage Alert and a Water Shortage Emergency, both of which require mandatory compliance. For the Advisory stage, the ordinance lists activities which will reduce water use. For each of the next two stages, the ordinance lists mandatory restrictions. The ordinance establishes the circumstances under which the Village will impose fines, possible imprisonment, and termination of water service for violations of mandatory provisions of the ordinance.

2. The Village adopted a water waste ordinance in April 2007: Municipal Code 8.24 (Attachment 5). From April through September, the ordinance allows spray irrigation (eg, sprinklers) only between 6 P.M. to 10 A.M. The ordinance also prohibits non-beneficial use and waste of water at all times. Non-beneficial use includes uses of water that run off onto other properties or public rights-of-way, as well as use of water to clean vehicles, equipment or hard surfaces, such as parking lots or other pavement. Finally, the ordinance establishes the procedure for enforcing this ordinance, including a series of progressively higher fines and possible water service disconnection. No citations have been issued to date; however, Village staff responds to reports of violations by speaking with the violators and making them aware of the ordinance requirements.

3. The Village has contracted with a private firm to conduct leak detection surveys for older parts of the water system every two years. The last survey, conducted in 2006, detected no leaks. Since the survey found no evidence of leaks in 2006 and the Village has budgetary constraints, Los Lunas has not scheduled a survey since that time. However, the Village plans to evaluate the need for additional surveys and resume them as needed within the next two years.

4. In 2008, the Village completed the replacement of all existing residential and commercial meters with wireless radio read meters. This is a state-of-the-art metering program that allows the staff to record use and generates bills without the meters having to be read on-site. In addition, possible leaks can be detected and addressed very quickly. Readings will be accessible through the Village website, so that not only the Village staff, but

consumers will be able to monitor their water use on a continuous basis. The Village staff anticipates that the readings will be available to residents within a year. The system will be set up so as to protect the privacy of the accounts. At this time the Village has meter readings and billings that are accurate and allow effective monitoring of water use and identification of water waste.

5. The Village changed its landscaping ordinance to require commercial users to reduce lawn size and follow certain planting directives, including incorporation of xeriscape principles and high standards for irrigation efficiency (Attachment 6). This ordinance applies to all subdivision plats, new commercial construction and remodeling of commercial structures that disturb more than 1000 square feet of land. It requires that the developer submit a detailed landscaping plan as a condition of plat approval or issuance of a building permit. Section E of this Ordinance establishes requirements for limitations on use of water in irrigated areas, specifies water conserving mixes of cool season grasses, prohibits planting of specific high-water-use trees and requires that all irrigation systems have backflow prevention devices.

6. The Village sends out a monthly newsletter with water bills. This newsletter contains information about the water waste ordinance in spring issues. These newsletters are also posted on the Village website, which also contains a water conservation page. The water conservation page contains links to OSE publications regarding efficient irrigation practices and other sources of water conservation information, such as the Los Lunas Plant Materials Center, the OSE and Tree New Mexico.

7. The Village staff has retrofitted most of the community's public buildings with either 1.6 or 1.28 gallon-per-flush toilets and faucets that use between 0.5 and 2.5 gallons per minute. Staff continually looks for opportunities, such as remodeling projects, to upgrade plumbing fixtures to even more efficient models.

8. The Los Lunas school system has implemented several water conservation measures at its educational facilities. The system employs an irrigation consultant; and the schools' landscape maintenance staff uses water conserving fertilizers and polymers for

landscaped areas and sports fields. The staff also uses soil moisture probes to help determine watering times for irrigation controllers. The school system is also in the process of converting all evaporative air conditioners to refrigerated models. For any new construction, the number of trees and plants is limited, bathroom fixtures with automatic shutoff sensors are required, and water conserving products, such as the fertilizers and polymers mentioned above, are specified.

In addition, many public buildings, such as the Library, have xeric landscapes; and some, such as the Fire Department and Recreation Center, use rainwater harvesting systems, with no other supplemental water, for landscape irrigation. **Figure 1** provides two views of such a system. The Village Hall hosts a xeric demonstration garden. **Figure 2** is a photo of a small portion of the garden. Part of the garden was damaged by remodeling construction during the last two years; however, it is currently being restored and includes a rainwater harvesting system for one section of the garden.

The Village has 14 parks in which areas that are landscaped and irrigated have been reduced from 70 percent to 35 percent of the total area. The formerly landscaped areas are now in mulch or hardscape. The Village has installed a highly efficient central irrigation control system that tracks rainfall and evapo-transpiration and is capable of a large variety of specific zone controls. It shuts down within two minutes if the system exceeds its programmed water budget. See **Figure 3.**

9. All new residential and commercial construction has included water conserving plumbing fixtures as mandated by the Energy Policy Act of 1992. This includes the construction of almost 1300 housing units since the Act went into effect in 1994, as well as a number of commercial establishments.

10. Effective January, 2010, the Village has increased its water rates by 10 cents per 1,000 gallons. The rates are currently $15.26 for the first 2,000 gallons of use, with $3.50 per 1,000 gallons for each additional 1,000 gallons of use. The Utilities Director has indicated that he plans to initiate a process of increasing rates and changing the rate structure to an increasing block rate within two years.

In addition to these new initiatives, the Village has continued to administer existing programs, such as enforcement of extremely high water and wastewater system construction standards, lower water rights transfer requirements for water conserving subdivisions, and ongoing monitoring and management of water infrastructure to minimize system loss. All of these programs have resulted in a very low percentage of non-revenue water. As a result of all the actions described above, using the basic calculation of per capita demand, the demand for water has decreased from 173 gallons per capita per day (gpcd) in 2000 to less than 133 gpcd in 2007.

### 3.3 Future conservation programs …and projected results

As described above, the OSE Calculator indicates 2008 per capita demand was 140 gpcd. Since 2008, the Village equipped all of its wells for advanced arsenic treatment. We estimate that the Village will use 100 AFY for arsenic backwash purposes. (See Section 3.5 for more complete discussion of this water use). Arsenic treatment will increase per capita demand by 5 gpcd. It is the Village's goal to be able to maintain per capita demand at 140 gpcd, which will require reducing other use by 5 gpcd. It is in this context that the Village has developed its plan for future conservation actions.

The Village staff, including the Village Administrator and the Directors of Utilities, Community Development and Parks and Recreation have met a number of times to develop a plan for new water conservation efforts that will be implemented over a five year period of time. The following lists these actions by year.

**Year 1-2 Actions**

The following actions are scheduled for implementation in 2010/2011.

1. Revise current ordinances regarding water waste, water shortages and landscaping to avoid duplication and make other changes as needed to update and strengthen the ordinances.

2. Correct existing computer-based data collection and management problems to improve the accuracy of water accounting information.

3. Evaluate the need, based upon operating data, and the cost of installing new meters on all the production wells. Schedule installation time frame based upon results of the evaluation.

4. Begin implementation of water use tracking tool on the Village website and publicize its availability and purpose. This tool is associated with the remote radio read meter system. A metered user will be able to access his account's water use records to monitor recent and ongoing use, as well as compare this year's use to a comparable period in the previous year.

5. Study the feasibility of implementing a toilet rebate program, or similar incentive, for water users with 3.5 gallon or higher per flush toilets.

6. Evaluate the establishment of procedures within the computerized billing system to identify higher-than-normal water usage for commercial, industrial and institutional water users.

7. Begin to work with school board members and other school officials to encourage the inclusion of water conservation curriculum in classrooms.

8. Complete restoration of xeriscape demonstration garden at the Village Hall.

The Village does not anticipate that these measures will directly lead to a large decrease in per capita demand. However, the staff opinion is that these actions must be accomplished before the Village can move to more aggressive actions described below.

**Year 3 Actions**

These actions are planned for implementation in 2012/2013.

1. Revise water rates to include an increasing block rate.

2. Work with the state correctional facility and other state facilities to encourage the reduction of water use at their locations.

3. Evaluate results of past leak detection surveys and resume a regular schedule of surveys as directed by the evaluation results.

4. Offer water use surveys, or other educational services or incentives, to those commercial, industrial and institutional water users whose usage is determined to be above normal.

5. Implement a toilet rebate program, or other incentive, for water users with 3.5 gallon or higher flush toilets, based upon results of the feasibility study in Action #5 of Year 1.

The Village estimates that the change in the water rate structure will decrease per capita demand by at least 2 gpcd. Although the Village may implement a toilet rebate program, since a large percentage of the housing stock is quite new, it is unlikely that this program will yield a decrease of more than 1 gpcd.

**Year 5 Actions**

This action is scheduled for implementation in 2014/2015.

1. Revise current requirements for new developments to include slope standards to prevent runoff, maintenance requirements for commercial landscapes, and other requirements such as highly efficient plumbing fixtures and appliances.

**Ongoing Actions**

In addition to the conservation actions described above, the following actions have been implemented and will continue on an ongoing basis:

1. Increase water use efficiency in public parks by upgrading irrigation systems, using water-efficient mulches and choosing drought tolerant plants.

2. Retrofit public buildings with Water Sense toilets and other water-saving plumbing fixtures; and improve landscape water use efficiency as mentioned in #1.

3. Encourage school officials to reduce water use at schools, especially in regard to the amount of water used to irrigate playing fields.

4. Use public education materials, such as brochures, the Village newsletter and conservation kits, and activities, such as xeriscape classes and water fairs, to encourage conservation actions by water users.

We estimate that, collectively, these ongoing efforts will decrease per capita demand by 2 gpcd. Thus, continuation of ongoing efforts, a progressive water rate structure and a toilet rebate program should result in a stable per capita demand of 140 gpcd.

## 3.4 Statement of gallons per capita demand relied upon

The OSE Calculator indicates that Per Capita Demand in 2008 was 140 gpcd. We will use this as the base rate; however, we anticipate that 2011 data will yield a significantly higher per capita rate. This is due to a series of factors. The most of important of these factors are described below.

- Early in 2010, the Village determined that the meter on Supply Well 6 was not registering low flows. This had been occurring since its installation in 2008, but was not detected at

that time. Thus, 2008 diversions were actually higher than the meter readings indicated. The meter was not replaced until March of 2010.

- In mid-2009, the Village hooked up the Central New Mexico Correctional Facility (CNMCF) to its water system. In the twelve months since the facility has been hooked up, metered use has been 210 AFY. Since the facility is outside the Village limits, the inmates will not be counted as residents of the Village, so per capita demand will be increased.
- In 2010, the Village began to equip its wells to provide arsenic treatment. There is a significant use of water for this purpose. In July, 2010, the Village used approximately 8.9 AF of water for arsenic backwash purposes. If this continues, demand will increase by 100 AFY. This will increase per capita demand by approximately 5 GPCD.
- Demand will also be increased to a lesser extent by new government and commercial users, such as the silvery minnow refugium, a new substance abuse program and the Lowe's Food Center.

## 3.5 40-year projection of water supply and water rights requirements

**Table 4** contains the total diversions and per capita demand for the three years to which the OSE GPCD Calculator has been applied, 2005, 2006 and 2008. The first two years were selected because the faulty meter at Well 6 had not been installed. Although the diversion numbers in 2008 were likely low because of the problem with the meter, the OSE Water Conservation staff requested that this calculation be included in the Calculator. This Table also projects Village demand through 2050, based on a stable per capita demand of 140.

Table 4 also contains a separate projection of demand for the CNMCF. This is based a demand of 0.175 AFY per inmate, which is the current metered use per inmate. Finally, Table 4 provides a conservative projection of total demand for water in the next forty years. We have maintained per capita demand at 140 gpcd. This indicates that the Village will absorb the increased demand from arsenic treatment and new commercial development, which is an aggressive goal for a community which currently has a relatively low per capita demand. Table 4 projects that demand will be almost 6800 AFY in 2050. If development accelerates and/or the Village is required to expand its service area, demand could be significantly higher. For

example, even if demand is only 5 percent more than projected, there will be a need for 7146 AFY of consumptive use water rights. We have used this number as the basis for the Village's pending application for a consolidated permit.

# 4. WATER SUPPLY PLAN

## 4.1 Overview of present water production and delivery system

**Figure 4** is a map of the current Village water supply system. The original system was constructed in 1939 and consisted of one well and a water supply tank that served a small Village population. These facilities were adequate for 30 years. However, in 1969, in response to population growth and increasing commercial development, the Village began to add facilities. Development was accelerated, beginning in the late 1980's. **Table 5** describes the development of major facilities.

In addition to facility development, the Village has recently completed all necessary work to be able to meet arsenic limits set by the U.S. Environmental Protection Agency (EPA). These improvements included installation of coagulation/filtration process arsenic removal systems at each of the Village's well sites. As a result of all these improvements, the Village system can not only serve its current population, meeting all water quality standards, but can accommodate future development.

The Los Lunas water system currently has four active wells: Well 3, Well 4, Well 5, and Well 6. **Table 6** defines the locations and characteristics of each well. The Los Lunas Water System consists of wells that pump to ground storage tanks, which are located such that most of the water is supplied to the system by gravity. The system uses four main storage tanks, a booster pump station at Well Site 3, a well equalization (nursing) tank and booster pump station at Well 6, and a number of pressure reducing stations. These facilities are designed to maintain a consistent pressure throughout the northwestern portion of the system. The tanks are connected to users throughout the service area through a network of pipes ranging in size from 6 inches to 20 inches in diameter.

There are three pressure zones within the service area. Areas west of Interstate 25 are in the upper pressure zone. Areas east of Interstate 25 to the valley floor are included in the middle pressure zone, and the valley floor represents the lower pressure zone. In order to

accommodate the rapid growth that the Village experienced between 2004 and 2007, particularly in the Huning Ranch area located west of Interstate 25, a new booster pump station was constructed adjacent to the Tank 5/6 site along with a new Tank 7. Although Tank 7 is currently in service, it will primarily serve future development.

