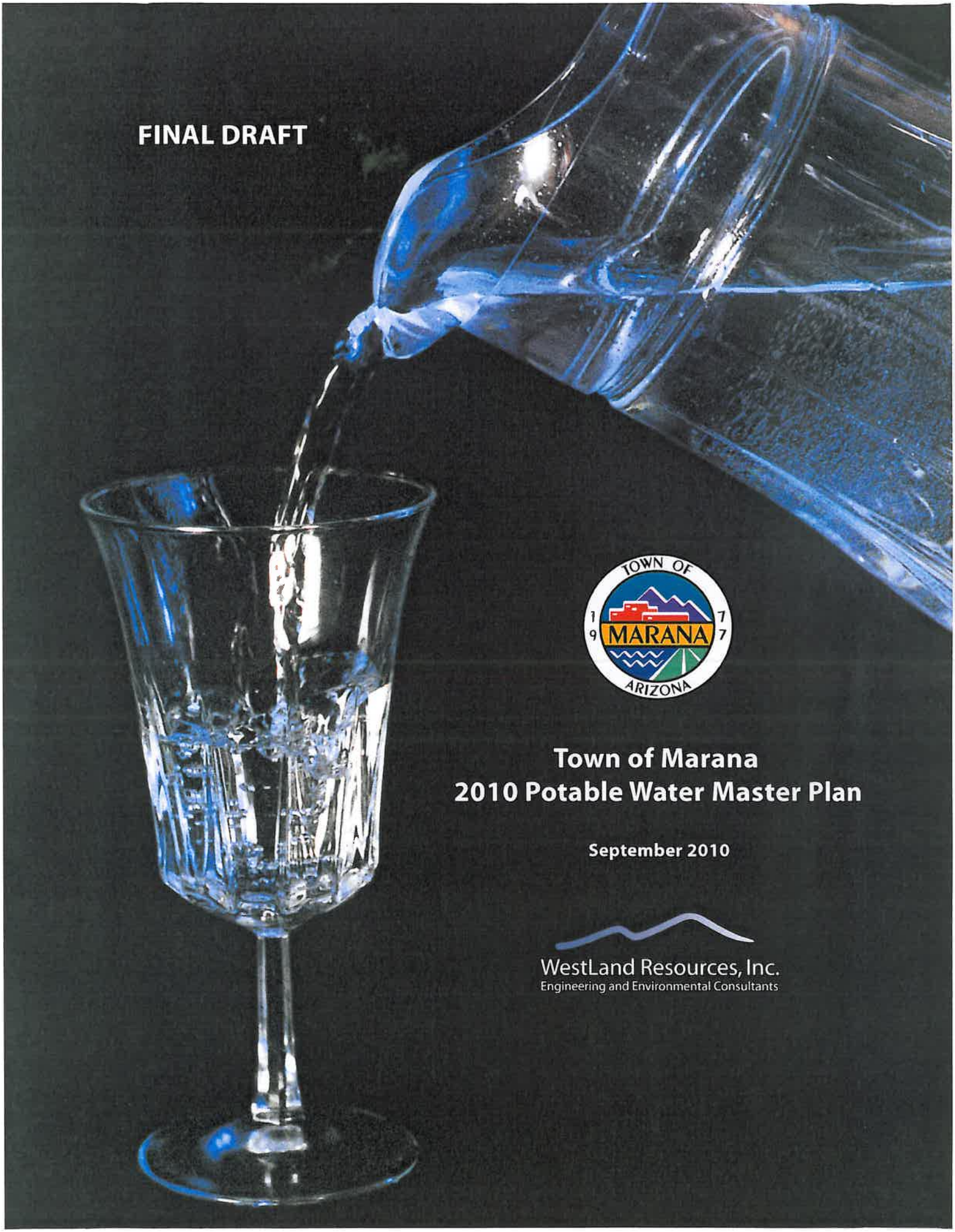


FINAL DRAFT

Town of Marana
2010 Potable Water Master Plan

September 2010

WestLand Resources, Inc.
Engineering and Environmental Consultants

▲▲▲ TABLE OF CONTENTS ▲▲▲

LIST OF EXHIBITS

(Exhibits appear at end of each section)

LIST OF FIGURES

LIST OF TABLES

AAC	Arizona Administrative Code
ACC	Arizona Corporation Commission
ADD	Average Daily Demand
ADEQ	Arizona Department of Environmental Quality
ADOSH	Arizona Division of Occupational Safety and Health
ADWR	Arizona Department of Water Resources
AFY	acre feet per year
AMA	Active Management Area
ARS	Arizona Revised Statues
AWWA	American Water works Association
AWS	Assured Water Supply
AZPDES	Arizona Pollutant Discharge Elimination System
BMP	Best Management Practice
BOR	Bureau of Reclamation
CAGRD	Central Arizona Groundwater Replenishment District
CAP	Central Arizona Project
CAWCD	Central Arizona Water Conservation District
CIP	Capital Improvement Project
CWA	Clean Water Act
CWS	Community Water Systems
EDU	equivalent dwelling unit
EOP	Emergency Operation Plan
EPA	Environmental Protection Agency
ft/s	feet per second
gpad	gallons per acre per day
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GRW	Ground Water Rule
IFC	International Fire Code
IPC	International Plumbing Code
MCL	Maximum Contaminant Level
MDWID	Metropolitan Domestic Water Improvement District
MG	million gallons
MCPCCP	Modified Non-Per Capita Conservation Program
MFR	multi-family residence
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated bi-phenyl
PCDEQ	Pima County Department of Environmental Quality
PDD	Peak Daily Demand
PHD	Peak Hourly Demand
PHSBPRA	Public Health Security and Bioterrorism Preparedness and Response Act
ppb	parts per billion
ppdu	persons per dwelling unit
PRV	pressure reducing valve
psi	pounds per square inch
PWS	Public Water Systems
RTC	Remote Terminal Unit
SCADA	supervisory control and data acquisition
SDWA	Safe Drinking Water Act
SFR	single family residence
SMCLs	Secondary maximum containment levels
TCR	Total Coliform Rule
WHP	Wellhead Protection Program

INTRODUCTION

The Town of Marana Water Department (Marana Water) 2010 Potable Water System Master Plan is a comprehensive planning document used to project the infrastructure and water resource requirements for the Town of Marana. This executive summary is to provide an overall picture of the Marana Water's potable system in terms of system demands and infrastructure requirements including wells, reservoirs, and booster stations.

The approach for the Master Plan is to evaluate the system on a capacity basis to determine the needs of existing and future customers, to set forth a schedule for the construction of new capital improvements, and to provide an estimate of the cost for the required improvements. The cost estimates can be used in the development of the budgets, rates, and connection fees for Marana Water.

PLANNING AREA

The planning area for the Master Plan is identified on **Exhibit ES-1: 2010 Marana Water Master Planning Area.** The planning area is similar to the planning area used in the Town of Marana 2007 General Plan, excluding La Osa, areas served or to be served by other water providers such as Tucson Water and Red Rock, and areas anticipated with low development potential. As depicted on **Exhibit ES-1**, the Marana Water planning area is situated in both Pima and Pinal counties, and encompasses portions of both the Tucson and the Pinal Active Management Areas (AMAs).

Marana Water has evaluated potable water demands within the Town of Marana 2007 General Plan area, including those demands served by other water providers. **Exhibit ES-2: Water Demand Projections** depicts the areas anticipated to be served by different water providers and their associated buildout potable water demand projections. Marana Water is projected to serve approximately 61,554 acre-feet per year (AFY) of potable water demands at buildout within the 2010 water master planning area. In comparison, the potable water demands for the Tucson Water intended service areas within the Town of Marana 2007 General Plan area are projected to be approximately 7,079 AFY.

WATER PRESSURE ZONES

The Marana Water planning area is separated into pressure zones based on elevation. The pressure zone delineations are typically consistent with zones used by adjacent municipal water providers. The zone boundaries are established at approximate 100-foot elevation differences. The overall Marana Water pressure zone delineations are shown on **Exhibit ES-3: Pressure Zones.**

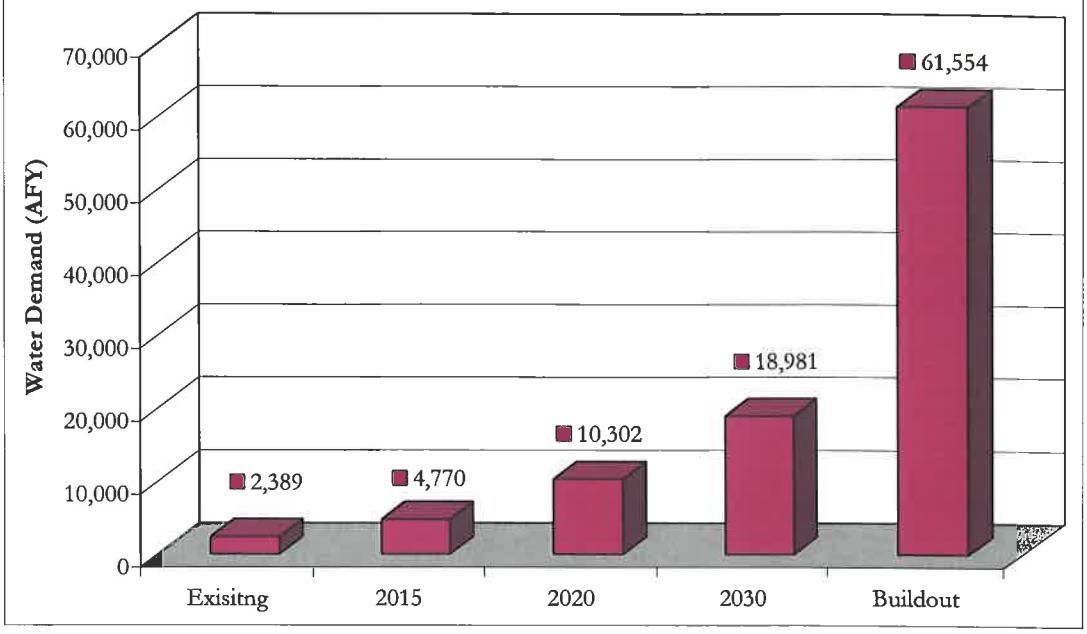
Based on elevation, the buildout Marana Water system is separated into ten (10) pressure zones: the V, W+, X, Y, Z, A, B, C, CR (Continental Reserve), and PR (Picture Rocks) Zones. The Marana Water X Zone consists of four subzones (X1a, X1b, X1c, and X1d) that are contiguous in area but are not anticipated to be interconnected within the 5-, 10-, and 20-year planning horizons. The Y Zone includes three subzones (Y1, Y2, and Y3) that are non-contiguous, and the Z Zone includes two subzones (Z1 and Z2) that are non-contiguous.

GROWTH/PHASING

Marana Water has coordinated with the Town of Marana Planning and Zoning Department to develop population and growth projections for its service area. Using the 2007 General Plan and assumptions regarding land use densities, Marana Water is projected to serve approximately 169,604 equivalent dwelling units (EDUs) at buildout, including approximately 74,532 residential units. Based on the census data of 2.7 persons per residential unit in the area, Marana Water is projected to serve approximately 201,200 people at buildout.

The rate of growth within the 5-year (2015) and 10-year (2020) planning horizons is based on Specific Plan growth information provided by the Town of Marana Planning and Zoning Department. The rate of growth between the 10- to 20-year (2030) planning horizons is assumed at the same growth rate as projected within the 10-year planning horizon. **Figure 1: Water Demand Projection** below shows the existing and projected water demands for 2015, 2020, 2030 and buildout.