Each well in the system is designed to serve a specific area of the community; however, they are also capable of providing water to other areas if another well goes down or if there is higher than average demand in other areas. Most system components are fifteen years old at most. The older components include Well 4, which was built in 1987, and Tank 3, which was built in 1963 and refurbished in 1997. Due to the relative youth of the system components, the system is in good condition and not in need of significant repair.

In 2001 EPA implemented a new Arsenic Rule. This changed the maximum contaminant level (MCL) for arsenic in a public water supply from 50 µg/L or parts per billion (ppb) to 10 ppb. The average arsenic concentration in the Los Lunas wells ranges from 12.6 to 18.2 ppb.

To achieve compliance with the Arsenic Rule, the Village elected to construct a coagulation assisted oxidation/filtration system at each well to remove arsenic. These treatment systems were designed specifically for the removal of arsenic. A typical recovery rate for water filtration systems is around 90% (meaning 10% of the raw water pumped is lost to backwash, filter to waste, etc…). The Village selected the manufacturer of the treatment systems specifically to maximize the recovery rate, and minimize the treatment losses. Through the first few months of operation, the Village has seen recovery rates of approximately 95%. Through optimization of the treatment systems and process control, this recovery rate may improve over time.

The Village began construction of the arsenic treatment systems in July, 2009 and completed work in May, 2010. The final construction cost (including change orders) for all of the Village's well sites was $2,671,643.73. The annual operation and maintenance costs are anticipated to be around $225,000. As described above, this system will increase diversions by at least 5 percent each year. For more information about the Village's water supply system, please refer to the Molzen-Corbin and Associates (MCA) study, *Arsenic Rule Compliance Strategy, Preliminary Engineering Report*, January, 2008.

## 4.2 Water availability and plan for supplying 2050 water demand

The Village does not have any plans to supply any portion of its demand with surface water. The available information indicates that the regional aquifer near Los Lunas is capable of producing significant quantities of good quality water in areas relatively near the valley. Although the groundwater in some areas has a high arsenic concentration, the Village system is now capable of treating this water, so this is no longer a limiting factor. To date, and for the projected future, there appear to be no limits to the Village's ability to meet its water needs from local groundwater.

The Los Lunas water supply is entirely from groundwater in Rio Grande alluvium and the Santa Fe group. The best aquifer conditions (up to 1500 foot thickness of relatively coarse sediments) are found in between the Rio Grande fault (east of the modern river valley) and the Isleta fault (west of the modern river valley). Other important attributes of the regional groundwater supply include the following (LWA, 1994).

- The alluvium in the modern valley of the Rio Grande, which began to be developed about one million years ago, will yield a large supply of water to wells, but is adversely affected by various water-quality problems. For a municipal supply, this alluvium is most important because it is the connection between water in the river and water in the main aquifer.
- Alluvial fan material east of Los Lunas can be a source of good quality groundwater, although well yields are potentially limited.
- Saline water is probably found beneath the main regional aquifer, and in the far west of the Los Lunas area.
- Within the valley there is some indication that supplies are better to the south than to the north.

This information indicates that the Village can continue to develop its groundwater supplies to provide its forty-year demand projections, provided that wells are not so shallow as to be dominated by alluvial water or so deep as to reach saline water. The best well locations are in the transition zone from the valley to the West Mesa and to the south.

# 5. WATER RIGHTS PLAN

## 5.1 Summary of existing water rights permits and proposed revised permit

The Village currently holds a permit to divert 4600 AFY. Because of the unprecedented growth from 2005 and 2007, the Village's very aggressive policy with respect to water rights transfers from developers, and the growth that these developers are planning, the Village now holds rights that are in excess of that amount. On August 11, 2008, the Village filed an Application to Increase Diversion and offset depletions with valid pre-1907 surface water rights. The proposed permit requests a diversion limit of 7,146 AFY which should allow the Village to meet its projected forty year demand.

## 5.2 Description of water rights portfolio including return flow credits

**Table 7** lists the Village's current water rights. Each of these rights are summarized in the Village's 2008 Annual Water Rights Report filed with the permit application. The Village's current permit allows return flows from the wastewater treatment plant to be credited to diversions associated with transferred irrigation rights and the Village's allocation of San Juan/Chama Project (SJCP) water. In the past 10 years, return flows have represented approximately 50 percent of diversions. Therefore, Table 7 assumes the Village will be able to divert 200 percent of its consumptive use rights associated with irrigation transfers and SJCP rights. The Village currently holds 556 AF of vested rights, 2144.738 AFY of transferred consumptive use irrigation rights and 392 AFY of consumptive use rights associated with its allocation of SJCP rights. Assuming a 50 percent return flow is credited to the Village's permit from its transferred irrigation rights and its SJCP allocation, the Village's current diversion water rights holdings total 5,626.562 AFY. In addition, the Village has three pending applications to transfer an additional 192 AFY of diversion rights, assuming a fifty percent return flow credit.

## 5.3 Comparison of existing water rights to forty year demand

As described in Section 3.5 of this Plan, the Village projects that demand for water in 2050 will be 7146 AFY. Presently, the Village has 5626 AFY of diversion rights to meet this demand. We anticipate that the bulk of the water rights needed to meet the projected forty-year demand will be acquired through the Village subdivision ordinance described below.

## 5.4 Effects of Village ordinance requiring water rights transfers

In 1977, the Village passed an ordinance which required that all subdivisions identify and transfer water rights to the Village that are adequate to meet the water supply needs of the subdivision. This ordinance has served as the primary vehicle for Village water rights transfers. We estimate that more than 95 percent of the transferred irrigation rights were transferred in by developers. The remaining 5 percent result from Village purchases of very small parcels of water rights, most from within the Los Lunas area.

The ordinance requires that a developer transfer between 0.20-0.336 AFY of consumptive use rights to the Village for each residential unit in a subdivision. In the absence of a water budget, the subdivider must transfer 0.336 AFY of consumptive use rights for each residential unit. However, the ordinance contains a provision that allows a subdivider to adopt conservation measures and to provide information that that will demonstrate that a specific development will use less than 0.336 AFY. The Village uses this information to prepare a water budget and recommend to the Council a transfer requirement that is less than 0.336 AFY per unit. Almost all subdivisions that have requested a lower water rights requirement have been allowed to transfer 0.23-0.28 AFY CU per unit. By ordinance, the water rights requirement cannot fall below 0.20 AFY/unit.

This Ordinance may be the most important conservation measure in the community. If a developer plans a subdivision with water conserving features, the water rights transfer requirement is less and the resulting water use at that subdivision will be less. This ordinance

produces a structural change in demand for water. This effect has been even more pronounced in Los Lunas, a community that has grown so rapidly during the past decade.

The Village has aggressively enforced this ordinance, granting no exceptions to its requirements. As a result, Los Lunas has water rights adequate to meet all residential development for a number of years into the future. We anticipate that subdivision transfers will serve as the basis for the remainder of the rights to serve the projected forty year demand for water.

Since 2004, developers in Los Lunas have transferred approximately 2600 AFY of diversion water rights to the Village wells. The bulk of these rights were transferred to provide for near term subdivision use. However, there remain approximately 600 AFY of rights that have been transferred to provide rights adequate to meet the demand of future subdivision development. These transfers confirm that Los Lunas will continue to grow in the future.

## 5.5 Other elements of the plan

Although the Village assumes that the majority of its water rights portfolio will continue to be provided through developer transfers, the Village will continue its program to purchase smaller parcels of rights, especially from small landowners in and around the Village. These parcels are usually too small for a developer to pursue. Presently, the Village is willing to enter into a purchase agreement with a landowner and prepare and file all paperwork necessary to transfer the rights. The Village pays for all these costs. In the past, these practices have resulted in the acquisition of more than 100 AFY of consumptive use rights being transferred to the Village wells.

In the past, the Village has transferred in-house use from domestic wells that were hooked up to the Village water system. The OSE no longer allows the transfer of these rights to a comprehensive water rights permit, so this is no longer an option for water rights acquisitions.
The pending application for an enlarged permit requests that the Village be given credit for its return flows from its wastewater treatment plant for those diversions associated with transferred irrigation rights and its SCJP allocation. This will effectively increase allowable diversions for

these rights by approximately 100 percent. At this time, the Village does not plan to request return flow credits from septic tanks and irrigated areas located within a mile of the River.

As described above, the Village has an allocation of 400 AFY of SJCP rights. Because the U.S. Bureau of Reclamation estimates there is a 2 percent transmission loss from Heron to the Middle Rio Grande, Los Lunas will be able to use 392 AFY of SCJP rights. Until Los Lunas needs these rights for its purposes, the Village leases these rights to others, generally in the Middle Rio Grande Valley. Each lease has a clause that allows the Village to terminate the lease in any year when the Village needs its SJCP allocation for the Village population. For the past 8 years, the Village has leased the remainder of its allocation back to the Bureau of Reclamation for silvery minnow habitat maintenance purposes. Los Lunas anticipates that it will continue this practice in the indefinite future.

Section 3.3 describes the future Village conservation efforts. Since current per capita demand is moderately low and the Village will be absorbing demand from the CNMCF, as well as increased use of water for arsenic treatment purposes, we anticipate that the goal of these efforts will be to maintain per capita demand at 140 gpcd.

## 5.6 Effects of Plan on water rights of others

The OSE staff has already completed its hydrologic evaluation of the impact of the pumping 7146 AFY over a forty year period of time. The model indicated that there would be no adverse impact from this level of pumping, provided that the offsetting rights are retired. The public will be provided notice of all future transfers and other water rights holders will have the opportunity to protest any application that may have any negative impact on any water rights holder. The OSE will evaluate each future transfer to ensure that there will be no negative effects on other water rights holders in the vicinity.

## 5.7 Relationship to regional water plan

Los Lunas falls within the planning jurisdiction of the Middle Rio Grande Council of Governments (MRGCOG). The Middle Rio Grande Regional Water Plan was initiated in 2001

and filed with the OSE in 2004. Ms. Betty Behrend, the Village Public Works Director at that time, was a member of the Water Resource Board which directed the study. The Board met at least once a month during a three-year period to provide the COG with input to the plan. In addition, the Board members reviewed and edited drafts of various sections of the plan. The Village formally endorsed the plan by resolution in 2004.

Chapter 10 of the regional plan report recommends specific conservation actions. There are three sections of recommendations which are most relevant to Los Lunas' Forty Year Plan. These include: R1-2 Outdoor Conservation Efforts, R1-4 Conversion to Low Flow Appliances, and R1-5 Urban Water Pricing. This plan documents the Village efforts in all of these areas.

In addition, in another section of the regional plan, recommendation R3-1 emphasizes the need to reduce unmeasured water use. As the AWWA Audit shows, the Village has had a very low percentage of non-revenue water for a number of years. This is due to the high design standards for the water and sewer system, its state-of-the-art metering system and the requirement that municipal departments pay for water like all other customers.

Finally, we would note that R2-12 recommends that local communities plan development that will: 1) reduce water consumption; 2) minimize impact on water resources; 3) encourage conservation-oriented economic development and 4) ensure adequate supplies for any proposed development. As described in Section 5.4, the Village subdivision ordinance meets all of these goals.

In summary, the Village staff and governing body have been involved with the development and endorsement of the Middle Rio Grande Regional Water Plan since its inception. The Village policies and its proposed conservation efforts are not only consistent with the plan, but serve as examples of effectiveness of the recommendations contained in the plan.

## 5.8 Consistency with forty year statute

New Mexico Statute 72.1.9 states: It is recognized by the State that it promotes the public welfare and conservation of water within the state for municipalities…to plan for the reasonable

development and use of water resources…The statute allows for a forty-year planning period to identify and acquire water rights and facilities to provide for the projected water rights demand of the community.

The Village's pending application and this Plan are consistent with the statute. The Village has assumed the responsibility of developing the water supply system that will be able to accommodate projected demand. The Village's water rights transfer ordinances correctly place on developers the burden of acquiring and transferring water rights to meet this demand. The water rights so acquired are in no way speculative: they represent financial commitments from the development community, and their concrete plans for and confidence in the growth of Los Lunas.

## 5.9 Anticipated reporting schedule

Los Lunas will update its GPCD calculation, beginning in 2011 and will provide an updated Calculator to the OSE on an annual basis. The Village proposes to update the AWWA Water Audit in 2015 and every five years thereafter. The Village proposes to report on the implementation of its water conservation program in 2015 and provide an implementation plan for the next 5 years beginning in 2015 and every 5 years thereafter.

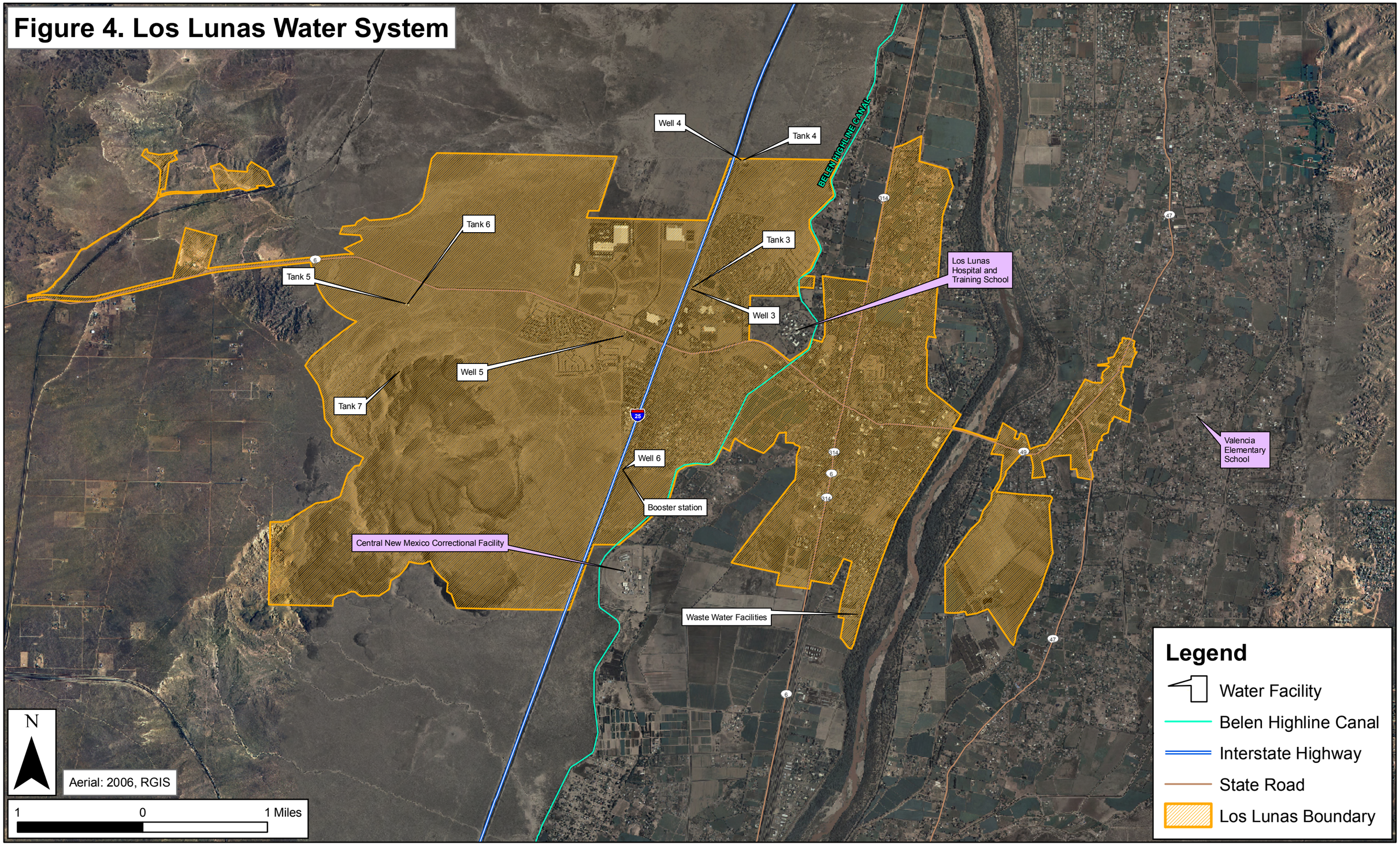
# FIGURES

**Figure 1. Rainwater Harvesting System**

## Figure 2. Xeriscape Garden

## Figure 3. Los Lunas Irrigation Weather Station

# Figure 4. Los Lunas Water System

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# TABLES

| Table 1. Village of Los Lunas Population Estimates and Projections | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Prepared by the Village of Los Lunas Planning Staff | | | | | | | | | | | | |
| | | POP. | Cumulative | POP. | OCCUPIED | | PERCENT | BUILDING | SINGLE | MULTI | MOBILE | PERS. |
| YEAR | POP. | GROWTH | Pop. Growth | INCR. | HOUSING | Cum. | Incr (Decr) | PERMITS | FAMILY | FAMILY | HOMES | PER UNIT |
| 31-Dec-99 | 10034 | | | N/A | 30 | 3601 | -0.5% | | 143 | | 30 | 2.75 |
| 31-Dec-00 | 10389 | 3.5% | 3.5% | 355 | 129 | 3730 | 3.6% | 71 | 71 | | 58 | |
| 31-Dec-01 | 10785 | 3.8% | 7.5% | 396 | 144 | 3874 | 3.9% | 110 | 110 | | 34 | |
| 31-Dec-02 | 11131 | 3.2% | 10.9% | 347 | 126 | 4000 | 3.3% | 114 | 114 | | 12 | |
| 31-Dec-03 | 11373 | 2.2% | 13.3% | 242 | 88 | 4088 | 2.2% | 74 | 74 | | 14 | |
| 31-Dec-04 | 11714 | 3.0% | 16.7% | 341 | 124 | 4212 | 3.0% | 103 | 103 | | 21 | |
| 31-Dec-05 | 13276 | 13.3% | 32.3% | 1562 | 568 | 4780 | 13.5% | 558 | 488 | 70 | 10 | |
| 31-Dec-06 | 14489 | 9.1% | 44.4% | 1213 | 441 | 5221 | 9.2% | 427 | 427 | | 14 | |
| 31-Dec-07 | 15339 | 5.9% | 52.9% | 850 | 309 | 5530 | 5.9% | 286 | 286 | | 23 | |
| 31-Dec-08 | 15834 | 3.2% | 57.8% | 495 | 180 | 5710 | 3.3% | 159 | 159 | | 21 | |
| 31-Dec-09 | 16208 | 2.4% | 61.5% | 374 | 136 | 5846 | 2.4% | 118 | 110 | | 18 | |
| 31-Dec-10 | 17063 | 5.3% | 70.1% | 855 | 311 | 6157 | 5.3% | 294 | 294 | | 17 | |
| 31-Dec-11 | 17817 | 4.4% | 77.6% | 754 | 274 | 6431 | 4.5% | 255 | 255 | | 19 | |
| 31-Dec-12 | 18479 | 3.7% | 84.2% | 663 | 241 | 6672 | 3.7% | 221 | 221 | | 20 | |
| 31-Dec-13 | 19104 | 3.4% | 90.4% | 624 | 227 | 6899 | 3.4% | 208 | 208 | | 19 | |
| 31-Dec-14 | 19755 | 3.4% | 96.9% | 652 | 237 | 7136 | 3.4% | 218 | 218 | | 19 | |
| 31-Dec-15 | 20465 | 3.6% | 104.0% | 710 | 258 | 7394 | 3.6% | 239 | 239 | | 19 | |
| 31-Dec-16 | 21174 | 3.5% | 111.0% | 710 | 258 | 7394 | 3.6% | 239 | 239 | | 19 | |
| 31-Dec-17 | 21859 | 3.2% | 117.8% | 685 | 249 | 7643 | 3.4% | 230 | 230 | | 19 | |
| 31-Dec-18 | 22533 | 3.1% | 124.6% | 674 | 245 | 7888 | 3.2% | 226 | 226 | | 19 | |
| 31-Dec-19 | 23209 | 3.0% | 131.3% | 677 | 246 | 8134 | 3.1% | 227 | 227 | | 19 | |
| 31-Dec-20 | 23894 | 3.0% | 138.1% | 685 | 249 | 8383 | 3.1% | 230 | 230 | | 19 | |

## Table 2. Los Lunas Service Area Population: 1999-2050

1999-2009 calculations based on actual data; 2010-2050 projections based on report methodology

| VILLAGE OF LOS LUNAS POPULATION ESTIMATES | | | | |
|---|---|---|---|---|
| DATE | VILLAGE | NON-VILLAGE | INMATE | TOTAL |
| 31-Dec-99 | 10,034 | 278 | 0 | 10,312 |
| 31-Dec-00 | 10,389 | 278 | 0 | 10,667 |
| 31-Dec-01 | 10,785 | 278 | 0 | 11,063 |
| 31-Dec-02 | 11,131 | 278 | 0 | 11,409 |
| 31-Dec-03 | 11,373 | 278 | 0 | 11,651 |
| 31-Dec-04 | 11,714 | 278 | 0 | 11,992 |
| 31-Dec-05 | 13,276 | 278 | 0 | 13,554 |
| 31-Dec-06 | 14,489 | 278 | 0 | 14,767 |
| 31-Dec-07 | 15,339 | 278 | 0 | 15,617 |
| 31-Dec-08 | 15,834 | 278 | 0 | 16,112 |
| 31-Dec-09 | 16,208 | 278 | 1,200 | 17,686 |
| 31-Dec-10 | 17,063 | 278 | 1,217 | 18,558 |
| 31-Dec-11 | 17,817 | 278 | 1,234 | 19,328 |
| 31-Dec-12 | 18,479 | 278 | 1,251 | 20,008 |
| 31-Dec-13 | 19,104 | 278 | 1,269 | 20,650 |
| 31-Dec-14 | 19,755 | 278 | 1,286 | 21,320 |
| 31-Dec-15 | 20,465 | 278 | 1,304 | 22,047 |
| 31-Dec-16 | 21,174 | 278 | 1,323 | 22,775 |
| 31-Dec-17 | 21,859 | 278 | 1,341 | 23,478 |
| 31-Dec-18 | 22,533 | 278 | 1,360 | 24,171 |
| 31-Dec-19 | 23,209 | 278 | 1,379 | 24,866 |
| 31-Dec-20 | 23,894 | 278 | 1,398 | 25,570 |
| 31-Dec-21 | 24,491 | 278 | 1,418 | 26,187 |
| 31-Dec-22 | 25,104 | 278 | 1,438 | 26,819 |
| 31-Dec-23 | 25,731 | 278 | 1,458 | 27,467 |
| 31-Dec-24 | 26,375 | 278 | 1,478 | 28,131 |
| 31-Dec-25 | 27,034 | 278 | 1,500 | 28,812 |
| 31-Dec-26 | 27,550 | 278 | 1,500 | 29,328 |
| 31-Dec-27 | 28,076 | 278 | 1,500 | 29,854 |
| 31-Dec-28 | 28,613 | 278 | 1,500 | 30,391 |
| 31-Dec-29 | 29,159 | 278 | 1,500 | 30,937 |
| 31-Dec-30 | 29,716 | 278 | 1,500 | 31,494 |
| 31-Dec-31 | 30,284 | 278 | 1,500 | 32,062 |
| 31-Dec-32 | 30,862 | 278 | 1,500 | 32,640 |
| 31-Dec-33 | 31,452 | 278 | 1,500 | 33,230 |
| 31-Dec-34 | 32,052 | 278 | 1,500 | 33,830 |
| 31-Dec-35 | 32,665 | 278 | 1,500 | 34,443 |
| 31-Dec-36 | 33,288 | 278 | 1,500 | 35,066 |
| 31-Dec-37 | 33,862 | 278 | 1,500 | 35,640 |
| 31-Dec-38 | 34,436 | 278 | 1,500 | 36,214 |
| 31-Dec-39 | 35,010 | 278 | 1,500 | 36,788 |
| 31-Dec-40 | 35,584 | 278 | 1,500 | 37,362 |
| 31-Dec-41 | 36,158 | 278 | 1,500 | 37,936 |
| 31-Dec-42 | 36,732 | 278 | 1,500 | 38,510 |
| 31-Dec-43 | 37,306 | 278 | 1,500 | 39,084 |
| 31-Dec-44 | 37,880 | 278 | 1,500 | 39,658 |
| 31-Dec-45 | 38,454 | 278 | 1,500 | 40,232 |
| 31-Dec-46 | 39,028 | 278 | 1,500 | 40,806 |
| 31-Dec-47 | 39,602 | 278 | 1,500 | 41,380 |
| 31-Dec-48 | 40,176 | 278 | 1,500 | 41,954 |
| 31-Dec-49 | 40,750 | 278 | 1,500 | 42,528 |
| 31-Dec-50 | 41,324 | 278 | 1,500 | 43,102 |

Note: CNMCF hooked up in July, 2009

## Table 3. Los Lunas Diversion; Per Capita Demand: 1996-2008

| VILLAGE OF LOS LUNAS<br>PER CAPITA WATER USE: 1996-2008 | | | |
|---|---|---|---|
| YEAR | DIV. (AFY) | POPULATION | GPCD |
| 1996 | 1,698.5 | 8,703 | 174.2 |
| 1997 | 1,757.8 | 9,105 | 172.4 |
| 1998 | 1,961.0 | 9,507 | 184.2 |
| 1999 | 1908.9 | 10,389 | 164.0 |
| 2000 | 2072.3 | 10,667 | 173.4 |
| 2001 | 1986.0 | 11,063 | 160.3 |
| 2002 | 1920.3 | 11,409 | 150.3 |
| 2003 | 2067.1 | 11,651 | 158.4 |
| 2004 | 1968.0 | 11,992 | 146.5 |
| 2005 | 2002.6 | 13,554 | 131.9 |
| 2006 | 2143.7 | 14,767 | 129.6 |
| 2007 | 2320.0 | 15,617 | 132.6 |
| 2008 | 2165.3 | 16,112 | 120.0 |

Note: Population includes Village residents and non-Village residents on water system