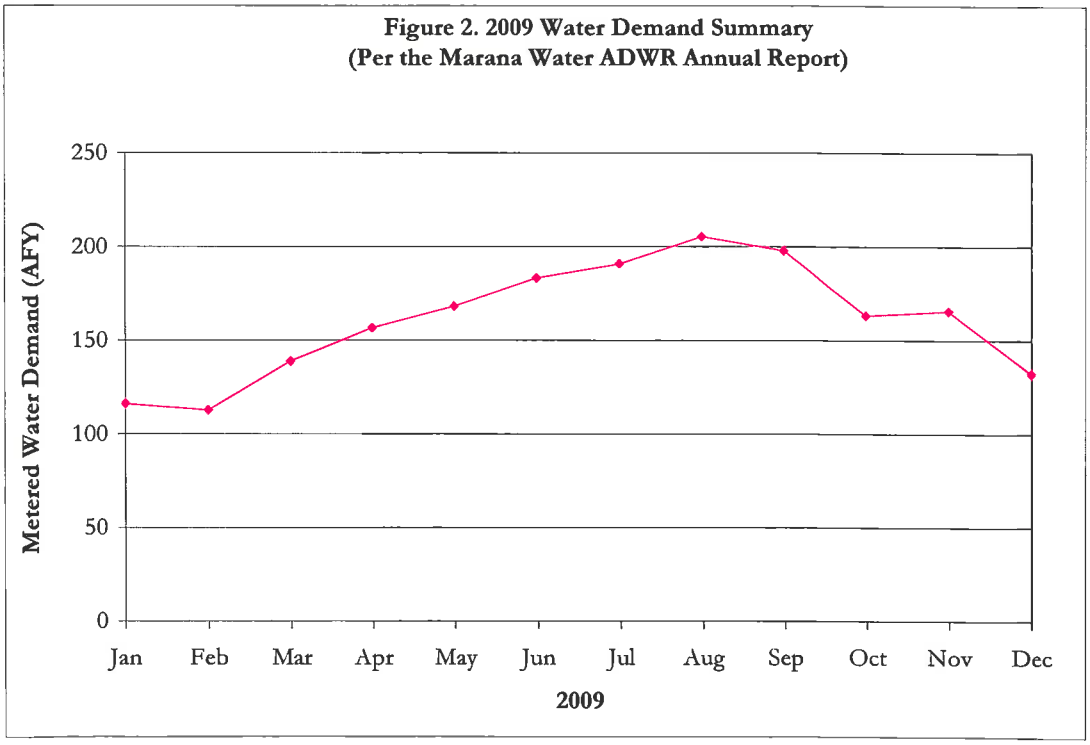
Figure 1. Water Demand Projection
(2010 Potable Water Master Plan)



WATER SYSTEM DEMAND PATTERN

Potable water systems in the southwestern United States are generally designed to accommodate peak demands. Peak day demands (PDD) are generally twice the annual average daily demands and 1.5 times the peak month average daily demand. **Figure 2: Marana Water 2009 Water Demand Summary** shows the Marana Water's potable water deliveries in 2009 (by month).

Figure 2. 2009 Water Demand Summary
(Per the Marana Water ADWR Annual Report)



WELLS

A complete evaluation of the well, storage, and booster capacity requirements for the Marana Water system was performed in the Master Plan. The well capacity requirement is based on providing PDD with the largest well out of service. At buildout, the projected PDD for Marana Water is approximately 76,322 gallons per minutes (gpm). In addition, a total of 9,100 gpm reserve well capacity is anticipated, resulting in a total well capacity requirement of 85,422 gpm for Marana Water at buildout. Marana Water currently has an existing well capacity of 15,417 gpm. Assuming the existing Marana Water wells remain the same production capacity, approximately 47 additional wells at a capacity of 1,500 gpm each will be required to meet the well capacity requirements of Marana Water at buildout.

STORAGE

Storage capacity requirements for Marana Water are based on 1.5 times of the Average Daily Demand (ADD), plus fire flow storage requirement. It is recommended, when practical, at least 25 percent of the ADD (if not all) be stored in gravity reservoirs. Gravity storage provides operational flexibility and reserve during emergencies such as sustained power outages. The storage requirement for Marana Water at buildout is approximately 85 million gallons, out of which 26 million gallons is recommended as gravity storage. Marana Water has an existing storage capacity of approximately 8 million gallons. To meet the storage capacity requirement at buildout, 77 million gallons of additional storage will be required.

BOOSTER STATIONS

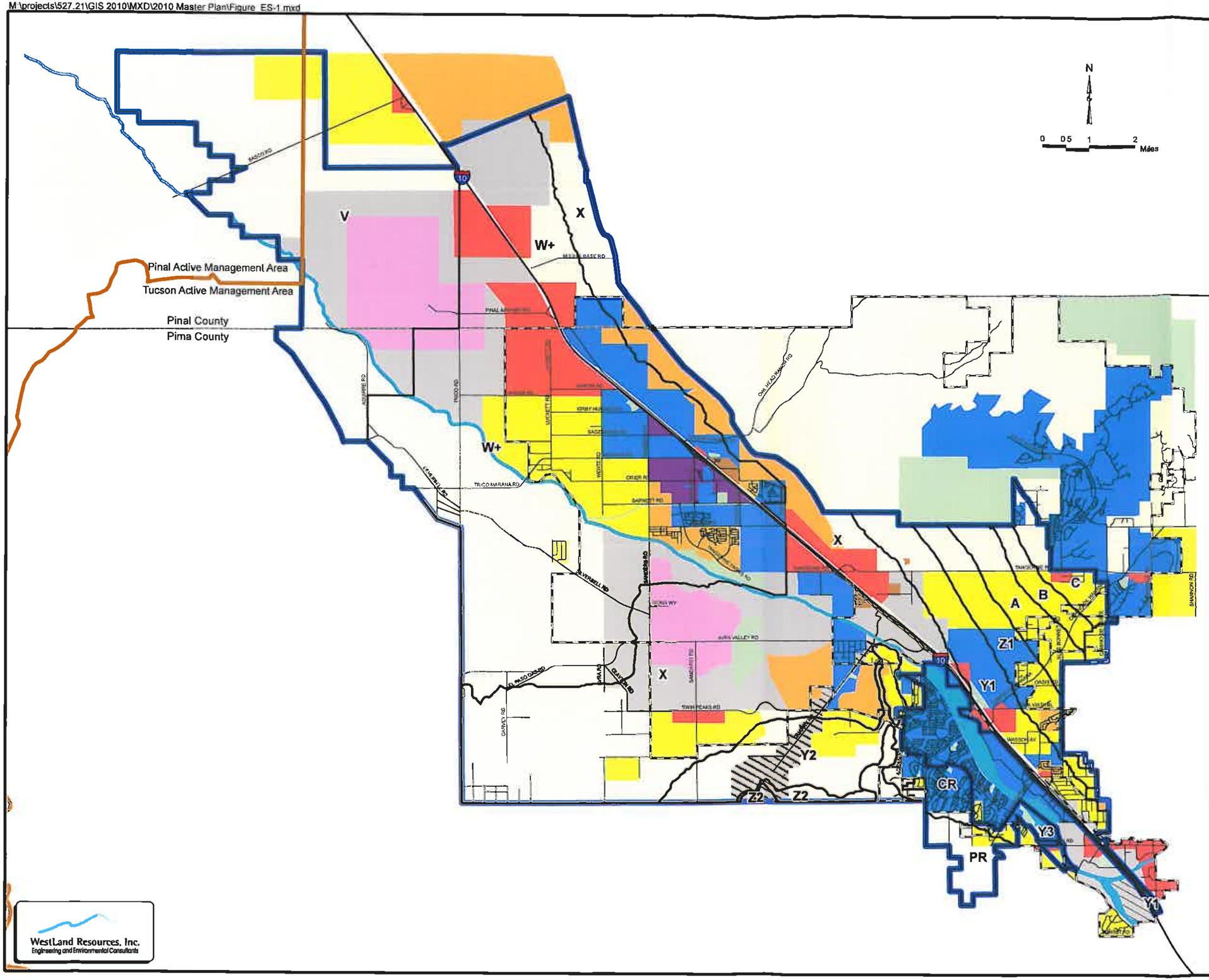
Booster station capacity requirements are based on providing PDD plus fire flow or peak hour demand (PHD), whichever is greater, for the pressure zones without gravity storage. The booster station capacity requirement may be reduced to providing PDD for the zones with adequate gravity storage capacity for fire flow and peak hour fluctuations. The capacity of each booster station is recommended to be 3,000 gpm or less to minimize the area of impact when the booster station is out of service. Approximately 35 additional booster stations, ranging from 1,500 to 3,000 gpm, will be required for Marana Water at buildout.

CAPITAL IMPROVEMENTS PROJECTS

The 10-year and buildout Capital Improvement Projects (CIP) for Marana Water have been developed in this Master Plan so that the costs for the improvements can be allocated to the individuals they serve. It is noted that the cost estimates are based on present day prices for the involved design and construction. These values will need to be properly inflated when preparing budgets and securing funds. The present day cost estimates for existing system upgrades (to bring the water system up to the Marana Water's current standard of service) is approximately $7.0 million. The majority of these projects are water main replacements system in the older service areas. Because these improvements are required within the existing system and may be considered as operation and maintenance related expenditures, these upgrades should be generally funded by existing water system rates.

Present day cost estimates for growth-related 10-year and buildout capital improvements are approximately $26.5 million and $143 million, respectively. The cost estimates for gravity storage and transmission mains are approximately $67.4 million at buildout. The cost opinions exclude those costs required for the delivery and treatment of alternative water sources. The cost components associated with the implementation of the growth-related improvements are generally funded by impact/connection fees allocated to future Marana Water customers.

M:\projects\527.21\GIS 2010\MXD\2010 Master Plan\Figure ES-1.mxd



Legend

- Marana Town Limits
- Pima/Pinal County Line
- ADWR Active Management Area Boundary
- 2010 Water Master Planning Area Boundary
- Pressure Zone Boundaries

Town of Marana General Plan 2007

- Airport
- Commercial
- Floodway
- Industrial
- Industrial (Low Density)
- Low Density Residential
- Medium Density Residential
- Mixed Rural
- Park
- Rural Density Residential
- Special Planning Area
- Specific Plan

TOWN OF MARANA 1977 ARIZONA

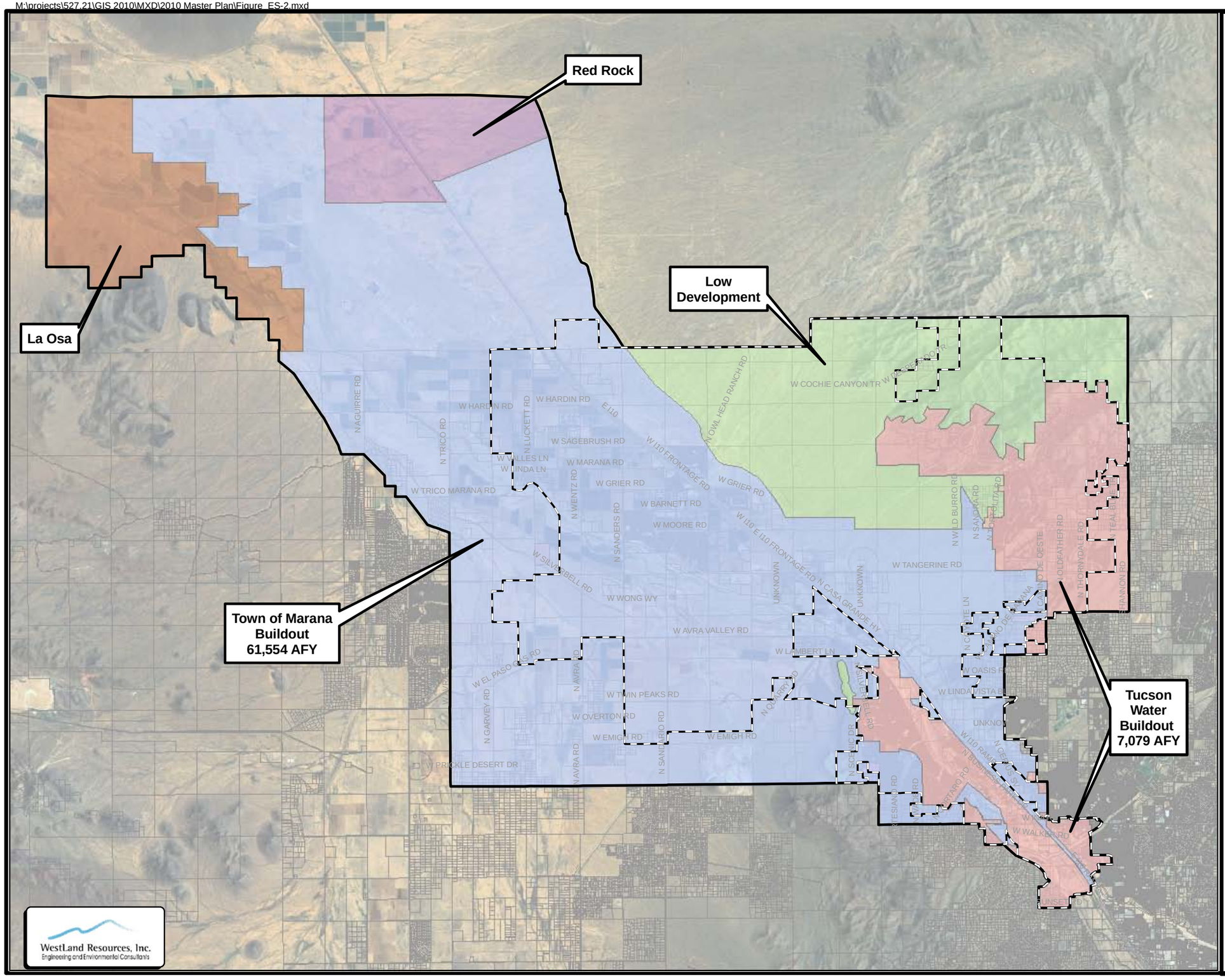
Water Master Planning Area

2010 Marana Water Master Plan

Exhibit ES-1

WestLand Resources, Inc.
Engineering and Environmental Consultants

M:\projects\527.21\GIS 2010\MXD\2010 Master Plan\Figure_ES-2.mxd



Legend

- 2007 Town of Marana General Plan Boundary
- 2010 Water Master Planning Area Boundary
- La Osa Water Service Area
- Tucson Water Service Area
- Red Rock Water Service Area
- Low Potential Development Area
- Existing Marana Town Limits