## TABLE 4. VILLAGE OF LOS LUNAS DEMAND FOR WATER

All Demand projections in AFY

| DATE | POPULATION | GPCD | VILLAGE DEMAND | PRISON | TOTAL |
|---|---|---|---|---|---|
| 31-Dec-05 | 13,554 | 143 | 2,002.6 | 0 | 2,002.6 |
| 31-Dec-06 | 14,767 | 140 | 2,143.7 | 0 | 2,143.7 |
| 31-Dec-08 | 16,112 | 140 | 2,158.7 | 0 | 2,158.7 |
| 31-Dec-10 | 17,341 | 140 | 2,719.4 | 210.0 | 2,929.4 |
| 31-Dec-11 | 18,095 | 140 | 2,837.6 | 212.9 | 3,050.5 |
| 31-Dec-12 | 18,757 | 140 | 2,941.5 | 215.9 | 3,157.4 |
| 31-Dec-13 | 19,382 | 140 | 3,039.4 | 218.9 | 3,258.4 |
| 31-Dec-14 | 20,033 | 140 | 3,141.6 | 222.0 | 3,363.6 |
| 31-Dec-15 | 20,743 | 140 | 3,252.9 | 225.1 | 3,478.0 |
| 31-Dec-16 | 21,452 | 140 | 3,364.1 | 228.3 | 3,592.4 |
| 31-Dec-17 | 22,137 | 140 | 3,471.5 | 231.5 | 3,703.0 |
| 31-Dec-18 | 22,811 | 140 | 3,577.2 | 234.7 | 3,811.9 |
| 31-Dec-19 | 23,487 | 140 | 3,683.3 | 238.0 | 3,921.3 |
| 31-Dec-20 | 24,172 | 140 | 3,790.7 | 241.3 | 4,032.0 |
| 31-Dec-21 | 24,769 | 140 | 3,884.3 | 244.7 | 4,129.0 |
| 31-Dec-22 | 25,382 | 140 | 3,980.4 | 248.1 | 4,228.5 |
| 31-Dec-23 | 26,009 | 140 | 4,078.8 | 251.6 | 4,330.4 |
| 31-Dec-24 | 26,653 | 140 | 4,179.6 | 255.1 | 4,434.8 |
| 31-Dec-25 | 27,312 | 140 | 4,283.1 | 258.7 | 4,541.7 |
| 31-Dec-26 | 27,828 | 140 | 4,364.0 | 262.5 | 4,626.5 |
| 31-Dec-27 | 28,354 | 140 | 4,446.5 | 262.5 | 4,709.0 |
| 31-Dec-28 | 28,891 | 140 | 4,530.6 | 262.5 | 4,793.1 |
| 31-Dec-29 | 29,437 | 140 | 4,616.3 | 262.5 | 4,878.8 |
| 31-Dec-30 | 29,994 | 140 | 4,703.7 | 262.5 | 4,966.2 |
| 31-Dec-31 | 30,562 | 140 | 4,792.7 | 262.5 | 5,055.2 |
| 31-Dec-32 | 31,140 | 140 | 4,883.4 | 262.5 | 5,145.9 |
| 31-Dec-33 | 31,730 | 140 | 4,975.8 | 262.5 | 5,238.3 |
| 31-Dec-34 | 32,330 | 140 | 5,070.0 | 262.5 | 5,332.5 |
| 31-Dec-35 | 32,943 | 140 | 5,166.0 | 262.5 | 5,428.5 |
| 31-Dec-36 | 33,566 | 140 | 5,263.9 | 262.5 | 5,526.4 |
| 31-Dec-37 | 34,140 | 140 | 5,353.9 | 262.5 | 5,616.4 |
| 31-Dec-38 | 34,714 | 140 | 5,443.9 | 262.5 | 5,706.4 |
| 31-Dec-39 | 35,288 | 140 | 5,533.9 | 262.5 | 5,796.4 |
| 31-Dec-40 | 35,862 | 140 | 5,623.9 | 262.5 | 5,886.4 |
| 31-Dec-41 | 36,436 | 140 | 5,714.0 | 262.5 | 5,976.5 |
| 31-Dec-42 | 37,010 | 140 | 5,804.0 | 262.5 | 6,066.5 |
| 31-Dec-43 | 37,584 | 140 | 5,894.0 | 262.5 | 6,156.5 |
| 31-Dec-44 | 38,158 | 140 | 5,984.0 | 262.5 | 6,246.5 |
| 31-Dec-45 | 38,732 | 140 | 6,074.0 | 262.5 | 6,336.5 |
| 31-Dec-46 | 39,306 | 140 | 6,164.0 | 262.5 | 6,426.5 |
| 31-Dec-47 | 39,880 | 140 | 6,254.1 | 262.5 | 6,516.6 |
| 31-Dec-48 | 40,454 | 140 | 6,344.1 | 262.5 | 6,606.6 |
| 31-Dec-49 | 41,028 | 140 | 6,434.1 | 262.5 | 6,696.6 |
| 31-Dec-50 | 41,602 | 140 | 6,524.1 | 262.5 | 6,786.6 |

Notes: Includes per capita demand for 2005, 2006 and 2008, per OSE GPD Calculator

## Table 5. Los Lunas Water System Improvements

| Year | Description |
|---|---|
| 1939 | Construction of Well 1, Tank 1. Service to small Village population |
| 1969 | Construction of Wells 2 and 3, and Tank 3, including Tank 3 booster pump station. |
| 1987 | Well 4, Tank 4 Built. |
| 1991 | Wells 1, 2 plugged with concrete. Tank 1 abandoned, later demolished. |
| 1991 | Well 3 replaced entirely, including booster pump station. |
| 1994 | Tank 5 Built. |
| 1996 | Well 5 Built. |
| 2003 | Construction of Well 6, Tank 6, North Loop transmission line, and booster pump station at the Well 6 site. |
| 2007 | Construction of a booster pump station adjacent to the Tank 5/6 site, water transmission lines, and Tank 7. |

## Table 6. Village of Los Lunas Wells

| Well No. | OSE No. | Location | Depth | Casing | Prod. | Tank | Capacity | Comments |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | (gpm) | | | Plugged |
| 2 | RG-17065-S | X=354,200<br>Y=1,385,100 | | | | | | Plugged |
| 3 | RG-17065-S-2 | X=347,856<br>Y=1,390,325 | 605 | 14 | 875 | 3 | 0.5 MG | Booster pump station can feed other pressure zones, Tanks 5 nd 6. |
| 4 | RG-17065-S-3 | X=349,919<br>Y=1,395,890 | 590 | 14 | 1190 | 4 | 1 MG | Supplies northern Village |
| 5 | RG-17065-S-4 | X=344,963<br>Y=1,388,321 | 700 | 14 | 1528 | | None | Provides supply to area west of I-25 |
| 6 | RG-17065 | X=344,800<br>Y=1,382,500 | 660 | 24 | 1400 | 6 | 1.5 MG | |

Note: Tank 7 is located by Tanks 5 and 6. It has been constructed and is currently online; will primarily serve future growth.

## Table 7. Village of Los Lunas Water Rights (9/30/10)

| NO. | TYPE OF RIGHT | DIVERSION | C.U. |
|---|---|---|---|
| W1 | Vested | 169.000 | 169.000 |
| W2 | Vested | 387.000 | 387.000 |
| | **SUBTOTAL** | 556.000 | 556.000 |
| W3-W6 | Supplemental Wells | | |
| T1-T-140 | Transferred Irrigation Rights | 4286.562 | 2144.738 |
| | San Juan-Chama Right | 784.000 | 392.000 |
| SUBTOTAL | | 5626.562 | 3092.738 |
| | Pending Transfers | | |
| T-141 | RG-1436-A | 53.160 | 26.580 |
| T-142 | SD-8521 | 55.020 | 27.510 |
| T-143 | SD-8520 | 82.020 | 41.010 |
| | **SUBTOTAL** | 190.200 | 95.100 |
| **TOTAL** | | 5816.762 | 3187.838 |
| | San Juan-Chama Storage | 336.000 | 168.000 |

Note 1. Water in storage can be used only once. It will be depleted by evaporative losses of 3-4 percent per year.

In addition, the Village is currently required to release 10 percent of its water in storage to the MRGCD.

# ATTACHMENTS

Attachment 1.

# 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 worksheets. 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 additiona Instructions Info

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

**NAME OF CITY OR UTILITY:** Los Lunas — New Mexico

**REPORTING YEARS:** Enter the most recent reporting year: 2009 — Data can be entered back to: 2003

**NAME OF CONTACT PERSON:** John Fullerton — **E-MAIL:** john.fullerton@gmail.com — **TELEPHONE:** — **Ext.**

**SELECT THE REPORTING UNITS FOR VOLUME DATA:** Gallons (US) — Gallons per Capita - v2.04 Beta

| | |
|---|---|
| Instructions & Utility | This sheet |
| Census Data | Census data and the portal to get the data from the Census website |
| Single-Family | Single-Family residential gallons and population |
| Multi-Family | Multi-Family residential gallons and population |
| ICI & Other Metered | Other data including Commercial, Industrial and Institutional [1.3] and Other metered [1.4] categories |
| Reuse | Data related to water reuse projects |
| Total Diverted | Total Production and Diverted Water |
| Reported Data | The calculated data graphical review of most common performance indicators |
| Annual Performance | The calculated data graphical review of **annual** performance indicators |
| Monthly Performance | The calculated data graphical review of **monthly** performance indicators |
| Definitions | 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: waternm@state.nm.us

# Census Information Data Table 2.1

Info

Click here to access the Census Web site

OR

Click here for instructions on how to find the data on the Census website

2009 TO 2003

*Use the most recent census data*

Return to Instructions

**DATA**

| US Census Table | Description | | INPUT |
|---|---|---|---|
| | | CENSUS YEAR | |
| P37 | Group Quarters Population | Total | **114** |
| H3 | Occupancy Status | Total | **3,845** |
| from H3 | | Occupied | **3,601** |
| from H3 | | Vacant | **244** |
| H12 | Ave. Household Size of Occupied Housing Units | Total | **2.75** |

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

| | |
|---|---|
| Vacancy Rate % | 6.3% |

COMMENTS:

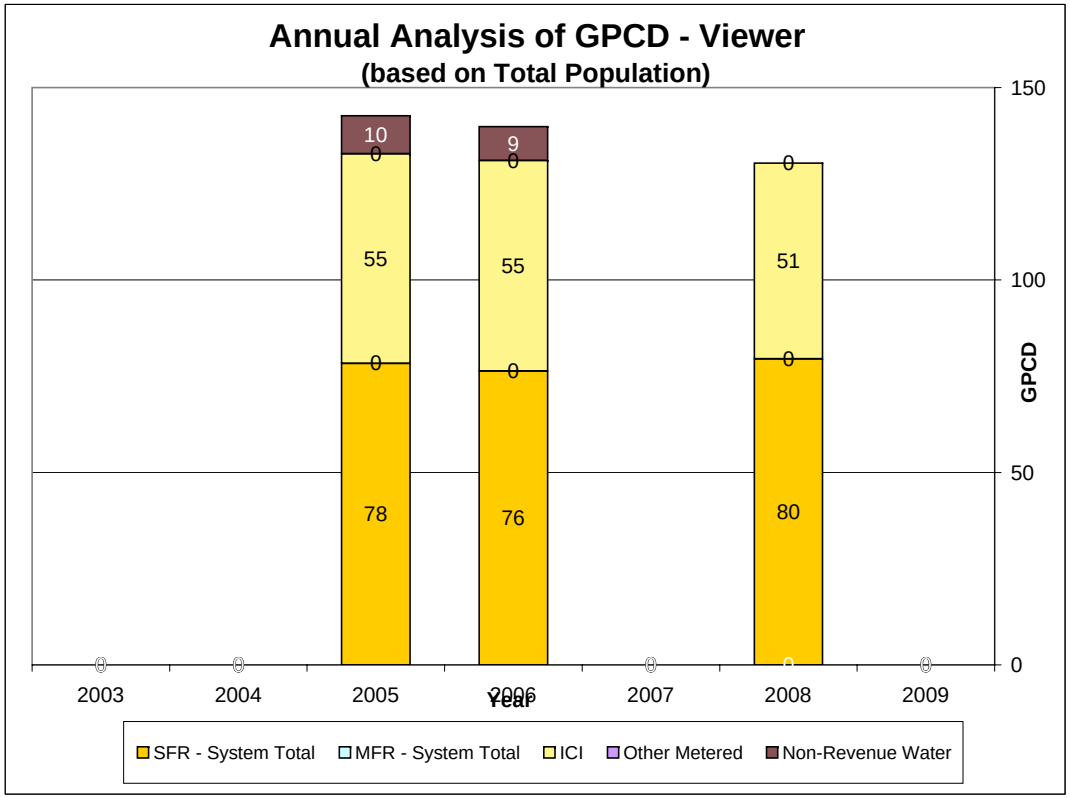
## 9. Annual Reporting Performance

Return to Instructions

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

| Year | SFR - System Total | MFR - System Total | ICI | Other Metered | Non-Revenue Water (Info) | Total Supplied | Non-Revenue Volume Million Gallons (US) |
|---|---|---|---|---|---|---|---|
| On Graph? | Yes | Yes | Yes | Yes | Yes | | |
| 2009 | N/A | N/A | N/A | N/A | #VALUE! | #VALUE! | 669.99 |
| 2008 | 79.51 | N/A | 50.89 | N/A | -0.27 | 130.13 | (1.45) |
| 2007 | N/A | N/A | N/A | N/A | #VALUE! | #VALUE! | - |
| 2006 | 76.36 | N/A | 54.66 | N/A | 8.86 | 139.88 | 44.24 |
| 2005 | 78.30 | N/A | 54.51 | N/A | 9.91 | 142.71 | 45.36 |
| 2004 | N/A | N/A | N/A | N/A | #VALUE! | #VALUE! | - |
| 2003 | N/A | N/A | N/A | N/A | #VALUE! | #VALUE! | - |

| Los Lunas | | |
|---|---|---|
| | | |
| 2009 | to | 2003 |



Attachment 2.

# AWWA WLCC Free Water Audit Software: Reporting Worksheet

 WAS v4.0

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? Click to access definition

Water Audit Report for: Los Lunas
Reporting Year: 2008 1/2008 - 12/2008

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 (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**

## WATER SUPPLIED

<< Enter grading in column 'E'

| | | | | |
|---|---|---|---|---|
| Volume from own sources: | 7 | 697.417 | Million gallons (US)/yr (MG/Yr) | |
| Master meter error adjustment (enter positive value): | 2 | 8.154 | under-registered | MG/Yr |
| Water imported: | n/a | | MG/Yr | |
| Water exported: | n/a | | MG/Yr | |
| **WATER SUPPLIED:** | | 705.571 | MG/Yr | |

## AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

| | | | | Pcnt: | Value: |
|---|---|---|---|---|---|
| Billed metered: | 7 | 699.000 | MG/Yr | | |
| Billed unmetered: | 8 | | MG/Yr | | |
| Unbilled metered: | 9 | | MG/Yr | | |
| Unbilled unmetered: | 6 | 0.100 | MG/Yr | | 0.100 |
| **AUTHORIZED CONSUMPTION:** | | 699.100 | MG/Yr | | |

Use buttons to select percentage of water supplied

OR

value

## WATER LOSSES (Water Supplied - Authorized Consumption)

6.471 MG/Yr

### Apparent Losses

| | | | | Pcnt: | Value: |
|---|---|---|---|---|---|
| Unauthorized consumption: | | 1.764 | MG/Yr | 0.25% | |
| Customer metering inaccuracies: | 9 | 0.700 | MG/Yr | 0.10% | |
| Systematic data handling errors: | 7 | 0.700 | MG/Yr | | |
| Apparent Losses: | | 3.164 | | | |

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

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

### Real Losses

| | | | |
|---|---|---|---|
| Real Losses = Water Losses - Apparent Losses: | | 3.307 | MG/Yr |
| **WATER LOSSES:** | | 6.471 | MG/Yr |

## NON-REVENUE WATER

**NON-REVENUE WATER:** 6.571 MG/Yr

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

## SYSTEM DATA

| | | | | |
|---|---|---|---|---|
| Length of mains: | 6 | 128.0 | miles | |
| Number of active AND inactive service connections: | 8 | 5,757 | | |
| Connection density: | | 45 | conn./mile main | |
| Average length of customer service line: | 6 | 50.0 | ft | (pipe length between curbstop and customer meter or property boundary) |
| Average operating pressure: | 6 | 65.0 | psi | |

## COST DATA

| | | | |
|---|---|---|---|
| Total annual cost of operating water system: | 6 | $3,574,519 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | 8 | $7.76 | $/1000 gallons (US) |
| Variable production cost (applied to Real Losses): | 6 | $5,084.00 | $/Million gallons |

## PERFORMANCE INDICATORS

### Financial Indicators

| | |
|---|---|
| Non-revenue water as percent by volume of Water Supplied: | 0.9% |
| Non-revenue water as percent by cost of operating system: | 1.2% |
| Annual cost of Apparent Losses: | $24,550 |
| Annual cost of Real Losses: | $16,815 |

### Operational Efficiency Indicators

| | | |
|---|---|---|
| Apparent Losses per service connection per day: | 1.51 | gallons/connection/day |
| Real Losses per service connection per day*: | 1.57 | gallons/connection/day |
| Real Losses per length of main per day*: | N/A | |
| Real Losses per service connection per day per psi pressure: | 0.02 | gallons/connection/day/psi |
| Unavoidable Annual Real Losses (UARL): | 46.62 | million gallons/year |
| Infrastructure Leakage Index (ILI) [Real Losses/UARL]: | 0.07 | |

* only the most applicable of these two indicators will be calculated

### WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 64 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: Master meter error adjustment
2: Volume from own sources
3: Billed metered

For more information, click here to see the Grading Matrix worksheet

# AWWA WLCC Free Water Audit Software: Water Balance

 WAS v4.0

| Water Audit Report For: | Report Yr: |
|---|---|
| Los Lunas | 2008 |

<table>
<tr><td rowspan="11">Own Sources<br>(Adjusted for known errors)<br>705.571</td><td>Water Exported<br>0.000</td><td colspan="3">Billed Water Exported</td></tr>
<tr><td rowspan="10">Water Supplied<br>705.571</td><td rowspan="3">Authorized Consumption<br>699.100</td><td rowspan="2">Billed Authorized Consumption<br>699.000</td><td>Billed Metered Consumption (inc. water exported)<br>699.000</td><td rowspan="2">Revenue Water<br>699.000</td></tr>
<tr><td>Billed Unmetered Consumption<br>0.000</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption<br>0.100</td><td>Unbilled Metered Consumption<br>0.000</td><td rowspan="3">Non-Revenue Water (NRW)<br>6.571</td></tr>
<tr><td>Unbilled Unmetered Consumption<br>0.100</td></tr>
<tr><td rowspan="7">Water Losses<br>6.471</td><td rowspan="3">Apparent Losses<br>3.164</td><td>Unauthorized Consumption<br>1.764</td></tr>
<tr><td>Customer Metering Inaccuracies<br>0.700</td></tr>
<tr><td>Systematic Data Handling Errors<br>0.700</td></tr>
<tr><td rowspan="4">Real Losses<br>3.307</td><td>Leakage on Transmission and/or Distribution Mains<br>Not broken down</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks<br>Not broken down</td></tr>
<tr><td>Leakage on Service Connections<br>Not broken down</td></tr>
<tr><td>Water Imported<br>0.000</td></tr>
</table>

# AWWA WLCC Free Water Audit Software: Grading Matrix



WASv 4.0

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**In the Reporting Worksheet, grades were assigned to each component of the audit to describe the confidence and accuracy of the input data. The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red**

## Grading

| | n/a | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volume from own sources:** | Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own) | Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing. | 25% - 50% of water production sources are metered; other sources estimated. No regular meter accuracy testing. | Conditions between 2 and 4 | 50% - 75% of water production sources are metered, other sources estimated. Occasional meter accuracy testing | Conditions between 4 and 6 | At least 75% of water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy. | Conditions between 6 and 8 | 100% of water supply sources are metered, meter accuracy testing and electronic calibration conducted annually, less than 10% of meters are found outside of +/- 6% accuracy | Conditions between 8 and 10 | 100% of water production sources are metered, meter accuracy testing and electronic calibration conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. |
| Improvements to attain higher data grading for "Volume from own Sources" component: | | to qualify for 2: Organize efforts to begin to collect data for determining volume from own sources | to qualify for 4: Locate all water production sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters | | to qualify for 6: Formalize annual meter accuracy testing for all source meters. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters. | | to qualify for 8: Conduct annual meter accuracy testing on all meters. 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. | | to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 6% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy. | | to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology. |
| **Master meter error adjustment:** | Select n/a only if the water utility fails to have meters on its sources of supply, either its own source, and/or imported (purchased) water sources | Inventory information on meters and paper records of measured volumes in crude condition; data error cannot be determined | No automatic datalogging of production volumes; daily readings are scribed on paper records. Tank/storage elevation changes are not employed in calculating "Volume from own sources" component. Data is adjusted only when grossly evident data error occurs. | Conditions between 2 and 4 | Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary. | Conditions between 4 and 6 | Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data adjusted to correct gross error from equipment malfunction and error confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component. | Conditions between 6 and 8 | Continuous production meter data logged automatically & reviewed daily. Data adjusted to correct gross error from equipment malfunction & results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations. | Conditions between 8 and 10 | Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results reviewed daily. Mass balance technique compares production meter data to raw (untreated) water and treatment volumes to detect anomalies. Regular calibrations between SCADA and sources meters ensures minimal data transfer error. |
| Improvements to attain higher data grading for "Master meter error adjustment" component: | | to qualify for 2: Develop plan to restructure recordkeeping system to capture all flow data; set procedure to review data daily to detect input errors | to qualify for 4: Install automatic datalogging equipment on production meters. Identify tanks/storage facilities and include estimated daily volume of water added to, or subtracted from, "Water Supplied" volume based upon changes in storage | | to qualify for 6: Review hourly production meter data for gross error on, at least, a weekly basis. Begin to install instrumentation on tanks/storage facilities to record elevation changes. Use daily net storage change to balance flows in calculating "Water Supplied" volume. | | to qualify for 8: Complete installation of elevation instrumentation on all tanks/storage facilities. Continue to use daily net storage change in calculating balanced "Volume from own sources" component. Adjust production meter data for gross error and inaccuracy confirmed by testing. | | to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. | | to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. |
| Water Imported: | Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water) | Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing. | 25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing. | Conditions between 2 and 4 | 50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing | Conditions between 4 and 6 | At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy. | Conditions between 6 and 8 | 100% of imported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually, less than 10% of meters are found outside of +/- 6% accuracy | Conditions between 8 and 10 | 100% of imported water sources are metered, meter accuracy testing and/or electronic calibration conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. |
| Improvements to attain higher data grading for "Water Imported Volume" component: | | to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources. | To qualify for 4: Locate all imported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters | | to qualify for 6: Formalize annual meter accuracy testing for all imported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters. | | 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. Repair or replace meters outside of +/- 6% accuracy. | | to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 6% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy. | | to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology. |

| Grading | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | n/a | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Water Exported: | Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales) | Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing. | 25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing. | Conditions between 2 and 4 | 50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing | Conditions between 4 and 6 | At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy. | Conditions between 6 and 8 | 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 | Conditions between 8 and 10 | 100% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. |
| Improvements to attain higher data grading for "Water Exported Volume" component: | | to qualify for 2: Review bulk water sales agreements with partner suppliers; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed. | To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters | | to qualify for 6: 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. | | to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all imported water meters. Repair or replace meters outside of +/- 6% accuracy. | | to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 6% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy. | | to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology. |
| **AUTHORIZED CONSUMPTION** | | | | | | | | | | | |
| **Billed metered:** | Select n/a only if the customer population is not metered, and is billed for water service on a flat or fixed rate basis | Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billed for the majority of the customer population | At least 50% of customers with volume-based billing from meter reads; flat or fixed rate billed for remainder. Manual meter reading used, less than 50% read success rate, failed reads are estimated. Limited customer meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing. | Conditions between 2 and 4 | At least 75% of customers with volume-based billing from meter reads; flat or fixed rate billed for remainder. Manual meter reading used, at least 50% meter read success rate, failed reads are estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters replaced only upon complete failure. Computerized billing records, but only periodic internal auditing conducted. | Conditions between 4 and 6 | At least 90% of customers with volume-based billing from meter reads; remaining accounts are estimated. Manual customer meter reading gives at least 80% customer meter reading success rate, failed reads are estimated. Good customer meter records, limited meter accuracy testing, regular replacement of oldest meters. Computerized billing records with routine auditing of global statistics. | Conditions between 6 and 8 | At least 97% of customers with volume-based billing from meter reads. At least 90% customer meter read success rate; or minimum 80% read success rate with planning and budgeting for trials of Automatic Metering Reading (AMR) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics; verified periodically by third party. | Conditions between 8 and 10 | At least 99% of customers with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) trials underway. Statistically significant customer meter testing and replacement program in place. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts. Annual audit verification by third party. |
| Improvements to attain higher data grading for "Billed Metered Consumption" component: | If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes. | to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures. | to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system. | | to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Conduct routine audit of global statistics. | | to qualify for 8: Purchase and install meters on unmetered accounts. Assess cost-effectiveness of Automatic Meter Reading (AMR) system for portion or entire system; or achieve ongoing improvements in manual meter reading success rate. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Refine routine auditing procedures based upon third party guidance. | | to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) system trials if manual meter reading success rate of at least 95% 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 routine auditing and require annual third party review. | | to maintain 10: Regular internal and third party auditing, and meter accuracy testing ensures that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management. |
| Billed unmetered: | Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no unmetered accounts exist | Water utility policy does not require customer metering; flat or fixed fee billed. No data collected on customer consumption. Only estimates available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach. | Water utility policy does not require customer metering; flat or fixed fee billed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption recorded on portable dataloggers. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses. | Conditions between 2 and 4 | Water utility policy does require metering and volume based billing but lacks written procedures and employs casual oversight, resulting in up to 20% of billed accounts believed to be unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts. | Conditions between 4 and 6 | Water utility policy does require metering and volume based billing but exemption exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. 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. | Conditions between 6 and 8 | Water utility policy requires metering and volume based billing for all customer accounts. Metering is prevalent in the service area with less than 5% of billed accounts unmetered and existing because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for unmetered accounts via site specific estimation methods. | Conditions between 8 and 10 | Water utility policy requires metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods. |

| Grading | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | n/a | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Improvements to attain higher data grading for "Billed Unmetered Consumption" component: | | to qualify for 2: Investigate a new water utility policy to require metering of the customer population, and a reduction of unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and datalogging the water consumption. | to qualify for 4: Implement a new water utility policy requiring customer metering. Expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. | | to qualify for 6: Budget for staff resources to review billing records to identify unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts | | to qualify for 8: Install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Implement procedures to obtain reliable consumption estimate for unmetered accounts awaiting meter installation. | | to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties to devise means to install water meters or otherwise measure water consumption. | | to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed unmetered accounts as is economically feasible. |
| Unbilled metered: | select n/a if all billing-exempt consumption is unmetered. | Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated. | Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size. | Conditions between 2 and 4 | Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes. | Conditions between 4 and 6 | 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 conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated. | Conditions between 6 and 8 | 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 the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists. | Conditions between 8 and 10 | 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. |
| Improvements to attain higher data grading for "Unbilled metered Consumption" component: | | to qualify for 2: 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 accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum. | to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. | | to qualify for 6: 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. | | to qualify for 8: 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 readings. | | to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process. | | to maintain 10: Reassess philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized. |
| Unbilled unmetered: | | Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate. | Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed. | Conditions between 2 and 4 | Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running x typical flowrate x number of events). | Default value of 1.25% of system input volume is employed | Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated. | Conditions between 6 and 8 | Clear policies and good recordkeeping exist for some uses (ex: unmetered fire connections registering consumption), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time x typical flow) or temporary meters, and relatively subjective estimates of less regulated use. | Conditions between 8 and 10 | Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time x typical flow) or use of temporary meters. |