⊛ Area outside Town Limits assume annexation

N

Feet

0 6,000 12,000

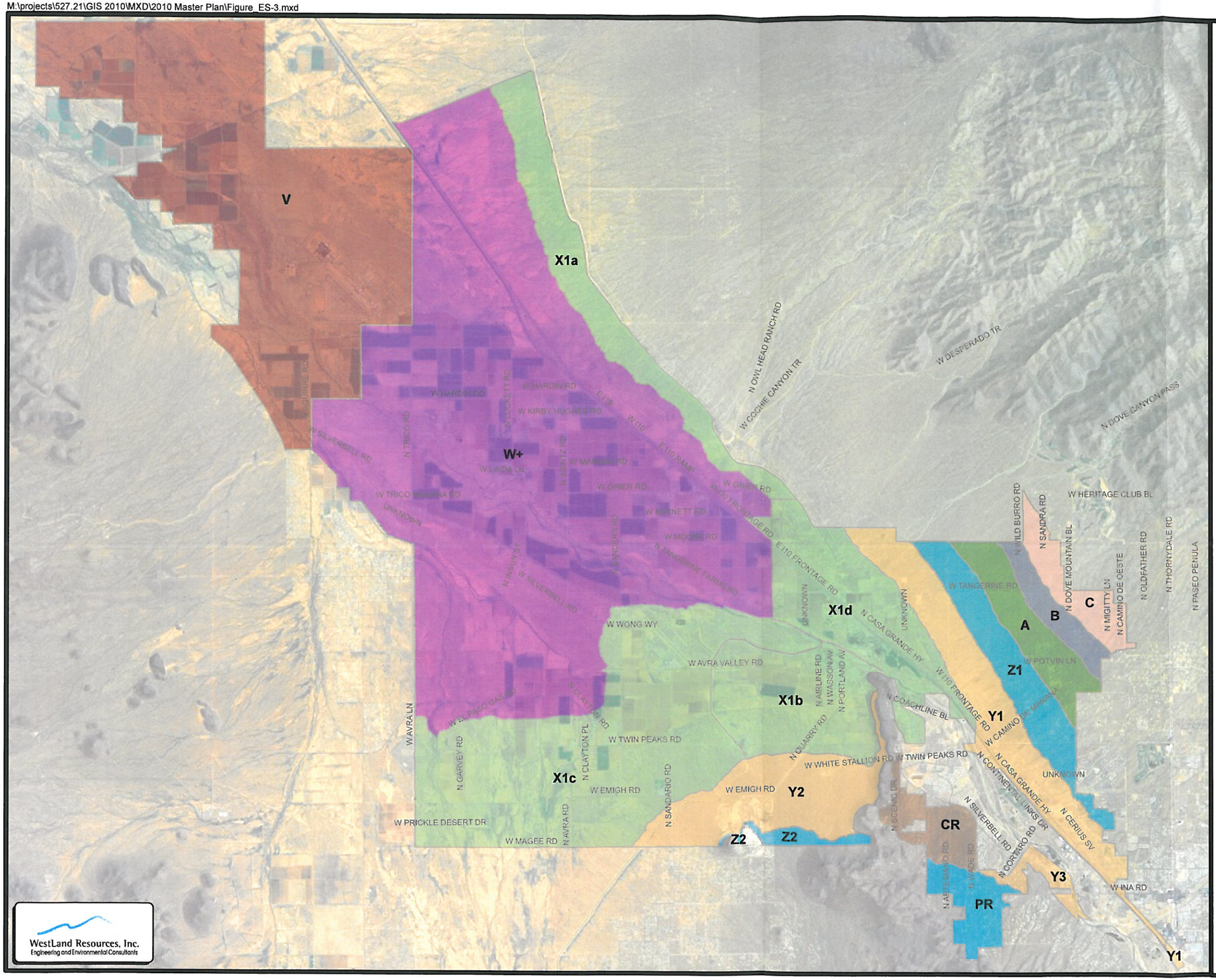
WestLand Resources, Inc.
Engineering and Environmental Consultants

Water Demand Projections

2010 Marana Water Master Plan

Exhibit ES-2

M:\projects\527.21\GIS 2010\MXD\2010 Master Plan\Figure_ES-3.mxd



N

Feet
0 5,000 10,000

TOWN OF MARANA 1977 ARIZONA

Pressure Zones

2010 Marana Water Master Plan

Exhibit ES-3

WestLand Resources, Inc.
Engineering and Environmental Consultants

1.1 INTRODUCTION

Town of Marana Water Department (Marana Water) provides water service primarily within the corporate limits of the Town of Marana (the Town). Currently, Marana Water serves approximately 13,000 people and has about 5,000 residential and commercial customer accounts. The Marana Water service area is expected to expand as the Town grows.

Currently, Marana Water relies on groundwater for its potable water supply. Marana Water strives to seek additional renewable sources of supply such as Central Arizona Project (CAP) water and reclaimed water to achieve safe yield set forth by the Arizona Department of Water Resources (ADWR).

The primary goals of the 2010 Potable Water System Master Plan are to evaluate the existing Marana Water potable water system, identify areas where the existing system need to be improved, and to project future demands and associated infrastructure requirements.

The Master Plan is the key guidance document for Marana Water to identify the capital components required to functionally and adequately serve both its existing and future customers. It is essential to make a distinction between these two elements as it is the Town's policy that new growth/development pay for itself. This places the financial burden of growth-related water infrastructure on future customers. This Master Plan provides the planning and capital cost data required for Marana Water to re-evaluate its impact fee rate structure projecting forward.

Another goal of this Master Plan is to identify and define key policy issues and present a plan to effectively manage those issues. This goal will be accomplished by defining the key water system planning elements that are most important to Marana Water, evaluating the existing system for service and upgrade requirements, and planning the capacity and capability of the Marana Water infrastructure to provide appropriate service to the expanding service basis.

The approach of this Master Plan is first to examine the current applicable regulatory environment and identify the regulatory constraints to which Marana Water must adhere. Based on the regulatory requirements, the Marana Water policies are presented. These policies include the definition of the water service area, the planning horizon envisioned in this Master Plan, the criteria used for infrastructure development, and the growth projections used to develop this planning document. Marana Water has implemented policies that meet or exceed the standard of service for potable water as required by federal, state, and local regulations.

An extensive coordination effort with the Town of Marana Planning and Zoning Department allowed for the updating of existing land uses and population projections throughout the proposed Marana Water service area. Planning projections provided by the Town have been used to create a general picture of the Marana Water's infrastructure requirements over the next 5, 10 and 20 years, as well as at buildout. Using current and future system requirements, a comprehensive water system plan has been developed to define the capital improvements required for the water system at the 10-year planning horizon and at buildout. Cost opinions for the infrastructural improvements have also been developed and an implementation plan for the construction of the improvements is provided.

As with all planning documents, this document is intended to be a living document, i.e., a tool that is flexible and fluid and is subject to change as growth patterns and infrastructure requirements change. Updates to the Master Plan should be achieved frequently to accurately reflect the new planning constraints that Marana Water will face in the future.

1.2 KEY ISSUES

The development of a Master Plan requires defining key issues and policies early in the planning process. These policies dictate the required water system layout, facility sizing, reliability, and costs of the required infrastructure. The existing policies have been continuously re-evaluated throughout development of this Master Plan by the Town. Infrastructural sizing and the associated costs (developed via comparisons with those of other local water companies of similar size/location/nature) were used in evaluating the future needs of Marana Water.

1.3 WATER SYSTEM PLANNING HORIZON

The planning horizons for this document are 5 years (2015), 10 years (2020), 20 years (2030), and ultimate buildout. The Master Plan will identify current conditions and water demand projections for the years 2015, 2020, 2030, and for projected buildout (as defined by the 2007 Town of Marana General Plan). These timeframes are consistent with the planning horizons defined by the Town's planning process. Potable water demand projections on a per-zone basis are provided for each of these horizons. These projections allow for the development of a capital improvement program and for the phasing of the funding, design and installation of the required infrastructure.

1.4 LIMITS OF WATER SERVICE AREA

This Master Plan defines the Marana Water buildout service area based on the Town's 2007 General Plan, excluding La Osa, areas to be served by Red Rock, Tucson Water, other water providers, and areas anticipated with low development potential. The buildout service area is flexible, and may vary in the future, as conditions require. Marana Water reserves first right of refusal for new service to all new development within its corporate boundaries.

1.5 WATER RESOURCES AND DEVELOPMENT

Marana Water currently relies solely on groundwater for its potable water. The system's existing well fields lie primarily within the Santa Cruz basin. The well field systems have historically provided a high-quality and reliable source of water. Marana Water has an Assured Water Supply (AWS) Designation with ADWR, and is a member of the Central Arizona Groundwater Replenishment District (CAGRD).

To remain consistent with its Designation of AWS, Marana Water will ultimately be required to use sources other than groundwater to meet its replenishment obligation. Marana Water currently has rights to 1,528 acre feet per year (AFY) of CAP water.

Concerns have arisen regarding the continued mining of groundwater in the Town and greater Pima County area. These concerns include the long-term decrease of groundwater levels, resulting local subsidence, degradation of water quality, increased pumping costs, and the need to build new and deeper wells. For these reasons, as well as general public opinion, the Town and other surrounding communities have been cooperating to investigate additional renewable water supplies for the northwest area. Entities involved in this effort include the Town of Marana, Metropolitan Domestic Water Improvement District (MDWID), Flowing Wells Irrigation District, Town of Oro Valley, Pima County, City of Tucson, Bureau of Reclamation (BOR), and Central Arizona Water Conservation District (CAWCD).

One goal of this 2010 Master Plan is to provide a distribution system that has the flexibility to accept water from one or more treated potential renewable water sources as well as from its existing groundwater well system. This will provide Marana Water with the flexibility, with minor infrastructure adjustments, to accept source water from a multiple number of potentially acceptable alternative water resources.

1.6 WATER QUALITY REGULATIONS

The Safe Drinking Water Act (SDWA) establishes minimum water quality standards for health and aesthetic water quality considerations. The SDWA identifies enforceable maximum contaminant levels (MCLs) for health-related constituents and non-enforceable secondary maximum contaminant levels (SMCLs) for aesthetic-related constituents. The SMCLs are not federally enforceable.

It is the policy of Marana Water to comply with and when practical exceed the requirements of SDWA for potable water. Marana Water regularly monitors the SDWA regulated constituents and is in compliance with the regulations. A summary of the regulatory requirements is identified in Chapter 2, Regulatory Requirements.

1.7 SYSTEM IMPROVEMENTS FOR EXISTING CUSTOMERS

This Master Plan identifies improvements necessary to bring the Marana Water system to the levels of service defined by the applicable system-related policies. These improvements are related to meeting capacity-related needs as well as replacing aged and outdated facilities. The upgrades to the existing system are considered operational and replacement-based, and are funded by water service rate generated revenue.

1.8 SYSTEM IMPROVEMENTS FOR GROWTH

This Master Plan identifies growth related improvements needed for Marana Water to serve future customers based on the applicable system-related policies. The funding for improvements supporting growth is connection fee-based and is generally funded by future development. The projected budgets for growth-related facilities should remain flexible and evolve within each fiscal year to meet the constantly changing growth scenarios.

1.9 CAPITAL EXPENDITURES AND TIMING

Capital improvement funding requirements are defined by the customers serviced by the project. Projects that improve the existing system are funded by rates. Projects that are to support future growth are funded by impact fees. The goal of the capital improvement program is to develop an environmentally sound and efficient water distribution system, and to create the greatest economic benefit to the existing and future customers of the water utility. This program must result in a well-planned and efficient water system that can be constructed in a properly timed and orderly fashion to meet the system's expanding needs. With the system development fee revenues available, Marana Water may sell bonds, or supply other financing, to provide the up-front capital required for constructing reservoirs, booster stations, wells, new source treatment and delivery, and major facilities. Project developers will continue to provide up-front capital to construct water system transmission main extensions to their property and, in some cases, provide additional capital for other water system improvements if funds from Marana Water are not available.

To meet the requirements of the Marana Water design guidelines and Arizona Department of Environmental Quality (ADEQ) criteria, the facilities required to serve a new development project must be constructed and operational prior to connection. To address this issue, Marana Water has implemented impact fees that are paid at the time of meter hookup. Collected fees reimburse the costs for constructing wells, reservoirs, transmission mains, and booster stations that support new customers. This requires a large outlay of initial capital to build facilities before the first dollar of system development fees is collected by Marana Water. In addition, based on the projected buildout, many years may pass before the system development fees collected will pay the water utility in full for the front costs it has incurred. This requires that the cost of financing be included in the system development fee.

A detailed analysis based on population and growth projections is required to balance the up-front capital financing of projects and repayment obligations of the system development fees. If bond sales are used, it is important that the timing and amount of sales are scheduled to best assume that the projected connection fee and development fee revenues will be adequate to pay the debt service of the bond sold; all in a timely manner without the utilization of other funding resources.