| Grading | | | | | | | | | | | |
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| Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component: | | to qualify for 5: Utilize accepted default value of 1.25% of system input volume as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings). | to qualify for 5: Utilize accepted default value of 1.25% of system input volume as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need for water from fire hydrants). | | to qualify for 5: Utilize accepted default value of 1.25% of system input volume as expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process. | to qualify for 6 or greater: Finalize policy and do field checks. Proceed if top-down audit exists and/or a great volume of such use is suspected. | to qualify for 8: Assess water utility policy and procedures to ensure that fire hydrant permits are issued for use by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. | | to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status. | | to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually. |
| **APPARENT LOSSES** | | | | | | | | | | | |
| Unauthorized consumption: | | Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated. | Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data. | conditions between 2 and 4 | Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running x typical flowrate x number of events). | Default value of 0.25% of system input volume is employed | Coherent policies exist for some forms of unauthorized consumption but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records. Unsupervised uses are guesstimated. | Conditions between 6 and 8 | Clear policies and good recordkeeping exist for certain events (ex: tampering with water meters); other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption. | Conditions between 8 and 10 | Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is quantified via formulae (time x typical flow) or similar methods. |
| Improvements to attain higher data grading for "Unauthorized Consumption" component: | | to qualify for 5: Use accepted default of 0.25% of system input volume. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings) | to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings) | | to qualify for 5: Utilize accepted default value of 0.25% of system input volume as expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process. | to qualify for 6 or greater: Finalize policy and do field checks. Proceed if top-down audit exists and/or a great volume of such use is suspected. | to quality for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for use and documentation of various occurrences of unauthorized consumption as they are uncovered. | | to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption. | | to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in documentation and enforcement efforts. |
| Customer metering inaccuracies: | select n/a only if the customer population is unmetered | Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program. Workflow is driven chaotically by customer complaints with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated. | Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. | Conditions between 2 and 4 | Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters. Limited number of oldest meters replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data. | Conditions between 4 and 6 | A reliable electronic recordkeeping system for meters exists. Population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data. | Conditions between 6 and 8 | Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters at varying lifespans to determine optimum replacement time for various types of meters. | Conditions between 8 and 10 | Good records of number, type and size of customer meters; ongoing meter replacement occurs. Regular meter accuracy testing gives reliable measure of composite inaccuracy volume for the system. New metering technology is embraced to keep overall accuracy improving. |
| Improvements to attain higher data grading for "Customer meter inaccuracy volume" component: | If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes. | to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of 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 procedures for meter recordkeeping with the electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results. | | to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year. | | to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology. | | to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new technology in Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering and customer consumption data. |

| Grading | | | | | | | | | | | |
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| Systematic Data Handling Error: | select n/a only if the customer population is billed a flat or fixed rate charge that is not based upon measured volumes of water consumption (unmetered population) | Vague policy for permitting (creating new customer accounts) and billing. Billing data maintained on paper records which are in disarray. No audits conducted to confirm billing data handling efficiency. Unknown number of customers escape routine billing due to lack of billing process oversight. | Policy for permitting and billing exists but needs refinement. Billing data maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work conducted to confirm billing data handling efficiency. Volume of unbilled water due to billing lapses is a guess. | Conditions between 2 and 4 | Policy and procedures for permitting and billing exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses. | Conditions between 4 and 6 | Policy for permitting and billing is adequate and reviewed periodically. Computerized billing system in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained. | Conditions between 6 and 8 | Permitting and billing policy reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Annual internal checks conducted with periodic third party audit. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year. | Conditions between 8 and 10 | Sound policy exists for permitting of all customer billing accounts. Robust computerized billing system gives high functionality and reporting capabilities. Assessment of policy and data handling errors conducted internally and audited by third party annually, ensuring consumption lost to billing lapses is minimized and detected as it occurs. |
| Improvements to attain higher data grading for "Systematic Data Handling Error volume" component: | | to qualify for 2: Draft written policy for permitting and billing. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function. | to qualify for 4: Finalize written policy for permitting and billing. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process. | | to qualify for 6: Refine permitting and billing procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process. | | to qualify for 8: Formalize regular review of permitting and billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. | | to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that internal and third party audits are conducted annually. | | to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum. |
| **SYSTEM DATA** | | | | | | | | | | | |
| Length of mains: | | Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated. | Paper records in poor condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented. | Conditions between 2 and 4 | Sound policy and procedures for permitting and documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length. | Conditions between 4 and 6 | Sound policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup. | Conditions between 6 and 8 | Sound policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping and asset management system are used to store and manage data. | Conditions between 8 and 10 | Sound policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. |
| Improvements to attain higher data grading for "Length of Water Mains" component: | | to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedure that result in poor documentation. | to qualify for 4: Complete inventory of paper records of water main installations & abandonments for a number of years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation and abandonments. | | to qualify for 6: Finalize updates/improvements to 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. | | to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic databases with backup as justified. | | to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. | | to maintain 10: Continue with standardization and random field validation to improve knowledge of system. |
| Number of active AND inactive service connections: | | Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count. | General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count. | Conditions between 2 and 4 | Permitting 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 service connection installations & abandonments; but count can be up to 5% in error from actual total. | Conditions between 4 and 6 | Permitting policy and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more that 3%. | Conditions between 6 and 8 | Permitting policy and procedures reviewed at least biannually. Well-managed computerized information management system and routine, periodic field checks and internal system audits allows counts of connections that is no more than 2% in error. | Conditions between 8 and 10 | Sound permitting policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections believed to be in error by less than 1%. |
| Improvements to attain higher data grading for "Number of Active and Inactive customer service connections" component: | | to qualify for 2: Draft new policy and procedures for permitting and billing. Research and collect paper records of installations & abandonments for several years prior to audit year. | to qualify for 4: Refine policy and procedures for permitting and billing. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections. | | to qualify for 6: Refine procedures to ensure consistency with permitting policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year. | | to qualify for 8: Formalize regular review of permitting policy and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system. | | to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances. | | to maintain 10: Continue with standardization and random field validation to improve knowledge of system. |

| Grading | | | | | | | | | | | |
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| Average length of customer service line: | If customer water meters are located outside of the customer building and adjacent to the curbstop or boundary separating utility/customer responsibility for the service connection piping (typically in a meter box or meter pit), then enter a value of zero in the Reporting Worksheet with a grading of 10. | Gradings 1-9 apply if customer properties are **unmetered**, if customer meters exist and are located **inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building** . In any of these cases the average distance between the curbstop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet) | | | | | | | | | Either of two conditions can be met to obtain a grading of 10 : a) The customer water meter is located outside of the customer building adjacent to the curbstop or boundary separating utility/customer responsibility for the service connection piping. In this case enter a value of zero in the Reporting Worksheet with a grading of 10. b). Customer water meters are located inside customer buildings, or the properties are unmetered. In either case the distance is highly reliable since data is drawn from a Geographic Information System (GIS) and confirmed by routine field checks. |
| | | Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curbstops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curbstops. | Policy requires that the curbstop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curbstop is the property of the water utility; and the piping from the curbstop to the customer building is owned by the customer. Most curbstops are installed as required but are not well-documented. Their location varies widely from site-to-site, and an estimate of this distance is based upon the findings of a small group of locations measured in the field. | Conditions between 2 and 4 | Good policy requires that the curbstop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curbstops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records. | Conditions between 4 and 6 | Clear policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties. | Conditions between 6 and 8 | Clearly worded policy standardizes the location of curbstops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curbstops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length. | Conditions between 8 and 10 | |
| Improvements to attain higher data grading for "Average Length of Customer Service Line" component: | | to qualify for 2 : Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curbstops. Obtain the length of this small sample of connections in this manner. | to qualify for 4 : Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data. | | to qualify for 6 : Establish coherent procedures to ensure that policy for curbstop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system. | | to qualify for 8 : Implement an electronic means of recordkeeping, typically via a customer information system or customer billing system. Standardize the process to conduct field checks of limited number of locations. | | to qualify for 10 : Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data. | | to maintain 10 : Continue with standardization and random field validation to improve knowledge of system. |
| Average operating pressure: | | Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation. | Limited telemetry monitoring of scattered sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls at points in the distribution system. | Conditions between 2 and 4 | Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data. | Conditions between 4 and 6 | Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data. | Conditions between 6 and 8 | Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable SCADA System data. | Conditions between 8 and 10 | Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. |
| Improvements to attain higher data grading for "Average Operating Pressure" component: | | to qualify for 2 : Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics | to qualify for 4 : Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure. | | to qualify for 6 : Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure. | | to qualify for 8 : Install a Supervisory Control and Data Acquisition (SCADA) System to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging. | | to qualify for 10 : Obtain average pressure data from 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. | | to maintain 10 : Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging. |

| Grading | | | | | | | | | | | |
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| **COST DATA** | | | | | | | | | | | |
| Total annual cost of operating water system: | | Incomplete paper records and lack of documentation on many operating functions making calculation of 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. | Conditions between 2 and 4 | Electronic, industry-standard cost accounting system in place. Gaps in data known to exist, periodic internal reviews conducted but not a structured audit. | Conditions between 4 and 6 | Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, not a Certified Public Accountant (CPA). | Conditions between 6 and 8 | Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and periodically by third-party CPA. | Conditions between 8 and 10 | Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and by third-party CPA. |
| Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component: | | to qualify for 2: Gather available records, institute new procedures to regularly collect and 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 audit 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 routine financial audit on an annual basis. | | to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis. | | to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively |
| Customer retail unit cost (applied to Apparent Losses): | | Antiquated, cumbersome water rate structure is use, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent 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. | Conditions between 2 and 4 | Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes. | Customer population unmetered. Fixed fee charged; single composite number derived from multiple customer classes. | Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block. | Conditions between 6 and 8 | Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, including residential, commercial, industrial and any other customer classes within the water rate structure. | Conditions between 8 and 10 | Third party reviewed weighted average composite consumption rate (includes residential, commercial, industrial, etc.) |
| Improvements to attain higher data grading for "Customer Retail Unit Cost" component: | | 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 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure. | | to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure. | Meter customers and charge rates based upon water volumes | to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure. | | to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure. | | to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified. |
| Variable production cost (applied to Real Losses): | If the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10 | Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate | Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost. | Conditions between 2 and 4 | Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate calculation of unit variable production costs based on these two inputs only. All costs are audited internally on a periodic basis. | Conditions between 4 and 6 | Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power and treatment (ex: liability, residuals management, etc.) are included in the unit variable production cost. Data audited at least annually by utility personnel. | Conditions between 6 and 8 | Reliable electronic, industry-standard cost accounting system in place, with all pertinent variable production costs tracked. Data audited at least annually by utility personnel, and periodically by third-party. | Conditions between 8 and 10 | Either of two conditions can be met to obtain a grading of 10 : 1) Third party CPA audit of all primary and secondary cost components on an annual basis. or: 2) Water supply is entirely purchased as bulk imported water, and unit purchase cost serves as the variable production cost. |
| Improvements to attain higher data grading for "Variable Production Cost" component: | | to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and 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: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, etc.) should be included to calculate a more accurate variable production cost. | | to qualify for 8: Formalize the accounting process to include primary cost components (power, treatment) as well as secondary components (liability, residuals management, etc.) Conduct periodic third-party audits. | | to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis. | | to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively |

Attachment 3.

# Discussion of Grading for AWWA Water Audit: Village of Los Lunas

**VOLUME FROM OWN SOURCES**

Grade: 7

Definition:

(6) At least 75% of water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.

(8) 100% of water supply sources are metered, meter accuracy testing and electronic calibration conducted annually, less than 10% of meters are found outside of +/- 6% accuracy.

Analysis:

The Village has 5 supply wells. All five wells are metered and 100% of the Village's water supply sources are metered. The Village recently replaced a meter at one of its supply wells and it is our opinion that none of the Village meters is now outside of +/- 6% accuracy. However, since the Village does not conduct annual meter accuracy testing and electronic calibration, we have assigned a 7 to this category.

**MASTER METER ERROR ADJUSTMENT**

Grade: 2

Definition:

No automatic datalogging of production volumes; daily readings are scribed on paper records. Tank/storage elevation changes are not employed in calculating "Volume from own sources" component. Data is adjusted only when grossly evident data error occurs.

Analysis:

The Village currently has manual read meters on all supply wells. All readings are taken on paper records. We have no information to show that any tank elevation changes are used to calculate the "Volume from own sources". The Village data is not tested on a regular basis and thus will likely only be adjusted when data errors are grossly evident. The Village has recently replaced one meter that was not registering correct flows.

**WATER IMPORTED**

N/A

**WATER EXPORTED**

N/A

**BILLED METERED**

Grade: 7

Definition:

Conditions between 6 and 8.

(6) At least 90% of customers with volume-based billing from meter reads; remaining accounts are estimated. Manual customer meter reading gives at least 80% customer meter reading success rate, failed reads are estimated. Good customer meter records, limited meter accuracy testing, regular replacement of oldest meters. Computerized billing records with routine auditing of global statistics.
(8) At least 97% of customers with volume-based billing from meter reads. At least 90% customer meter read success rate; or minimum 80% read success rate with planning and budgeting for trials of Automatic Metering Reading (AMR) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics; verified periodically by third party.

Analysis:

The Village generally meets the requirements for a grade of 8. The staff maintains good customer meter records with at least 97% of customers with volume based billing reads; customer read success rate is likely above 95%. Three years ago, the Village converted all meters to remote radio read meters, so there is no current need for replacement of meters. The Village does not audit billing records on a scheduled basis; however, the staff has recently conducted an audit of billing records and found inaccuracies caused by new software associated with the automatic read meters. The Village is currently addressing these issues. Because there is no routine auditing or verification by a third party, we have assigned a grade of 7.

**BILLED UNMETERED**

Grade: 8

Water utility policy requires metering and volume based billing for all customer accounts. Metering is prevalent in the service area with less than 5% of billed accounts unmetered and existing because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for unmetered accounts via specific estimation methods.

Analysis:

The Village is currently operating in a way consistent with the standards set forth for a grade of 8.

**UNBILLED METERED**

Grade: 9: Conditions between 8 and 10

Definition:

(8) 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 the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.

(10) 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.

Analysis:

The Village grants no exemptions for payment and meter readings for all radio read meters are recorded on a monthly basis. Municipal departments budget for water use and are billed on a monthly basis. Contractors are issued temporary fire hydrant meters and pay for metered use. However, since there is no regular auditing of the few unbilled metered accounts, we have not assigned a 10 to this item.

**UNBILLED UNMETERED**

Grade: 6

Definition:

Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed use exists and annual volumes to be quantified by inference, but unsupervised uses are guesstimated.

Analysis:

The Village strives to minimize unmetered use. However, there are some uses which are not metered, including water for firefighting purposes, water use for firefighting training exercises, hydrant flushing and water used for road repairs. For uses such as hydrant flushing and road work, the Village staff provides estimates of use to the Public Works Director. Uses for firefighting and training exercises are guesstimated.

**UNAUTHORIZED CONSUMPTION**

Grade: 5 (Default)

Analysis:

We have assigned the default of 5 to this component. The Village strives to eliminate unauthorized consumption. The staff issues meters for construction use, has installed locks on fire hydrants that are most vulnerable to theft and has installed a metered coin-operated water station for small amounts of use. Finally, the staff is very vigilant about looking for evidence of water theft. However, we do not know how much water is lost to unauthorized consumption and therefore have assigned the default to this category of use.

**CUSTOMER METERING INACCURACIES**

Grade: 9

Definition:

Conditions between 8 and 10.

(8) Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters at varying lifespans to determine optimum replacement time for various types of meters.

(10) Good records of number, type and size of customer meters; ongoing meter replacement occurs. Regular meter accuracy testing gives reliable measure of composite inaccuracy volume for the system. New metering technology is embraced to keep overall accuracy improving.

Analysis:

Within the last 3 years the Village has installed remote radio read meters, which is the most advanced metering system. At this point, meter replacement is not necessary. The Village has excellent records of number, type and size of meters. However, the Village has encountered problems with the software system associated with the meters. The Village is addressing these problems and overall accuracy of the meters is improving. Because of the software problem, we have assigned a 9 to this item.

**SYSTEMATIC DATA HANDLING ERRORS**

Grade: 7

Definition:

Conditions between 6 and 8.

(6) Policy for permitting and billing is adequate and reviewed periodically. Computerized billing system in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.

(8) Permitting and billing policy reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Annual internal checks conducted with periodic third party audit. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.

Analysis:

The Village has state of the art remote radio read meters. The software will produce an array of reports to confirm billing data, including a series of accountability check flags. However, there is no procedure for revising permitting and billing policy. The Village has experienced problems with its billing software and is working to establish complete functionality of the system.

**LENGTH OF MAINS**

Grade: 6

Definition:

(8) Sound policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system back-up.

Analysis:

In the opinion of the Village's consulting engineer, Molzen-Corbin and Associates (MCA), the Village meets all criteria for a grade of 6. The Village maintains paper records, which MCA believes to be highly accurate.

**NUMBER OF ACTIVE AND INACTIVE SERVICE CONNECTIONS**

Grade: 8

Definition:

(8) Permitting policy and procedures reviewed at least biannually. Well-managed computerized information management system and routine, periodic field checks and internal system audits allows counts of connections that is no more than 2% in error.

Analysis:

In the opinion of MCA, the Village will meet all criteria for a grade of 8 once the software update has been completed. This update is scheduled for completion by the end of June.

**AVERAGE LENGTH OF CUSTOMER SERVICE LINE**

Grade: 6

Definition:

(6) Clear policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.

Analysis:

In the opinion of MCA, the Village meets all criteria for a grade of 6. The Village maintains paper records at this time.

**AVERAGE OPERATING PRESSURE**

Grade: 6

Definition:

(6) Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.

Analysis:

In the opinion of MCA, the Village meets all criteria for a grade of 6.

**TOTAL ANNUAL COST OF OPERATING WATER SYSTEM**

Grade: 6

Definition:

Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, not a Certified Public Accountant (CPA).

Analysis:

We believe these conditions are essentially met. Data are audited by the Village Clerk.

**CUSTOMER RETAIL UNIT COST**

Grade: 8

Definition:

Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, including residential, commercial, industrial and any other customer classes within the water rate structure.

Analysis:

We believe these conditions are essentially met. The Village has two categories of users: residential and commercial, which includes municipal users. The service charge is designed to reimburse the Village for the fixed costs of operating the system. The commodity charge is $3.15/1000 gallons. This is based on the variable cost of providing water service.

**VARIABLE PRODUCTION COST**

Grade: 6

Definition:

Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power and treatment (ex: liability, residuals management, etc.) are included in the unit variable production cost. Data audited at least annually by utility personnel.

Analysis:

We believe these conditions are essentially met. Included in the additional costs are budgeted amounts for engineering and water rights consulting services, as well as the lease of the Village's allocation of water from the San Juan Chama Project (SJCP).

Attachment 4.



## 13.20.010 Statement of policy.

A. The governing body has determined that the public health, safety and welfare requires maximum beneficial use of its available water resources to the extent to which it is capable, and that the conservation and most efficient use of water is in the best interest of the community.
B. The purpose of this chapter is to provide a means for the governing body to implement measures to manage water use in response to emergencies or catastrophic events that may disrupt the municipal water supply system.
C. As a basis for initiating actions pursuant to this chapter, the governing body finds that water shortages may exist due to one or more of the following conditions:
1. A general water supply shortage due to a sudden increase in demand or a reduction or limitation at the source of supply;
2. The distribution system or storage facilities of the water utility are inadequate to meet the current or anticipated demands of the water service customers;
3. The water supply system is unable to maintain the minimum water quality standards in accordance with all applicable laws and regulations; or
4. A mechanical or structural breakdown of the supply, storage and/or distribution facilities of the water supply system. (Ord. 331 §1, 2006)

## 13.20.020 Authorization.

A. The governing body may determine and declare that a water emergency exists within the municipal water service area and, upon such determination, to promulgate regulations, rules and conditions relative to the use of water in order to relieve the water shortage.
B. The village administrator, following public notice, is authorized to implement the emergency water shortage plan through the applicable provisions of this chapter. (Ord. 331 §2, 2006)

### 13.20.030 Application.

A. The provisions of this chapter shall apply to all persons, customers and property served by the municipal water utility system. With the exception of temporary water emergency surcharges, these provisions shall also apply to all water users within the corporate limits of the municipality.
B. All domestic wells within the jurisdiction of the municipality shall be governed by this chapter as authorized by state law [3-53-1, 3-53-1.1, and 3-53-2 NMSA 1978]. (Ord. 331 §3, 2006)

### 13.20.040 Water emergency stages.

Any of the following water emergency stages may be declared by the governing body following a determination regarding the severity of conditions leading to a water shortage. Such determination shall be based on the best available information and data regarding the water supply and distribution system.
There are three water emergency stages which are triggered by an impending shortage of water estimated to occur during a specified period of time. If the severity of the water emergency lessens, the governing body may downgrade the water shortage to a lower stage or discontinue the water emergency. The water use restrictions and regulations of each stage are added to all higher level stages, unless the higher stage has a more stringent requirement.
A. Stage 1: Water Shortage Advisory--Voluntary Compliance. Whenever the estimated demands on the water system exceed the estimated supply such that it appears that there will be a substantial shortage of water over the next twelve-month period, a stage 1 water shortage advisory will be declared. The following requirements shall be in effect, and unless otherwise noted, are voluntary but strongly encouraged:
1. The village administrator shall make public announcements through the local news media and any other means available that an impending water problem exists, explaining the water conservation requirements of the stage 1 water shortage advisory;
2. All residents are encouraged to minimize indoor water use by utilizing high efficiency fixtures and appliances, decreasing water use for eating and cleaning purposes, and eliminating all on-site water leaks;
3. Restaurants and banquets are requested to discontinue serving nonbottled drinking water, except upon request;
4. Hotels and motels are urged to implement water conservation measures, including less frequent changing of towels and bed linens during short stays, except upon request;
5. With the exception of hand watering, drip, or subsurface irrigation, all spray irrigation shall be prohibited between ten a.m. and six p.m. daily from the first day of April to the last day of September of each calendar year;
6. The use of potable (drinking) water for dust control and washing down sidewalks, driveways, parking areas, tennis courts, patios or other paved areas shall be prohibited;
7. Routine fire hydrant flushing shall be curtailed except to alleviate specific complaints;
8. Commercial and industrial water users are urged to implement water conservation plans for their facilities and decrease water consumption;

9. All municipal facilities will go on reduced water budgets and outdoor watering of parks, landscaping and recreational areas shall implement nighttime watering schedules;
10. The use of harvested (stored) rainwater and household greywater for outdoor watering is recommended and encouraged; and
11. All domestic well operators are urged to reduce water use to the minimum levels of absolute necessity.

B. Stage 2: Water Shortage Alert--Mandatory Compliance. Whenever the estimated demands on the water system exceed the estimated supply such that it appears that there will be a substantial shortage of water over the next six-month period, a stage 2 water shortage alert will be declared. The following mandatory requirements, in addition to the requirements of the stage 1 water shortage advisory, shall be in effect:
1. The village administrator shall make public announcements through the local news media and any other means available that an immediate water problem exists, explaining the water conservation requirements of the stage 2 water shortage alert;
2. With the exception of hand watering, drip or subsurface irrigation, use of reclaimed or greywater, all spray irrigation shall be prohibited between ten a.m. and six p.m. daily. Landscape watering will be limited to no more than three days a week per following schedule. The last number of the street address shall determine watering days. Odd numbers may water only on Monday, Wednesday, or Friday. Even numbers may water only on Tuesday, Thursday, or Saturday;
3. No new in-ground landscaping shall be planted except for xeriscapes which utilize drip or subsurface irrigation;
4. The use of potable (drinking) water for washing of vehicles, equipment, trailers or boats shall be prohibited, except by use of a handheld bucket or hoses with shut-off nozzles; and
5. A temporary water emergency surcharge shall be instituted as an overlay onto the existing water rate structure on the first billing cycle following declaration of a stage 2 water shortage alert or a stage 3 water shortage emergency. A water emergency surcharge for residential customers shall be applied at a rate of five dollars for every thousand gallon increment above twelve thousand gallons. All industrial and commercial users will be surcharged one dollar per thousand gallons for all water billed during the stage 2 water shortage alert or stage 3 water shortage emergency.

C. Stage 3: Water Shortage Emergency--Mandatory Compliance. Whenever a major failure or disruption of the municipal water supply system occurs, or whenever the estimated demands on the water system exceed the estimated supply such that it appears that there will be a substantial shortage of water over the next two-month period, a stage 3 water shortage emergency will be declared. The following mandatory requirements, in addition to the requirements of the stage 1 water shortage advisory and the stage 2 water shortage alert, shall be in effect:
1. The village administrator shall make public announcements through the local news media and any other means available that a severe water shortage problem exists, explaining the water conservation requirements of the stage 3 water shortage emergency;
2. Subject to certain exceptions, outdoor watering of any lawn, garden, or landscaped area shall be prohibited. Watering performed with permanent drip irrigation system, sub-surface irrigation, reclaimed or greywater is exempt from these requirements. Using a handheld bucket or hose to water trees, shrubs and containerized plants is also permitted;
3. Nurseries watering container plant stock shall be exempt from the restrictions of this

chapter;
4. Fire hydrant flushing shall be prohibited except for firefighting, or emergency potable water supply for human or animal consumption;
5. Use of potable water for recreational or aesthetic purposes such as water slides, fountains or yard play shall be prohibited;
6. All commercial and industrial water users shall implement a water conservation program to reduce water use to the minimum levels of absolute necessity;
7. Depending on the expected severity of the water emergency situation, the governing body shall not be limited to the defined requirements of this chapter. Should the water emergency be of such magnitude to demand more stringent action such as closure of facilities and services, the governing body shall have the authority to impose more severe restrictions or actions. (Ord. 331 §4, 2006)

### 13.20.050 Violations and penalties.

A. The village administrator or designee shall be responsible for the enforcement of this chapter and may prescribe policies, rules or regulations to carry out the intent and purposes of this chapter.
B. Following a determination by the village administrator or designee that a violation of any mandatory requirement of this chapter has occurred, the responsible party shall be issued a written warning citation to abate such violation immediately.
C. If the responsible party continues to violate the stated mandatory requirement, then that party shall be cited to municipal court by the village administrator or designee. Every person convicted of a violation of this chapter shall be punished by a fine not exceeding five hundred dollars or imprisonment for a period not exceeding ninety days, or both such fine and imprisonment. The conviction and punishment of any person for a violation shall not excuse or exempt such person from the payment of any fee due or unpaid at the time of such conviction and nothing in this chapter shall prevent a criminal prosecution of any violation of the provisions of this chapter. Each violation of any mandatory requirement of this chapter shall be considered a separate offense.
D. Disconnection of Service. For repeated violations of this chapter, the village may disconnect the violator’s water service and refuse to provide water service to the violator until assurances satisfactory to the village are provided by the violators that such violations shall cease. (Ord. 331 §5, 2006)

### 13.20.060 Severability.

The provisions of this chapter shall be deemed to be severable, and should any part of this chapter be declared by the courts to be unconstitutional or invalid, such holdings shall not affect the validity of this chapter other than the part so declared to be unconstitutional or invalid. (Ord. 331 §6, 2006)

Attachment 5.