1.10 ANNEXATION POLICY

Marana Water requires all commercial and industrial property, residential subdivisions, and single family residences within the Town of Marana General Plan planning area but outside of the established Town limits to be annexed into the Town prior to obtaining water service from Marana Water.

2.1 FEDERAL REQUIREMENTS

2.1.1 Safe Drinking Water Act (SDWA)

The Environmental Protection Agency (EPA) has established regulations for water quality in potable water supply and distribution systems based on the requirements of the SDWA. The SDWA was signed into law in December 1974 and has been amended several times since it first became law. The SDWA requires that the EPA establish legally enforceable MCLs for a number of contaminants and continuously identify and set MCLs for additional contaminants. Currently, MCLs have been promulgated for inorganic chemicals such as arsenic, cyanide, lead, and copper; organic chemicals in the classifications of volatile organic chemicals, pesticides/herbicides/polychlorinated bi-phenyls (PCBs), synthetic organic chemicals, treatment chemicals, and byproducts; radiological contaminants; turbidity (for surface waters and groundwater influenced by surface waters); and microbiological contaminants. The EPA also established non-enforceable SMCLs relating to contaminants that may adversely affect the aesthetic quality of drinking water. The authority to enforce the MCL standards within Arizona has been delegated to the State of Arizona. Water quality programs are overseen by ADEQ. The following lists some of the rules most relevant to Marana Water under the SDWA:

- High nitrate levels have occurred in areas of the Marana Water service area mainly due to agricultural fertilizer runoff and/or septic system effluent seeping into the groundwater. The current MCL for nitrate is 10 parts per million (ppm). All currently active Marana potable wells meet the Nitrate standard.

- In January 2001, the EPA adopted a new arsenic standard, reducing the drinking water standard from 50 parts per billion (ppb) to 10 ppb. Public water systems (PWS) were required to comply with the new standard in January 2006. As of July 2010, all Marana Water potable wells meet the new standard.

- Water suppliers are required to prepare annual water quality reports, termed Consumer Confidence Reports, for their customers. The first reports were due by October 1999 and each July thereafter. As of July, 2010, Marana Water is in compliance with all these reporting requirements. The latest annual report is available online at the Marana Water website.

- In November 2006, The EPA published the new Ground Water Rule (GWR) to provide for increased protection against pathogens in PWSs that use ground water sources. The EPA is particularly concerned about ground water systems that are susceptible to fecal contamination. Community Water Systems (CWSs) that rely on groundwater supplies began complying by December 1, 2009. More details regarding the rule requirements and implementation are provided in Section 2.1.2.

- The EPA has developed a rule regarding levels of radon in drinking water. The rule includes MCLs and monitoring requirements for community water systems. Currently, the EPA/ADEQ does not regulate radon in drinking water.

2.1.2 Ground Water Rule (GWR)

2.1.2.1 Rule Requirements

The requirements of the GWR include the following:

- Completion of regular sanitary surveys of PWS to look for significant deficiencies in key operational areas.

- Triggered source water monitoring when a system does not provide treatment that achieves at least 99.99 percent (4-log) inactivation or removal of viruses and identifies a positive sample during its Total Coliform Rule (TCR) monitoring and assessment monitoring (at the option of the state) targeted at high-risk systems.

- Implementation of corrective actions by ground water systems with a significant deficiency or evidence of source water fecal contamination.

- Compliance monitoring for systems to ensure installed treatment technology reliably achieves at least 99.99 percent (4-log) inactivation or removal of viruses.

2.1.2.2 Sanitary Survey

The sanitary survey is a major component of the GWR. The sanitary survey regulations have long been in place for surface water systems; however, the implementation of the GWR extends these regulations to include ground water systems. The sanitary survey is a review conducted by the State. This review looks at critical components of a public water system. The rule defines eight components that must be reviewed during a survey:

- Source
- Treatment
- Distribution
- Finished water storage
- Pumps, pump facilities, and controls
- Monitoring, reporting, and data verification
- System management and operation
- Operator compliance with State requirements

2.1.2.3 Monitoring

There are three main provisions to the monitoring regulations of the GWR.

- Triggered source water monitoring
- Assessment source water monitoring
- Regular compliance monitoring

Source water monitoring will be required if a water system does not provide 4-log treatment and identifies a positive sample during its TCR monitoring. If a system receives notice of a total coliform-positive sample collected under the TCR, it must take a source water sample at every ground water source in use within 24 hours. There is an exception to the source water sample requirement if the State can determine the positive sample was due to a problem in the distribution system, not the source. Further, if any initial triggered source water sample is fecal indicator-positive, the system must collect an additional five repeat source water samples over the next 24 hours. It is at the State's discretion to require immediate corrective action to address contamination at those sites.

The GWR also provides a provision for States to require systems that do not provide sufficient disinfection treatment to conduct assessment source water monitoring at any time and require systems to take corrective action. For those systems that already provide 4-log treatment to their drinking water, the rule requires regular compliance monitoring to ensure the installed treatment technology reliably achieves at least 4-log inactivation or removal of viruses.

2.1.2.4 Corrective Action

The corrective actions include: correcting all significant deficiencies (e.g. repairs to well pads and sanitary seals, control of cross-connections, etc.), providing an alternate source of water, eliminating the source of contamination, or provide treatment that reliably achieves at least 4-log treatment of viruses.

2.1.2.5 Implementation

CWSs that rely on groundwater supplies have begun complying by December 1, 2009. As the State has control over the assessment monitoring, there are no national timeframes associated with this portion of the rule. The EPA requires States must complete their initial round of sanitary surveys by December 31, 2012 for most CWSs. States will have until December 31, 2014 to complete the initial sanitary survey for CWSs that are identified by the state as outstanding performers and non-community water systems.

As of July, 2010, Marana Water is implementing the GWR by conducting triggered source monitoring if a total coliform-positive sample is indentified during the routine TCR monitoring. It is Marana Water's policy to retrofit its existing system as funding permits to provide 4-log treatment, and to require all its new sources to provide 4-log treatment.

2.1.3 Public Health Security and Bioterrorism Preparedness and Response Act

The Public Health Security and Bioterrorism Preparedness and Response Act (PHSBPRA) of 2002 amended the SDWA to add a number of new requirements for community water systems regarding drinking water security and safety. The new section of the SDWA requires that water systems serving over 3,300 persons must conduct a vulnerability assessment to determine the susceptibility of the system to terrorist attack or other intentional acts intended to substantially disrupt the ability of the system to provide a safe and reliable supply of drinking water. A vulnerability assessment helps the water utility evaluate the

susceptibility of the water supply, storage, and distribution system, and its electronic or computer systems to possible threats and determine risks to the community based on potential threat scenarios. The assessment can help the water utility identify and prioritize corrective actions to reduce risk of loss and damage due to hostile acts. Corrective actions may include security upgrades, modifications to operational procedures, and policy changes to mitigate the identified vulnerabilities. A vulnerability assessment contains the following elements: description of the water system, identification and prioritization of adverse consequences to avoid, determination of critical system assets, assessment of the likelihood of malevolent acts, evaluation of existing response measures, analysis of current risk, and development of a prioritized plan for risk reduction.

The PHSBPRA also requires that the community water system serving a population greater than 3,300 prepare or revise an emergency response plan that incorporates the results of the vulnerability assessment. This emergency response plan must identify procedures to be used in the event of an intentional attack on the water system. The plan has to be completed no later than six months after the completion of the vulnerability assessment. As of July, 2010. a vulnerability assessment and an emergency response plan for Marana Water have been completed. Marana Water is currently in its implementation phase to conform to the PHSBPRA.

2.1.4 Occupational Safety and Health Administration (OSHA)

The OSHA is a federal agency created to ensure safe and healthful workplaces. State and local government workers are excluded from federal coverage under the Occupational Safety and Health Act, but are covered under the State of Arizona Workplace Safety and Health Program, which includes, by reference, the Federal Occupational Safety and Health Standards. The state program was developed in accordance with OSHA requirements and approved by the U.S. Department of Labor. This program includes compliance activities to ensure employers are complying with the Arizona Occupational Safety and Health Standards requirements. The requirements of the Arizona Division of Occupational Safety and Health (ADOSH) contain many subjects related to working conditions, including work surfaces such as ladders, exposure to hazardous materials, exposure to noise, and safety training. These requirements pertain to both Marana Water employees and personnel employed by contracting or consulting companies working at Marana Water sites. The state program also includes a Worker's Compensation Program that relates to medical benefits and compensation for job-related accidents, illnesses, and injuries.

2.2 STATE REQUIREMENTS

Arizona Revised Statutes (ARS) Titles 45 and 49 were developed by the State of Arizona to deal with subjects relevant to the operation of a municipal water system. ARS Title 45 describes the duties and programs of ADWR. ARS Title 49 describes water quality control, and is the primary regulation for potable water supplies. Title 49 designates the ADEQ as the agency responsible for ensuring the health and safety of public water supplies. The Arizona Administrative Code (AAC) consists of rules and regulations used to expand and define the provisions of the ARS. AAC Title 18 relates to environmental quality, and covers the subjects of safe drinking water, water quality standards, and operator certification.

2.2.1 Arizona Department of Environmental Quality (ADEQ)

The Environmental Quality Act was established in 1986 for the purpose of describing the responsibilities of the ADEQ. Broad authorities were established for the management, control, and regulation of sources that may impact water quality. The ADEQ was required to adopt numerous standards for surface and groundwater quality, to define aquifer boundaries and to establish aquifer classification procedures. The ADEQ has provided a number of guidelines for the design of water systems to assist water suppliers in constructing water systems that provide safe, reliable water service. The Pima County Department of Environmental Quality (PCDEQ) currently has delegated authority over the Marana Water system for compliance with ADEQ regulations for new construction and sanitary surveys. The ADEQ administers local authority over the Marana Water system for testing and compliance with the EPA water quality standards. The following information has been summarized from the AAC Engineering

Bulletin No. 10 – Title 18 and various ADEQ guidance publications:

2.2.1.1 Drinking Water Quality Requirements

The mission of the Arizona Safe Drinking Water Program is to ensure the delivery of safe drinking water to users of public water systems through regulatory oversight, technical assistance, and public education in facility planning, design, construction, operation, and compliance monitoring, and to preserve and protect drinking water sources. The Drinking Water Program is federally mandated to ensure safe drinking water supplies for the public. Arizona has primacy for this program and, therefore, enforces the federal regulations in addition to state requirements. The Wellhead Protection Program (WHP) is incorporated into the Drinking Water Program and involves the promotion of voluntary programs in communities aimed at protecting aquifers for drinking water use.

2.2.1.2 Pressure Requirements

Pressure extremes in water systems result in a potential for contamination of the water being delivered by the system. Low pressures may allow contaminants to enter the water system. Marana Water has a backflow prevention program as defined below (in 2.2.1.4) to help prevent contaminants from entering the system. High water system pressures may cause ruptures or breaks. The normal working pressure in a distribution system should not be less than 35 pounds per square inch (psi) during peak hour flow conditions. The system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. This requirement is generally interpreted to mean that the minimum residual pressure must be 20 psi at each meter in a fire-flow event from any hydrant during a flow condition of peak day flow plus fire flow.

Maximum pressures of as much as 120 psi may be allowed in small, low-lying areas not subject to high flow rates and surge pressure, provided pressure-reducing equipment is installed. The International Plumbing Code (IPC) requires the water pressure within the individual property owner's plumbing below 80 psi. Increasing or regulating the pressure from the meter to the customer is the responsibility of the customer. Pressure reduction is generally provided using a private pressure reducing valve (PRV) on the service side of the connection.

2.2.1.3 Regulatory Storage Requirements

The minimum storage capacity for a community water system is required to be equal to the average daily demand during the peak month of the year. However, this requirement may be reduced by aquifer storage components when multiple wells are used to provide source water. Storage capacity may be based on existing consumption and phased in as the water system expands. Marana Water has adopted the storage requirement of a minimum of 1.5 times annual average daily demand (ADD) plus fire-flow requirements. Storage should be provided in the zone where the usage is required or in a location where it may be readily transferred to the zone of use. Out of the overall storage requirement, 25 percent is recommended to be provided as gravity storage. The gravity storage will provide Marana Water with operational flexibility, system reliability, and potential operational cost reductions.

2.2.1.4 Backflow Prevention Requirements

The AAC requires water suppliers protect the public water system from contamination caused by backflow through unprotected cross-connections by requiring the installation and periodic testing of backflow prevention assemblies. The law requires that a backflow preventer be installed whenever there is a possibility that cross-connections might occur or a foreign substance might enter the water system. Such substances include chemicals, chemical or biological process waters, and water from public water supplies that have deteriorated in sanitary quality. Backflow prevention assemblies must be tested annually, and the test records must be kept for a period of at least three years. In line with the AAC requirements, the Town of Marana Code describes the specific requirements of backflow prevention and cross-connection control for the Marana Water system.

2.2.1.5 Emergency Operating Plan (EOP)

It is a requirement of the ADEQ that each community water system develops an EOP and keeps the plan in an easily accessible location. A water supply EOP is also required as part of the SDWA WHP program and under the PHSBPRA. The ADEQ has prepared a Drinking Water

Emergency Operations Plan Checklist to provide specific guidance regarding information to be included in the emergency plan. This checklist has a specific requirement for utilities to identify how they will maintain the system without their largest supply source.

The plan shall detail the steps that a water system will take to assure continuation of service in the following emergency situations:

- Loss of a water supply source.
- Loss of supply due to major component failure.
- Damage to power supply equipment or loss of power.
- Contamination of water in the distribution system as a result of backflow.
- Collapse of reservoirs, reservoir roofs, or pump-house structures.
- Breaks in transmission or distribution lines.
- Chemical or microbiological contamination of the water supply.

The EOP should provide an overview of the water system (including system mapping), establish personnel duties, identify emergency contacts and notification procedures, and delineate emergency operating procedures. The EOP should also provide for alternate sources of water and identify critical system components and spare parts. The PHSBPRA also requires that each community water system maintain an EOP that incorporates the results of the vulnerability assessment, as discussed in Section 2.1.3. Marana Water has developed an EOP and the EOP is being updated regularly to comply with the State's requirement.

2.2.1.6 Clean Water Act – National Pollutant Discharge Elimination System (NPDES) / Arizona Pollutant Discharge Elimination System (AZPDES)

The Clean Water Act (CWA) regulates discharges of pollutants residing in "process" water to waters of the United States (waters) through the NPDES permit program. The ADEQ has primacy for the NDPES permit program, i.e., the state government now administers the program and issues permits through AZPDES. The AZPDES includes two types of permits: general permit and individual permit.

The ADEQ issued an AZPDES General Permit on April 27, 2010 for De Minimis discharges, including those associated with potable water systems. Activities covered under the General Permit include: Operation and maintenance flushing, well flushing, line break and post-repair flushing, and discharges related to system pressure releases and overflows. Discharges are required to meet all standards applicable to the receiving water body.

In general, the AZPDES permit (both general and individual permit) requires the use of Best Management Practices (BMPs) to ensure discharges of pollutants to the waters of United States are limited.

2.2.2 Arizona Department of Water Resources (ADWR)

The ADWR was created in 1980 to administer state water laws, except those relating to water quality. The ADWR also explores methods of augmenting water supplies to meet future demands and works to develop public policies to promote conservation and the equitable distribution of water. The ADWR oversees the use of groundwater resources under state jurisdiction and negotiates with external political entities to protect and augment Arizona's water supply.

2.2.2.1 Groundwater Management Code

To address groundwater depletion in the State's most populous areas, the State Legislature created the Groundwater Management Code in 1980 and directed the ADWR to implement it. The objectives of the Code are to control severe groundwater overdraft, provide the means for effectively allocating Arizona's groundwater resources, and augment Arizona's groundwater supply through water supply development. The Code contains six main provisions:

- The establishment of a program of groundwater rights and permits.
- A provision allowing for no new agricultural irrigation within the five (5) Active Management Areas (AMAs).

- The preparation of five water management plans, one for each AMA.
- The development of a program that requires demonstration of an Assured Water Supply (AWS) for new growth.
- A requirement to meter/measure water pumped from all non-exempt wells.
- A program for annual water withdrawal and use reporting.

2.2.2.2 Active Management Areas

Areas where groundwater depletion is most severe are designated as AMAs and are subject to regulation. There are five designated AMAs in Arizona, including the Tucson AMA and the Pinal AMA. The existing and majority of the projected Marana Water service areas at buildout are within the Tucson AMA. The balance of the anticipated Marana Water service areas are within the Pinal AMA. The Tucson AMA has a statutory goal of achieving safe-yield by 2025. Safe-yield means that the amount of groundwater pumped from the AMA on an average annual basis does not exceed the amount that is naturally or artificially recharged. The safe-yield goal is a basin-wide balance. Water level declines in one portion of the AMA can be offset by recharging water in another part of the AMA.

The Groundwater Code directs the ADWR to develop and implement water conservation requirements for agricultural, municipal, and industrial water users. The ADWR develops and updates management plans for each AMA. The management plans reflect the evolution of the Groundwater Code, moving Arizona toward its long-term water management goals. The management plans establish conservation requirements for municipal, agricultural, and industrial water users. In each successive management plan, water conservation and management requirements are expected to become increasingly stringent. The Tucson AMA is currently operating under the Third Management Plan and is developing its Fourth Management Plan.

2.2.2.3 Conservation Requirements

The ADWR develops conservation requirements with assistance from water users in the AMAs. Municipal water conservation requirements apply to water providers, cities, towns, private water companies, and irrigation districts that provide water for non-irrigation uses. The goal of the municipal conservation program in all AMAs is to promote efficient water use.

Marana Water is currently enrolled and regulated under the Modified Non-Per Capita Conservation Program (MNPCCP) established in the Tucson AMA's Third Management Plan. Based on the total number of residential and non-residential service connections in the distribution system, Marana Water is regulated as a tier II municipal provider and is required to implement a public education program and five additional water conservation measures including providing new homeowners with low water use landscape information, implementing residential interior retrofit programs, customer high water use inquiry resolution, customer high water use notification, and developing industry partnerships on water conservation.

The Tucson AMA Third Management Plan and other conservation-related state programs also cover a number of other requirements that are intended to promote water conservation, including:

- Along new publicly owned medians or roadside areas served by municipal providers, groundwater may only be used for watering specific low-water-use plants. The ADWR maintains a list of approved low-water-use plants.
- The Third Management Plan restricts water use at turf facilities larger than 10 acres in size, such as golf courses, schools, parks, cemeteries, and common areas of homeowners' associations. The amount of water that turf facilities can use on an annual basis is specified by a formula in the plans. The municipal restrictions for turf facilities are the same as those that apply to industrial facilities.
- The Third Management Plan contains restrictions on the use of groundwater in artificial lakes. A 1987 State Law (the "Lakes" bill) restricts the use of groundwater to create/maintain lakes, ponds, and swimming pools within AMAs. In general, new lakes in AMAs cannot be larger than 12,320 square feet

unless certain exemptions apply. For example, the lakes may be filled with effluent. However, special permits are available from the ADWR that allow new lakes to be filled with poor quality groundwater or other water sources on an interim or emergency basis. Lakes built before January 1, 1987, and lakes located in certain public facilities, such as parks, can continue to use groundwater. Golf course lakes are also exempt from the law because they are regulated by specific provisions within the management plans.

- Private residential swimming pools cannot be larger than Olympic size (12,320 SF). Resorts, motels, and country clubs can have several pools, but only one pool can be larger than Olympic size, but not larger than 1 acre in size.

- Each large municipal water provider must maintain its distribution system and properly meter and account for all deliveries. Water losses may not exceed 10 percent. Small providers must maintain their systems such that losses do not exceed 15 percent.

2.2.2.4 Assured Water Supply

The Groundwater Code established requirements to ensure that water supplies are adequate to meet the long-term needs of new development. The AWS Program requires the demonstration that sufficient water supplies of adequate quality are physically, continuously, and legally available for 100 years. In an AMA, anyone who offers subdivided or non-subdivided land for sale or lease must demonstrate an assured supply of water to the ADWR before the land may be marketed to the public. To receive an AWS certificate from the ADWR, a developer must demonstrate that: 1) water of sufficient quantity and quality is available to sustain the proposed development for 100 years, 2) the proposed use is consistent with the management plan and the AMA management goal, and 3) the water provider has the financial capability to construct water delivery and treatment systems to serve the proposed development. Alternatively, the developer can locate the proposed development within the service area of a city, town, or private water company that has already received a Designation of Assured Water Supply from the ADWR. If a "designated" provider serves the subdivision, the developer only need obtain a written commitment of service from the water provider.

In 1995, the ADWR adopted new AWS rules, primarily to support the groundwater management goals. New rules associated with this program promote the use of renewable supplies, such as effluent and water delivered via the CAP, as a component of an assured supply. The rules require new developments to be based predominantly on renewable supplies.

In 1993, the Arizona legislature formally created CAGRD to provide a way for developers and water providers to demonstrate an AWS and help the state meet the objectives of the 1980 Groundwater Management Act by replenishing pumped groundwater. The CAGRD recharges groundwater supplies on behalf of its members in order to reach and maintain "safe yield" in the Tucson AMA. Marana Water is a member of the CAGRD. The CAGRD is managed by the CAP, which in turn is managed and operated by the Central Arizona Water Conservation District (CAWCD). The CAWCD is a municipal corporation, also known as a public improvement district. This quasi-governmental entity was formed to repay the federal government for the reimbursable costs of construction, and to operate and manage the CAP. The CAGRD currently replenishes excess CAP water for members to meet their replenishment obligations.

2.2.2.5 Groundwater Rights in AMAs

A vital part of groundwater management involves identifying existing water rights and providing ways for water users to initiate new withdrawals. Within an AMA, an entity must have a groundwater right or permit to pump groundwater legally, unless the entity is withdrawing groundwater from an exempt well (maximum pump capacity of 35 gpm). Exempt wells may be used to withdraw groundwater only for non-irrigation purposes, and are generally used for domestic and landscape purposes. Exempt wells must be registered with the ADWR, but they are subject to fewer requirements than non-exempt wells within AMAs. In order to withdraw water from non-exempt wells in AMAs, either grandfathered rights, service area rights, or a withdrawal permit must exist for the well.

Users who pump groundwater from non-exempt wells in AMAs must also report annual pumpage to the ADWR. This provision helps the ADWR determine how much water is being used and where it is being used. The Code also requires payment of an annual groundwater withdrawal fee. Revenues from the groundwater withdrawal fees are used for administration and enforcement purposes and for funding augmentation and conservation assistance programs. Withdrawal fees can also be used for the purchase and retirement of grandfathered rights.

2.3 LOCAL REQUIREMENTS

The Town of Marana is governed by an elected Mayor and Council, which have jurisdiction over rates, fees, and water management issues. The Mayor and Council are advised regarding water utility issues by the Utilities Citizen Advisory Commission, based on the requirements and guidance set forth in the Town's Water Policies and Water Utility Code. The function of the Utilities Citizen Advisory Commission is to act as an advisory committee for the Town Council on capital improvement program planning and rate structure formulation. The Commission reviews and makes recommendations on water system development, long-term water sources, capital needs, rate adjustments, capital budget and allocations, state and federal legislation regarding water-related issues, expansion of utility service areas, and private water company acquisition.

2.3.1 Town of Marana Water Policies

The Town of Marana Mayor and Council have developed water policies to provide guidance regarding the operations and finances of the utility. The Town's water policies, presented in the next chapter, discuss requirements for financing of the water utility, including setting water rates and other fees, system development requirements, acquisition of other water systems, water supply, management and development, and conservation.

2.3.2 Town of Marana Water Code

The purpose of the Water Code is to promote the health, safety, order, and general welfare of those persons served by Marana Water. The Water Code sets guidelines for providing water service to the residents of Marana and those served by Marana Water but outside the Town boundaries. The Water Code provides the basis for the operations of the water utility, and describes the conditions that must be met to allow new construction, the agreements required for new construction or line extensions, and the method for review and approval for construction of facilities by entities other than the Town. The Water Code also includes the water system capacity requirements, oversizing refunds, and service area inclusion and fees.

Based on the regulatory requirements in Chapter 2, the Town of Marana has developed ordinances and policies relating specifically to the operation of its water utility. This section presents a summary of the policies for service set by the Town of Marana.

3.1 NON-POTABLE WATER SYSTEM POLICY

The goal of the Water Master Plan is to provide the flexibility within the water system infrastructure to adapt to the varying conditions that will occur when irrigation demands are removed from the potable water system. It is the goal of Marana Water to serve the majority of the service area's irrigation and turf demands via either a separate reclaimed or a non-potable water distribution system.

The potable water system will continue to serve the existing and future large irrigation users until the non-potable water system is in place and operational. The potable water system will be designed to operate both reliably during the period it is serving the large turf users and efficiently, following their removal. The potable water system may be used as a backup for serving the non-potable users in case of temporary non-potable water system outages. This condition may be accommodated by the existing well system in the winter months. The wells, booster stations, and reservoirs will be designed, constructed, and phased into the system to eliminate major operational changes during the conversion of the large turf users to alternative water supplies, and to avoid large redundant facilities after the large turf users are removed from the system.

3.2 FIRE FLOW POLICY

The Town of Marana is currently served by the Northwest Fire District, and has adopted the 2006 International Fire Code (IFC). The 2006 IFC includes tables and formulas for calculating the required fire flow for residential and commercial facilities. The fire-flow requirements for residential facilities are typically based on the development density, the square footage of the homes, and whether or not the structures are sprinklered. Fire-flow requirements for homes typically range from 750 gpm to 1,500 gpm, depending on the above conditions. The typical residential subdivision has a fire-flow requirement of 1,000 gpm for two-hour duration for units having a buildable area of less than 3,600 square feet. Other requirements include fire hydrants with a maximum spacing of 250 feet between residential structures and the nearest fire hydrant.