## 8.24.010 Statement of policy.

A. The governing body has determined that wasted water unnecessarily depletes the water supply, results in the loss of a valuable natural resource, causes soil erosion, degrades streets, and may create public safety hazards.
B. Water waste is prohibited as a condition of receiving service from the municipal water utility. Water waste within the municipal limits is prohibited even if the water is not provided by the municipal water utility. (Ord. 342 § 1, 2007)

## 8.24.020 Authorization.

The village administrator or his designee shall be responsible for the enforcement of this chapter. The governing body may prescribe policies, rules, or regulations to carry out the intent and purposes of this chapter. (Ord. 342 § 2, 2007)

## 8.24.030 Definitions.

As used in this chapter:
“Drip irrigation” means low-pressure, low-volume irrigation applied slowly, near or at ground level.
“Fugitive water” means the pumping, flow, release, escape, or leakage of any water from any pipe, valve, faucet, connection, diversion, well, or any facility for the purposes of water supply, transport, storage, disposal, or delivery onto adjacent property or the public right-of-way. Fugitive water shall not include:
1. Storm water run-off;
2. Flow of water resulting from temporary water supply system failures or malfunctions;
3. Water applied to prevent or abate health, safety, or accident hazards when alternate methods are not available. The washing of outdoor eating areas and sidewalks is not included in this exemption;
4. Flow of water resulting from vandalism, weather conditions, or emergencies; and
5. The occurrence of an unforeseeable or unpreventable failure or malfunction of plumbing

or irrigation system hardware.
“Greywater” means untreated household wastewater that has not come in contact with toilet waste. Greywater also does not include water from kitchen sinks or dishwashers.
“Harvested water” means precipitation or irrigation run-off collected, stored and available for reuse for irrigation purposes.
“Public right-of-way” means dedicated public land for the use of the public for the movement of people, goods, vehicles, or storm water. For purposes of this chapter, public right-of-way shall include curbs, streets, and storm water drainage structures.
“Responsible party” means the owner, manager, supervisor, or person who receives the water bill, or person in charge of the property, facility, or operation during the period of time the violation is observed.
“Shut-off nozzle” means a devise attached to the end of a hose that completely shuts off the flow of water, even if left unattended.
“Spray irrigation” means the application of water to landscaping by means of a device that projects water through the air in the form of small particles or droplets.
“Sub-surface irrigation” means low pressure, low volume irrigation applied slowly, below ground level.
“Water waste” means any water, other than natural precipitation, that flows from a property to the public right-of-way or adjacent private property. Water waste is a nonbeneficial use of water. Nonbeneficial uses include but are not restricted to:
1. Landscape water applied in such a manner that it overflows the landscaped area being watered and runs onto adjacent property or public right-of-way;
2. Landscape water which leaves a sprinkler, sprinkler system, or other application device in such a manner as to spray onto adjacent property or public right-of-way;
3. Washing of vehicles, equipment, or hard surfaces such as driveways when water is applied in sufficient quantity to result in excess flow from that surface onto adjacent property or the public right-of-way; and
4. Water shall not be used to clean parking lots unless it is applied to prevent or abate health, safety, or accident hazards when alternate methods are not available. (Ord. 342 § 3, 2007)

### 8.24.040 Water waste restrictions.

A. No person, firm, corporation, or government facility or operation shall cause, or permit to occur any water waste or the flow of fugitive water onto adjacent properties or public right-of-way whether served by the municipal water utility or by a private well.
B. The following restrictions apply to all properties that use spray irrigation within the municipal limits or are served by the municipal water utility:
1. Beginning April 1st through September 30th, spray irrigation is allowed only from six p.m. to ten a.m. on all properties.
2. Shut-off nozzles are required on any hoses used for hand watering, vehicle or equipment washing, or other outdoor uses.
3. Additional scheduling or restrictions may be applied during declared drought or emergency events.
C. The water waste restrictions do not apply to the following:
1. Outdoor watering performed with permanent drip irrigation system, sub-surface irrigation, harvested water, or greywater is exempt;

2. Watering of containerized plants and nursery plant stock is exempt;
3. Repair and maintenance of irrigation systems;
4. Single-day irrigation needed for application of chemicals for maintenance of existing or new landscape;
5. Use of potable water for dust control or soil compaction when no alternative source is available;
6. Nonprofit car washes held as fund raisers, if vehicles are washed using hand held buckets and hoses equipped with shut-off nozzles. (Ord. 342 § 4, 2007)

### 8.24.050 Violations and penalty fees.

A. Any responsible party who violates any of the provisions of this chapter shall be subject to progressively higher penalty fees until the violation ceases, an extension of time for corrective measures is granted, or an appeal is initiated in accordance with the provisions of this chapter.
B. A citation issued by a code enforcement officer shall be mailed to the responsible party by certified mail within three days following discovery of a violation of this chapter. The responsible party must correct the violation or may request an extension of time to take corrective measures, or initiate an appeal in accordance with this chapter within thirty days following receipt of the notice of violation. If the violation is not corrected within the time allowed by this chapter, unless an extension of time or an appeal is pursued in accordance with this chapter, then the assessed penalty fee must be paid within thirty calendar days following the date of receipt of the certified mail notification. In the event that the responsible party fails or refuses to pay the assessed penalty, then the village shall disconnect said water service and the responsible party shall be required to pay the assessed penalty and a reconnect fee before water service is restored. A warning citation shall be issued for the first violation with no assessed penalty fee.
C. The assessment of penalty fees for violations defined by this chapter shall be as follows:
1. First observed violation: warning: no penalty fee;
2. Second observed violation: fifty dollars;
3. Third observed violation and all subsequent violations: one hundred dollars;
4. For purposes of assessing penalty fees, any violation prior to the effective date of this chapter shall not be considered if a period of two years has elapsed since the violation occurred, or the property has been transferred to a new owner. (Ord. 342 § 5, 2007)

### 8.24.060 Extension of time and appeals.

A. The municipal court judge may grant an extension of time to allow the responsible party to take corrective measures, provided that the general intent of this chapter has been met, but compliance with this chapter will cause practical difficulties or unnecessary hardship.
B. An extension of time to take corrective measures as provided for in subsection A of this section may be granted for a period not to exceed six months and shall stipulate both short-term corrective measures and a schedule for completion of long-term corrective measures.
C. Any responsible party may appeal a written notice of violation to this chapter to the municipal court and a hearing shall be scheduled as soon as possible. An appeal of a written notice of violation must be made no later than thirty calendar days from the date of

the receipt of a notice of violation of this chapter, and it shall be the responsibility of the appellant to obtain a hearing on said appeal within thirty calendar days of its filing unless the appellant requests an extension of time from the municipal court. An extension of time to commence the hearing on appeal shall only be granted upon a showing of good cause for the extension. If the municipal court's decision is adverse to the appellant, the appellant may appeal that decision to the Thirteenth Judicial District Court. (Ord. 342 § 6, 2007)

Attachment 6.

Title 17 ZONING*

Chapter 17.44 SUPPLEMENTARY USE REGULATIONS

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### 17.44.220 Landscape design standards.

A. It is the purpose and intent of this section to foster the creation of regionally appropriate, sustainable landscapes. This section requires the utilization of water conservation and irrigation efficiency to guide the design, installation, and maintenance of landscaping. There is sufficient information to believe that certain trees and shrubs produce allergens that adversely impact the health and well-being of many residents of the village of Los Lunas, and that actions to reduce the production of these harmful allergens are therefore appropriate. It is also the purpose of this section to enhance the appearance of the village in order to promote civic pride and vitality.

B. The requirements of this section apply to subsections (B)(1) and (2) below, and a landscape plan that demonstrates compliance with this section is required with the following:

1. Applications for subdivision plat approval when landscaping is proposed for entrance features, medians or utility strips adjacent to sidewalks.

2. Applications for building permits as follows:

a. All new construction resulting in an enclosed structure with a gross floor area greater than five hundred square feet;

b. For additions or remodeling of existing structures that disturb greater than one thousand square feet of land area, or have a valuation of over eighty thousand dollars;

c. The requirements of this section do not apply to applications for new single-family dwelling units and interior remodeling.

C. A landscape plan showing the location of plant material on a site plan will be submitted that provides an ample quantity and variety of ornamental plant species suitable for the climate. The landscape plan shall include the following:

1. Species and size of existing plant material;

2. Extent and location of all plant materials and other landscape features. Plant material must be identified with labels or an understandable legend;

3. Plant schedule indicating common and botanical names, size at installation, size at maturity, quantities and method of transplant;

4. All landscape features must be drawn to scale;

5. Proposed treatment of all ground surfaces clearly indicated (paving, turf, gravel, grading, etc.);

6. Irrigation system operation information and water budgets based on gallons used for landscape plants shall be included on the landscape plan or with attached documents.

D. The director of the community development department or his designee shall have the authority to enforce this section.

1. No building permit shall be issued, or subdivision plat recommended for approval without compliance with this section;

2. Lack of compliance with this chapter may result in withholding or revocation of a certificate of occupancy;
3. Should the requirements of this section not have been met prior to the request for a certificate of occupancy the applicant may provide a financial guarantee, as per the existing policy of the community development department at the time of the request;
4. The director or his designee shall have discretion to allow alternate means of compliance with the requirements of this section when the proposed alternate means satisfy the intent, and are equivalent or exceed the requirements of this section.
E. Water conservation shall guide landscape and site planning, design, installation and management. Landscape design shall apply the principles of xeriscape and achieve the highest industry standards for irrigation efficiency. The purpose of these strategies is to develop drought tolerant landscapes and to reduce the demand on the potable water system.
1. Water features, including but not limited to fountains, streams and ponds are classified as high water use and must be integrated into an overall site water conservation plan;
2. All new irrigation systems and major renovations of existing irrigation systems shall install backflow prevention devices;
3. Irrigation systems shall be designed to prevent water waste, over-watering and to prevent overspray or drainage of water onto any paved or unplanted surface;
4. Landscapes shall be irrigated with automatic underground irrigation systems designed such that the overall water consumption will not exceed fifteen gallons of potable water per square foot of landscape area per year;
5. Turf, sod, or grass seeding of cool season species shall not be planted in areas where any dimension is less than ten feet.
F. Plant material selection shall emphasize drought tolerant plant species and shall limit the use of high water use plan species. Tree species that increase harmful allergens are prohibited and include, but are not limited to, Cypress, Juniper, Mulberry, Elm and Ash.
G. Warm season grasses are recommended for decorative lawns. When installed, cool season turf grass lawns shall be limited to seed mixes containing not more than twenty-five percent Kentucky Bluegrass varieties and Poa prensis v.
1. Public parks and athletic fields are exempt from this restriction. These locations shall install only the minimum cool season turf required for the active recreational use;
2. As of November 7, 2002, Russian Olive and Salt Cedar shall not be sold or installed within the village limits because of their classification as noxious weeds.
H. Street trees:
1. All new developments shall provide street trees;
2. Vertical clearance below the lowest branch shall be seven feet over pedestrian walkways and fourteen feet over streets;
3. Maintenance and replacement of street trees is the responsibility of the owner of the property on which the tree is located;
4. Caliper size of the street trees will be a minimum of one and one-half inch measured six inches above the ground. Height will be a minimum of six feet;
5. Street trees shall be located so as not interfere with the function of any underground utility lines;
6. Street trees may be planted according to the following schemes:
a. Street trees may be planted in open soil between the back of curb and sidewalk with

their centerline places at the midpoint between the two,
b. If the sidewalk is at the back of the curb and less than six feet wide, trees may be planted at least two feet beyond the property-side edge of the sidewalk,
c. If the sidewalk is at the back of the curb and six feet wide or wider, trees may be planted in cutouts in the sidewalk. The centerline of the tree will be at least two feet from the back of the curb,
d. Street trees may be planted in random clusters within twenty feet from the back of the curb;
7. Street trees must be selected from the list of approved street trees, which is on file in the community development office;
8. The distance between evenly spaced trees shall be no greater than the diameter of the tree canopy at maturity. For example, a three hundred foot frontage will require ten trees with a thirty-foot canopy, or fifteen trees with a twenty-foot canopy. The area west of I-25 will require street trees to be planted for every sixty feet of frontage on Main Street. The number of trees placed in random clusters must equal or exceed the number of trees that would be required if they were placed evenly;
9. When parking areas are visible from Main Street, there shall be landscaping between the street and the parking with vegetation, planters, berms, or other similar means;
10. Landscaping of off-street parking shall incorporate shade trees distributed throughout the parking area at no less than one tree for every twenty parking spaces west of I-25. Minimum size of tree planters shall be thirty-six square feet per tree. In no case shall the parking supply be reduced below the minimum number of spaces in this title;
11. Street trees located within twenty-five feet of parking may count toward the off-street parking shade tree requirements for that parking lot.
I. To preserve clear views at street intersections, driveways and medians, shrubs and ground covers within the clear-sight triangles shall be maintained at a minimum of seven feet from the lowest branch to the top of the curb. Only the plants that can withstand reflected heat from asphalt and pavement shall be planted. All landscape areas within the zone shall be irrigated with an automatic underground irrigation system and/or automatic drip irrigation system;
J. Commercial developments shall be separated from adjacent residentially zoned properties by inclusion of a seven foot wide landscaped buffer area in the site plan and by vertical six foot opaque screening with a fence, wall or landscape plants. Where small lots will be converted from residential to commercial, and the seven foot wide landscape buffer will prevent the required amount of parking, buffer width can be reduced to not less than three feet with the provision that the proposed use of the lot will not be considered a nuisance to adjacent residential properties. (Ord. 280, 2002)