Commercial facility fire-flow requirements also vary depending on the square footage of the commercial building, occupancy type, building material type, exposure distance to other buildings, and whether or not the structure is sprinklered. Typical commercial facilities within the Town of Marana area have fire-flow requirements from 1,500 to 4,000 gpm for a two- to four-hour duration. The fire hydrant spacing is generally the same as for residential structures.

The Marana Water service area includes a number of older subdivisions, which were developed prior to the adoption/enforcement of the IFC. These areas do not have the currently required fire-flow capacity. Per the IFC, these areas are grandfathered and not required to be retrofitted to meet the IFC standards. The lack of fire-flow capacity varies greatly in these older areas. Some areas are served by 4-inch mains with little fire-flow capacity. Other areas have larger mains and existing fire hydrants but may lack booster and storage capacity to meet the fire flow and duration requirement.

There are generally two considerations to providing adequate fire flow to a neighborhood. The first consideration includes offsite requirements; such as the volume of fire flow storage available in the reservoirs, adequately designed pressure zones, and the size of offsite transmission mains. The second factor involves the internal distribution system within the neighborhood, including main sizes, adequate looping, and fire hydrant placement. It is the goal of Marana Water to develop adequately sized reservoirs, properly designed pressure zones, and main sizing to provide adequate fire flow throughout the major water transmission mains within its water system. The required infrastructure for the interior subdivisions, including replacement mains, pavement replacement, looped systems, and new fire hydrants, may be developed and financed through miscellaneous capital improvements, system upgrades, or local neighborhood improvement districts.

The existing Marana Water's procedures for plan review call for all subdivision and water extension plans to be reviewed and approved by the Northwest Fire District fire marshal. The fire marshal typically reviews fire hydrant locations,

spacing, and fire-flow capacity requirements. The fire marshal also reviews street layouts, adequate access for fire trucks, and turnaround capacities for the trucks. The design engineer of the water project is required to provide design calculations and improvement plans for the facilities needed to provide the required fire flow to the development. Marana Water also requires hydraulic modeling to be performed for the integration into the Marana Water system. These plans are then reviewed and approved by Marana Water prior to construction.

The design and development of this Master Plan include projecting fire-flow requirements within prescribed areas based on the land use zoning. These fire-flow projections are incorporated into each zone of the water system for infrastructure sizing and design. For the purpose of this Master Plan, the fire-flow requirement is generally assumed to be 2,000 gpm for two-hour duration for a pressure zone. However, when the existing fire flow requirement in a particular zone has exceeded this assumption, the larger existing flow requirement is then applied.

3.3 STORAGE CAPACITY POLICY

Reservoir storage capacity is a critical element in the design and operation of water systems. Reservoir storage is used primarily to accommodate hourly fluctuations and demand, PDD fluctuations, fire-flow requirements, and emergency reserve storage. Each of these requirements added together forms the required storage capacity for each zone. Current ADEQ criteria typically require the minimum storage capacity per zone to equal the average day demand of the peak month. Under certain circumstances, in service areas with excess well capacities, the storage capacity may be lowered.

The advantages of having additional storage include operational flexibility, reduced cycling time for production facilities, lower pressure fluctuations, greater reliability, and reduction in well capacity requirements for larger reservoir storage volumes. The disadvantages of a larger storage capacity requirement are the additional cost and aesthetic impacts of larger reservoirs, additional land area required for reservoir sites, and the increased potential to water stagnation in larger reservoirs. The selected storage capacity requirement for Marana Water is 1.5 times the ADD plus fire-flow requirements. This volume of water will provide for hourly system fluctuations, emergency storage and fire-flow reserves. This storage criterion is based on maintaining a well system capable of providing peak-day demand for the system with the largest well out of service. Marana water recommends the storage reservoir be assumed at 60 percent full when performing hydraulic modeling for fire-flow availability.

It is the policy of Marana Water to use gravity storage for each zone wherever possible. A gravity storage system provides a highly reliable water delivery system that operates with small pressure fluctuations and will also continue to operate during power outages using the remaining water in the reservoir system. When it is not economically feasible to provide a zone's full storage capacity via gravity storage, it is recommended at least 25 percent of the capacity be provided via gravity storage. The exceptions to these design criteria may be those isolated zones in the upper portions of the service area where reservoir locations are not available.

3.4 SYSTEM PRESSURE POLICY

The design criteria for Marana Water include zone boundaries located at approximate 100-foot elevation intervals. The zone boundaries of the Marana Water system are generally matched to the Tucson Water zone boundaries. For the purposes of this Master Plan, Marana Water will adopt the Tucson Water zone boundary delineations and high-water elevations for its pressure zones, with the exception of the W+ Zone, and the Continental Reserve/Picture Rocks service area, where the existing pressure zone delineation will be maintained as is.

Using these design criteria, typical static pressure fluctuations within the system will vary from approximately 40 psi at the top of the zone to 87 psi at the bottom of the zone. The point of use pressures will vary from static with daily demand fluctuations and fire-flow conditions. It is the policy of Marana Water that its system be designed to maintain a residual pressure of at least 20 psi in all portions of the system under all conditions of flow, and a pressure of at least 35 psi during PDD. These pressures and zone boundary elevations are based on the finished floor elevations of the homes or the elevation of the highest floor of a multi-level building. In areas with steep terrain or where highly

variable elevations occur, zone boundaries may be allowed to be spaced at larger intervals than 100-foot and the static water pressures may be allowed to approach 120 psi if needed for effective operation. In these cases, Marana Water requires appropriate pressure-reducing facilities be installed to protect its infrastructure and individual services. The IPC requires the water pressure within the individual property owner's plumbing below 80 psi. All pressures above 80 psi within the water delivery system shall be reduced by individual PRV located on the provide side of the building service.

Pressure fluctuations in the water system are highly dependent on the design of a water system. Two methods are typically used for system design and control. The preferred method is a gravity storage system with the water surface of the reservoir set at the high water elevation of the system. This allows customers within the zone boundary to be served directly from the reservoir by gravity and the system pressure is thus regulated by the reservoir level. This method provides a highly reliable system with small pressure fluctuations. The pressure fluctuations under static conditions may be as little as 5 psi. The system will also continue to operate during power outages using the remaining water in the reservoir system.

The second method of system control is based on pressure. Under these conditions, the operation of pumps is controlled by the pressure within the water system. Pumps turn on and off based on prescribed pressure ranges. This method of control will typically allow pressure ranges in the system to vary by as much as 20 psi throughout the day. In addition to greater pressure fluctuations, unless backup generators are provided, the water service will be disrupted during power outages. The above pressure fluctuations are required to be incorporated into the design criteria for designing of the zone boundaries, booster stations, and reservoir systems. Marana Water currently utilizes both methods of control, with backup generators provided at many booster stations.

3.5 LOOPED WATER SYSTEMS POLICY

Marana Water requires looped water transmission and distribution mains for its water main grid system and individual development whenever practical. Review criteria include requiring developments to stub to property lines for future connections and to provide a looped system for internal distribution. In addition, appropriate valving at the recommended locations and intervals is required to isolate smaller sections of main during breakages and to reduce the number of residences out of service.

3.6 BACKUP GENERATOR POLICY

Marana Water typically incorporates onsite backup generators at its large booster stations that provide pressure service to areas not connected to a gravity storage system. It is also the policy of Marana Water to make provisions for the connection to portable backup generators for those booster stations without onsite backup generators. Marana Water currently has three onsite backup generators installed at the Marana Park booster station (400 Kilowatts (KW)), San Lucas booster station (275 KW), and the Continental Reserve booster station (400 KW). Marana Water also has a 35 KW portable generator stored at the Marana Operations Center.

3.7 SCADA POLICY

Marana Water has a fully integrated supervisory control and data acquisition (SCADA) system. The system provides radio communication by Remote Terminal Units (RTUs) between all of the water facilities and a central control station at the water utility office via spread spectrum radio communication technology. The telemetry system allows an operator to remotely monitor and control water system operations. In addition, the system offers the ability to detect and analyze overall system trends over time. The telemetry-control system monitors water level elevations of reservoirs, water pressures, air levels, pump on/off conditions, and system failures. In the event of a failure, the RTU automatically alerts water utility personnel of the failure, allowing operators to take corrective actions prior to the disruption of customer service. The SCADA system also provides site security monitoring features for early intrusion detection. It is the policy of Marana Water to continuously maintain and upgrade its automated telemetry controls system.

3.8 WATER QUALITY CONTROL POLICY

It is the policy of Marana Water to provide for system disinfection via wellhead chlorination and maintain adequate residual chlorine concentrations throughout the water system. Wellhead chlorination protects the water system from passive airborne and

bacteriological contamination. This policy will help prevent bacteriological contamination that may occur through airborne contamination at reservoirs or within stagnant mains.

In light to the GWR requirements, it is the policy of Marana Water to provide 4-log virus treatment for new potable wells. This typically means a well-reservoir-booster station system is required to provide adequate contact time for disinfection. For the purpose of 4-log treatment demonstration, a chlorine residual of 0.5 ppm prior to the first customer is recommended.

3.9 VALVE AND PUMP FACILITY MAINTENANCE POLICY

It is the policy of Marana Water to develop and implement a preventive, routine maintenance program to provide regularly scheduled maintenance on control valves, pumping units, motors, and other critical components of the water distribution system. Marana Water strives to exercise valves, inspects reservoirs, hydropneumatic tanks and boosters and fire pumps on a regular basis.

3.10 LAND ACQUISITION POLICY

The Marana Water Master Plan provides locations and sizes for future wells, reservoirs, booster stations, future treatment facilities, and major transmission mains for the 10-year planning horizon. This Master Plan also identifies the sizes and locations of major gravity storage facilities and transmission mains at buildout. These facilities will be generally located on the water system maps. Many factors and constraints are required to determine the final location for each site. These factors include the proximity to existing water transmission mains, proximity to three-phase power, access to public streets, specific elevation requirements for gravity reservoirs, hydrogeologic requirements for well sites, noise and buffer requirements for booster stations and wells, aesthetic screening requirements for aboveground facilities, and the cost of acquiring the land and/or availability of other preferable sites.

Experience has demonstrated that the early identification of land and right-of-way needs for future use can result in substantial acquisition savings when compared to "urgent need" acquisitions. To minimize land acquisition costs for Marana Water, it is recommended that all appropriate Town departments be made aware of the future land requirements of the utility. This mechanism will alert Town staff and the development community early in the planning process that water utility facilities are required in a specified location. Through this process, site acquisition, concept planning and layouts, and water facilities design can be planned along with the surrounding development. Land acquisition for water facilities should be included in planning review checklists and pre-application meetings for upcoming plan reviews. It is recommended that property dedications and acquisitions for potential water plant sites be made part of the rezoning and platting process for new developments.

It is also essential for Marana Water to locate and acquire land for future well sites, boosters, reservoirs, treatment facilities, and existing facility expansions prior to facility design/development. This will allow the water utility to secure property when available and help in informing surrounding landowners of the future uses.

3.11 EXISTING SYSTEM UPGRADE POLICY

The Marana Water Master Plan evaluates the existing water system in terms of engineering design criteria, to guide the utility in determining required upgrades to existing water facilities. The system design criteria include demand calculations, peaking factors, water supply requirements, the number and capacity of required wells, reservoir storage requirements, booster station capacity requirements, emergency backup systems, distribution system sizing, and water system grid requirements. An evaluation of the existing system was performed during the initial stages of the Master Plan planning process.

The Master Plan identifies areas where the existing system does not meet the proposed standard of service as adopted by Marana Water. It specifies new facilities and/or facility upgrades to bring the existing system into compliance with design criteria. These facilities include new wells, booster station upgrades, reservoir capacity additions, transmission main augmentations, and pipeline replacement. The projected cost estimates are provided for these facilities, as well as a priority schedule and timeline for the infrastructure development. It is anticipated that the cost of upgrading the existing system will

be financed by water utility rates. The system upgrades are limited to the existing water facilities and the spine water distribution mains, and not include projects to upsize mains within individual developments.

3.12 OVERSIZED REFUND AND CREDIT POLICY

The Marana Water Master Plan includes the locations of the major water facilities and major water distribution mains. The major water distribution mains are generally located within the rights-of-way of major streets within the Town. The water mains are sized to deliver adequate flows to meet PDD plus fire flow, or PHD, whichever is greater. These water main sizes are generally larger than required to serve a single development. During the extension of water main facilities to serve a development, it is preferable to initially construct the ultimate size water main rather than building smaller mains and later constructing additional parallel mains for future developments. Phasing the development of distribution system, calling for parallel mains, is typically uneconomical and many times becomes impossible before the second phase can be constructed due to restrictions and availability of existing right-of-way corridors. It is, therefore, the policy of Marana Water to build the ultimate water main facilities initially for water main extensions.

The Town of Marana Code has an existing oversizing refund policy whereby the initial development installs the ultimate-sized water main at their cost. The Town will refund the oversizing cost of the water main by reimbursing the developer for the material cost difference between what was required to deliver water to the subject property and what was required to enhance the water system for future growth, in accordance with provisions identified in the water service agreement.. The oversized refunding credit policy will typically be used for water distribution and transmission mains only.

3.13 WATER SYSTEM DEVELOPMENT AND FINANCING POLICY

Water system development procedures and system financing are the most critical and important policies to be addressed during updating of the Water Master Plan. The water system development requirements have been divided into two primary components: 1) the existing system upgrade requirements, and 2) water system improvements for growth and expansion.

3.13.1 Existing System Upgrades

The first category of water system improvements defined by the Master Plan includes the specific facility requirements to bring the existing water system into compliance with the adopted water system design criteria, policies, etc. These projects have been identified, and opinions of probable cost (present value) have been provided. The policy of Marana Water is to develop a schedule for implementation and construction of the upgrades. Improvements may require financing through long-term debt and payback through the water rates.

Required facilities include upgrades to existing storage and transmission mains. The required facilities are expected to have a useful life of 20 years or greater, but will require high initial cash outflows in the early years. Since these facilities primarily benefit the existing rate users, long-term debt may provide a mechanism for obtaining the initial cash flow requirements and spreading the payments over a longer term. This method of financing more closely matches the facilities' useful life and provides the ability to pay off the financing through water rates.

3.13.2 Water System Improvements for Growth and Expansion

The second category of water system improvements includes water system expansion for system growth and water system service area expansion. The policy of Marana Water is that future growth pay for itself. All costs of the new facilities, which are required for new system development, will be paid for by the future developments benefited.

Two methods may be used to allocate these costs to the development community. The first will be through water system development fees. Water system development fees will be assessed to smaller developments, based upon meter sizes, water demand requirements, or alternative methods. The water system development fee will include all costs associated with providing the facilities for serving the new development. These costs will include design and construction costs for the required reservoirs, booster stations, production wells, transmission mains, AWS, administrative, financing,

and other costs associated with inflationary cost escalations.

The second method of fair share cost allocation to the development community will be through development and water service agreements. Marana Water will individually evaluate the larger developments to determine the appropriate size, location, and phasing requirements for future development on an individual basis.

3.14 PROJECT PRIORITIZATION POLICY

Project priorities should be established based on meeting system design requirements and providing the greatest return of system development fees. Priority and project approval guidelines are used in developing the Capital Improvement Plan (CIP) for growth-related projects. Project priorities are established based on the following requirements (listed in no specific order):

1. Ability to provide required peak demand, pressure, fire flow, and system reliability for largest projected population growth or commercial area.
2. Existing system's ability to meet ADEQ and Marana Water's requirements.
3. Greatest return of development fees to pay capital and financing costs.
4. Ability of project to improve service to other users in the system.
5. Ability of Marana Water to pay for projects with funds on hand.
6. Ability to construct transmission mains as a part of an existing roadway project at costs significantly lower than future construction costs. The Master Plan projects should be integrated into major street and route roadway projects.
7. Ability of the project to enhance commercial growth within the Town.

3.15 WATER UTILITY CONSTRUCTION STANDARDS POLICY

Marana Water has developed a set of construction standards relating to specific details of construction of elements of the water system. These standards are required to be implemented on all construction projects for Marana Water and exceed the minimum standards as required by ADEQ. Details are provided for a variety of construction elements, including backflow prevention, air release valves, meter boxes, PRVs, and drainage structure crossings. The standards also include design and construction general notes.

3.17 DROUGHT PREPAREDNESS PLAN

Marana Water has filed a Drought Preparedness Plan with ADWR in response to the potential impacts of a prolonged drought, if occurred, on its potable water supplies. The Drought Preparedness Plan defines four stages of drought responses from moderate to severe, which in turn determine the measures to be initiated to conserve the Marana Water's potable water supply. The four stages of drought and associated measures are defined as below:

- Stage One (Moderate) is initiated when any two of the triggers are present. (i) Arizona Drought Monitor percent of precipitation for the water year is 70% to 90% of normal. (ii) Arizona Drought Monitor is D-2: severe drought. (iii) The annual decline of the overall groundwater level is between 1.0 feet to 2.4 feet. (iv) over 45 consecutive days of 100 Fahrenheit degrees. In Stage One, Marana Water will increase customer awareness about the drought and water resources through education. Additionally, the Town of Marana will work with Pima County to put in place ordinances that strengthen Southern Arizona's conservation ethic. Marana Water will work with its neighboring water providers to look at cooperative efforts that include providing emergency backup as well as joint conservation efforts. Most importantly, Marana Water will continue its overall water management efforts to use renewable water supplies. In effect, Marana Water has already been doing all of Stage One measures for last few years.
- Stage Two (Abnormally Dry) is initiated when any two of the triggers are present. (i) Arizona Drought Monitor percent of precipitation for the water year is 50% to 70% of normal. (ii) Arizona Drought Monitor is D-3: extreme drought. (iii) The annual decline of the overall groundwater level is between 2.5 feet to 3.9 feet. (iv) Over 60 consecutive days of 100 degrees. In Stage Two, Marana Water requests

customers to limit landscape irrigation to two days per week and only between 8:00 p.m. and 8:00 a.m., as well as avoiding other outdoor water uses such as hosing down walkways and washing vehicles without a bucket and hose with a positive cutoff nozzle. Hotels and restaurants will be asked to initiate industry green measures for conserving water, such as providing water only on request and washing sheets and towels only if requested. Under Stage Two, all of the measures of Stage One will also continue.

- Stage Three (Emergency) is initiated when any two of the triggers are present: (i) Arizona Drought Monitor percent of precipitation for the water year is 25% to 50% of normal. (ii) Arizona Drought Monitor is D-4: exceptional. (iii) The annual decline of the overall groundwater level is between 4.0 feet to 4.9 feet. (iv) over 75 consecutive days of 100 Fahrenheit degrees. In Stage Three, Marana Water will not permit the use of potable water for construction including dust control; reclaimed water will need to be used instead. Marana Water will consider instituting a drought surcharge to Tier 5 of its rate structure. Additional voluntary water reduction measures will be requested from customers including the limiting of landscape irrigation to one day per week and only between 8:00 p.m. and 8:00 a.m. In addition to avoiding outdoor water uses, customers will be asked not to empty or fill their pools. The other measures of Stage One and Stage Two will continue to be in place.

- Stage Four (Crisis) is initiated when any two of the triggers are present: (i) Arizona Drought Monitor percent of precipitation for the water year is 25% of normal. (ii) Arizona Drought Monitor is D-4: exceptional. (iii) The annual decline of the overall groundwater level is 5.0 feet or more. (iv) over 90 consecutive days of 100 Fahrenheit degrees. Under Stage Four, Marana Water will begin the process set forth in Arizona Revised Statues section 9-463.06 to consider adopting a moratorium on the issuance of permits and approvals for new water-consuming uses and activities. Marana Water will consider instituting a drought surcharge to Tier 3 and Tier 4 of the rate structure in addition to the one for Tier 5. No potable water will be used for construction. Customers will be requested to limit landscape irrigation only to trees and shrubs one day per week and only between 8:00 p.m. and 8:00 a.m. and no irrigation of turf or ground covers. Other previous measures will continue to be in place.

5.1 General

This chapter presents the analysis of future development potential, calculations for the future water system demands, and recommendations for future system infrastructure upgrades for the 5-year, 10-year, 20-year, and buildout planning horizons.

The planning area for Marana Water at buildout is based on the Town of Marana limits as indicated in the adopted 2007 Town of Marana General Plan, excluding La Olsa, areas to be served by Red Rock, Tucson Water, and other water providers, and areas anticipated with low development potential.

Topography for the planning area is provided by the Town of Marana Technology Services Department. Areas with existing land use were removed from the general plan database and the parcel database. The topography database was used to extend the pressure zone boundaries to the edges of the 2010 planning area. The resulting pressure zone database was used to assign the land use projections to each water pressure zone.

The future system demand projections are based on the land use provided in the 2007 Town of Marana General Plan. **Table 5-1: Planning Density by Land Use Category** shows the planning density in EDUs assumed for each land use category.

TABLE 5-1. Planning Density by Land Use Category

Land Use Category	EDUs per Acre	Percent attached to Municipal Water	EDUs Attached per Acre
Airport	0.25	100%	0.25
Commercial	4	100%	4
Industrial	4	100%	4
Industrial (Low Density)	0.4	100%	0.4
Low Density Residential	1.5	100%	1.5
Medium Density Residential	4	100%	4
Park	0.2	100%	0.2
Rural Density Residential	0.1	50%	0.05
Special Planning Area	4	100%	4
Specific Plan Commercial/Industrial	4	100%	4

An EDU represents either a single-family residence or some other water use that consumes the same amount of water as a single-family residence. For example, as shown in **Table 5-1**, it is assumed that, on average, one acre of commercial land use will use the same amount of water as four single-family residences (or 4 EDUs).

Exhibit 5-1: Town of Marana 2007 General Plan and Specific Plans shows the areas in the 2007 General Plan associated with specific plans. For each specific plan, the Town of Marana Planning Department has provided the area in acres for each land use. For example, one specific plan might include a combination of High- and Medium-density Residential and some Commercial land use. EDU estimates for the specific plan areas are based on the densities by land use category shown in **Table 5-1** and on the assumption that buildout will be about 90–100 percent of the specific plan projections based on discussions with Town of Marana planning staff. **Table 5-2: Specific Plans Used in Flow Projections** shows the EDUs associated with each specific plan based on 4 EDUs per acre of commercial and industrial land use.

TABLE 5-2. Specific Plans Used in Flow Projections

Specific Plan	Residential Units	Commercial and Industrial Acres	Total EDUs
Barrios De Marana	315	20	395
Cascada	3,419	84	3,755
Deanza	306	0	306
Gladden Farms II	2,111	210	2,951
Las Pilas	350	5	370
Mandarina	2,249	215	3,109
Marana Gardens	39	0	39
Marana Main Street	0	28	112
Marana Spectrum	0	167	668
Pima Farms	1,621	30	1,741
Rancho Marana East	506	78	818
Rancho Marana West	2,299	223	3,191
Saguaro Springs	2,250	10	2,290
Sanders Grove	2,249	19	2,325
Tangerine Commerce Park	0	112	448
The Shops At Tangerine	0	281	1,124
The Villages Of Tortolita	5,849	505	7,869
Uptown At Marana	929	121	1,413
Grand Total	24,517	2,108	32,949

5.2 BUILDOUT SYSTEM DEMANDS

The future water system analysis is based on the ultimate projected number of EDUs in the Marana Water's planning area, which will be used for long-term planning and financial analysis. As growth occurs, the future water system will expand to serve currently as yet undeveloped areas within the planning area. The projected residential units, commercial/industrial acres, and the water demands by pressure zones are presented in **Table 5-3: Buildout Projection Summary**. The water demands were calculated using the same demand criteria as for the existing system demands.

TABLE 5-3. Buildout Projection Summary

Water Service Zone	Population	Residential Units	Non-residential Acres	Buildout EDUs	Average Daily Demand (gpm)	Peak Daily Demand (gpm)	Peak Hour Demand (gpm)
A	5,406	2,002	5	2,013	453	906	1,585
B	2,591	960	0	960	216	432	756
C	2,645	980	78	1,289	290	580	1,015
CR	4,556	1,687	34	1,884	424	848	1,484
PR	637	236	0	370	83	166	291
V	5,562	2,060	7,065	16,385	3,687	7,373	11,060
W+	83,724	31,009	12,818	77,385	17,412	34,823	52,235
X1a	21,331	7,900	163	8,549	1,924	3,847	5,771
X1(b,c,d)	45,998	17,036	9,487	44,681	10,053	20,106	30,159
Y1	13,053	4,834	900	8,292	1,866	3,731	5,597
Y2	3,994	1,479	885	1,833	412	825	1,443
Y3	1,222	452	105	1,905	429	857	1,500
Z1	10,477	3,880	30	3,998	900	1,799	3,148
Z2	40	15	116	61	14	27	48
Total	201,235	74,532	31,685	169,604	38,161	76,322	116,093
Projected Buildout Demand					**61,554 AFY**		

5.3 YEAR -5, -10, AND -20 SYSTEM DEMANDS

Growth patterns for the next 20 years were projected in order to plan for the implementation of infrastructure, In addition to buildout conditions, system demands within 5 years (2015), 10 years (2020), and 20 years (2030) were projected for planning purposes.

The growth patterns for the first 10 years (2015 and 2020) are based on the assumption that growth during this time will occur in the specific plan areas and in the area surrounding the Marana Airport, and growth for the next 10 years (2030) will occur along the freeway in Pima County, at the Marana Airport, and along Tangerine Road east of I-10. The Town of Marana Planning Department provided estimates of the percentage of growth of each specific plan during four phases: existing, 5-year (2015), 10-year (2020), and beyond 2020. **Table 5-4: Phasing of Specific Plan Development** shows each specific plan and the percent of planned development estimated to occur in each phase. The period between 10- and 20-year was extrapolated from the 5- and 10- year growth data (about 2,000 EDUs per year).

Growth of the area surrounding the airport was also divided by phase, with 25 EDUs per year or growth during the 5-year period and 130 EDUs per year growth beyond the initial 5-year period. The Marana Airport currently has approximately 50 EDUs.

Table 5-4. Phasing of Specific Plan Development (as Percent of Buildout)

Specific Plan	Estimated Percent of Development Planned by Phase			
	Existing	5-Year	10-Year	Beyond 10 Year
Barrios De Marana	--	20	50	30
Cascada	--	20	40	40
DeAnza	--	15	55	30
Gladden Farms II	--	25	60	15
Las Pilas	--	--	50	50
Mandarina	--	10	50	40
Marana Gardens	--	--	100	--
Marana Main Street	--	20	50	30
Marana Spectrum	--	50	50	--
Pima Farms	95	5	--	--
Rancho Marana East	--	--	20	80
Rancho Marana West	15	10	50	25
Saguaro Springs	--	15	50	35
Sanders Grove	--	10	70	20
Tangerine Commerce Park	--	20	50	30
The Shops At Tangerine	--	--	60	40
The Villages Of Tortolita	--	--	60	40
Uptown At Marana	--	--	40	60

Table 5-5: 2015 Projected Demand Summary, Table 5-6: 2020 Projected Demand Summary, and Table 5-7: 2030 Projected Demand Summary present the anticipated EDUs, ADD, PDD, and PHD served by Marana Water for 5, 10, and 20 years.

TABLE 5-5. 5-Year (2015) Projected Demand Summary

Water Service Zone	Equivalent Dwelling Units (EDUs)	Average Daily Demand (gpm)	Peak Daily Demand (gpm)	Peak Hour Demand (gpm)
A	24	5	11	19
B	0	0	0	0
C	12	3	5	9
CR	1,861	419	837	1,466
PR	233	52	105	183
V	747	168	336	588
W+	4,959	1,116	2,232	3,347
X1a	660	149	297	520
X1b	718	161	323	565
X1c	259	58	117	204
X1d	420	95	189	331
Y1	1,357	305	611	1,069
Y2	0	0	0	0
Y3	1,243	280	559	979
Z1	651	146	293	512
Z2	0	0	0	0
Total	13,143	2,957	5,914	9,792
2015 Projected Demand			**4,770 AFY**	

TABLE 5-6. 10-Year (2020) Projected Demand Summary

Water Service Zone	Equivalent Dwelling Units (EDUs)	Average Daily Demand (gpm)	Peak Daily Demand (gpm)	Peak Hour Demand (gpm)
A	72	16	32	57
B	0	0	0	0
C	24	5	11	19
CR	1,861	419	837	1,466
PR	233	52	105	183
V	1,493	336	672	1,176
W+	14,581	3,281	6,561	9,842
X1a	2,043	460	919	1,609
X1b	1,863	419	838	1,467
X1c	844	190	380	665
X1d	2,933	660	1,320	2,310
Y1	2,739	616	1,233	2,157
Y2	0	0	0	0
Y3	1,243	280	559	979
Z1	1,212	273	545	954
Z2	0	0	0	0
Total	31,140	7,007	14,013	21,020
2020 Projected Demand			**10,302 AFY**	

TABLE 5-7. 20-Year (2030) Projected Demand Summary

Water Service Zone	Equivalent Dwelling Units (EDUs)	Average Daily Demand (gpm)	Peak Daily Demand (gpm)	Peak Hour Demand (gpm)
A	513	115	231	404
B	216	49	97	170
C	271	61	122	213
CR	1,884	424	848	1,484
PR	233	52	105	183
V	2,771	623	1,247	2,182
W+	23,243	5,230	10,459	15,689
X1a	3,227	726	1,452	2,541
X1b	3,814	858	1,716	3,003
X1c	2,872	646	1,292	2,262
X1d	5,416	1,219	2,437	3,656
Y1	3,765	847	1,694	2,965
Y2	460	104	207	362
Y3	1,712	385	770	1,348
Z1	1,843	415	829	1,451
Z2	61	14	27	48
Total	52,300	11,768	23,535	37,962
2030 Projected Demand			**18,981 AFY**	

5.4 FUTURE SYSTEM SIZING AND REQUIREMENTS

The water system design criteria that were established in Section 4.2, Existing System Design Criteria, are also used to develop the future water system capacity requirements for the Town's water systems. Future system requirements include well capacity, storage capacity, booster capacity, and transmission mains to serve buildout and phased system demands.

5.4.1 Source Capacity

Potable water production capacity requirements are based on meeting PDD with the largest well out of service. A summary of the well capacity requirements for the 5-, 10-, 20-year and buildout projections are presented in **Table 5-8: Future Source Capacity Requirements Summary**. The source capacity requirements in **Table 5-8** include reserve well capacity. Based on historic consumption records for the region, the PDD is twice the ADD. The PDD for Marana Water at buildout is approximately 76,322 gpm (**Table 5-3**). The reserve well capacity is anticipated to be approximately 9,100 gpm at buildout (10,330 gpm from Table 5-8 less 1,230 gpm, which is not needed when the pressure zones X1b and X1c are interconnected). Based on these projections, Marana Water will be required to maintain a production well capacity of approximately 85,422 gpm at buildout.

Table 5-8. Future Source Capacity Requirements Summary

Zone with Wells	Zone Served	Existing Well Capacity (gpm)	Reserve Well Capacity (gpm)	2015 Source Capacity Required (gpm)	2020 Source Capacity Required (gpm)	2030 Source Capacity Required (gpm)	Buildout Source Capacity Required (gpm)	Additional Capacity Required at Buildout (gpm)
Y1	A	2,097	1,150	2,070	2,971	3,484*1	6,740*1	4,643
	B							
	C							
	Z1							
	Y1							
X1	X1b	2,285	1,230	1,553	2,068	2,946	23,965*1	17,325
	X1c	4,207	2,000	2,117	2,380	3,292		
	X1d	58	1,700	4,418	10,501	3,077*1		
W+	X1a	--				13,612	40,370	36,550
	W+	3,820						
V1	V1	--	1,500	1,836	2,172	2,747	8,873	8,873
Y2	Y2	--	1,000	--	--	1,234	1,852	1,852
	Z2							
CR	CR	2,950	1,750	3,252	3,252	3,473	3,622	672
	PR							
	Y3							
	Total	**15,417**	**10,330**	**15,244**	**23,343**	**33,865**	**85,422**	**70,005**

*1 Includes half of the PDD for the Z1, A, B, and C pressure zones as the source water in these pressure zones are assumed to supply by X1 and Y1 Zone.

Marana Water has existing potable well capacity of approximately 15,417 gpm. Assuming the existing wells in the Town maintain the same production capacity, the additional source capacity required to serve buildout demands is projected to be 70,005 gpm. Approximately 47 new wells at 1,500 gpm each is required to meet its ultimate source capacity requirements assuming all source water is provided via wells.

Marana Water intends to introduce CAP water as an alternative source of potable water to its service areas. Two alternatives to serving CAP water to the Marana Water potable system include recharge and recovery wells and/or surface water treatment plant and blending with groundwater.

Marana Water currently owns 1,528 AFY CAP water rights. The projected buildout water demands for the Town are approximately 61,554 AFY. To achieve the goal of safe yield, an additional 60,026 AFY of renewable water sources are required. Marana Water is working proactively to secure its renewable water sources, which includes control of the water reclaimed from sewage conveyed by Marana owned sewers.

5.4.2 Storage

Storage sizing requirements are based on meeting 150 percent of the ADD, plus fire flow. It is recommended that at least 25 percent of the required storage capacity be allocated as gravity storage that feeds the pressure zone by gravity, if it is not practical to place all as gravity storage. Fire-flow demands will either be served from the

reservoir that floats the zone or from a reservoir that serves the zone indirectly through boosters or PRVs. Fire flow was generally assumed to be 2,000 gpm for two hour duration for the pressure zones that include zoned commercial and/or industrial use unless a larger fire flow requirement has already been established within the existing service areas. In addition, the existing fire flow requirements for the CR (Continental Reserve) and PR (Picture Rocks) as of 1,500 gpm and 700 gpm, respectively, for two hour duration were assumed as these areas are near buildout and no substantial growth is anticipated.

The storage requirements per zone are presented in **Table 5-9: Future Storage Capacity Requirements Summary**. The primary storage facilities for Marana Water are planned for the V, W+, X1, Y1, Z1, PR, CR, and Y3 service areas. At buildout, Marana Water requires approximately 77 million gallons of additional storage distributed throughout the system to meet the storage criteria, all of which is required to meet future demands as the existing system has an excess storage capacity of approximately 3.1 million gallons.

Table 5-9. Future Storage Capacity Requirements Summary

Zone with Storage	Water Service Zone	Existing Storage (gallons)	Fire Flow Storage Required (gallons)	2015 Potable Storage Required (gallons)	2020 Potable Storage Required (gallons)	2030 Potable Storage Required (gallons)	Buildout Potable Storage Required (gallons)	Additional Storage Required at Buildout (gallons)*
A	A	--	240,000	11,664	34,992	249,318	978,318	2,311,207
	B			0	0	104,976	466,435	
	C			5,832	11,664	131,706	626,454	
Z1	Z1	1,100,000	240,000	316,192	588,838	895,504	1,943,028	1,083,028
Y1	Y1	185,000	240,000	659,502	1,331,154	1,829,790	4,029,912	4,084,912
X1	X1b	1,940,000	240,000	348,705	905,175	1,853,361	21,714,745	19,569,745
	X1c	525,000	330,000	125,874	410,184	1,395,792		
	X1d	10,000	240,000	204,120	1,425,438	2,632,176		
W+	X1a		240,000	320,760	992,898	1,568,322	4,154,814	39,988,924
	W+	2,075,000	300,000	2,410,074	7,086,366	11,296,098	37,609,110	
V	V		240,000	363,042	725,598	1,346,706	7,963,095	8,203,095
Y2	Z2		240,000	0	0	29,646	29,646	1,160,484
	Y2		240,000	0	0	223,560	890,838	
CR	CR	1,000,000	180,000	904,446	904,446	915,624	915,624	95,624
PR	PR	100,000	84,000	113,238	113,238	113,238	179,809	163,809
Y3	Y3	1,000,000	300,000	604,098	604,098	832,032	925,830	225,830
	Total	**7,935,000**	**-**	**6,387,547**	**15,134,089**	**25,417,849**	**82,427,658**	**76,886,658**

* Includes fire flow requirement.

5.4.3 Booster Stations

Booster station sizing is based on providing PDD plus fire flow or PHD, whichever is larger, for the pressure zone without gravity storage. When gravity storage is provided for a pressure zone, the booster station requirement is to provide PDD for the zone and all that need water from the zone. . **Table 5-10: Future Booster Station Capacity Requirements Summary** provides the anticipated booster station capacities for the 5-year, 10-year, 20-year and buildout planning horizons. If the floating reservoir storage required to provide fire flow has not been built, the booster station may require additional capacity to provide the interim fire-flow requirements.

Table 5-10. Future Booster Station Capacity Requirements Summary*1

Water Service Zone	Existing Booster Capacity (gpm)	Fire Flow Required (gpm)	2015 Booster Capacity Required (gpm)	2020 Booster Capacity Required (gpm)	2030 Booster Capacity Required (gpm)	Buildout Booster Capacity Required (gpm)	Additional Booster Capacity Required at Buildout (gpm)
A		2,000	14	38	340	1,412	1,412
B		2,000	0	0	2,158	2,722	2,722
C		2,000	2,005	2,011	2,122	2,580	2,580
CR	3,000	1,500	3,002	3,002	2,838	2,943	(57)*2
PR	1,000	700	805	805	805	866	(134)*2
V		2,000	2,336	2,672	3,247	7,373	7,373
W+	6,720	2,500	4,921	12,342	17,517	34,823	28,103
X1a	1,300	2,000	2,297	2,919	3,452	5,847	4,547
X1b	6,180	2,500	2,823	3,338	4,216	21,965	10,765
X1c	4,900	2,750	2,867	3,130	4,042		
X1d	120	2,000	2,189	3,320	5,077		
Y1	2,100	2,000	2,920	3,821	4,334	5,590	3,490
Y2		2,000	0	0	2,234	2,852	2,852
Y3	3,100	2,500	3,059	3,059	3,270	3,357	257
Z1	2,085	2,000	2,309	2,588	3,279	3,717	1,632
Z2		2,000	0	0	2,027	2,027	2,027
Total	**30,505**	**-**	**31,545**	**43,045**	**60,960**	**98,075**	**67,570**

*1 The 5-, 10-, 20-year booster capacities are based on providing PDD plus fire flow or PHD, whichever is greater. The booster capacity at buildout is based on PDD plus fire flow or PHD, whichever is greater when no gravity storage is provided. With gravity storage, the booster capacity is based on providing PDD. Gravity storage is assumed to be provided for the V, W+, X1, Y1, Z1, and A zones.

*2 Indicates excess booster capacity of the zone.

5.4.4 Gravity Storage Transmission System

A number of new transmission mains are required to transport the gravity storage water throughout the distribution networks. **Table 5-11: Transmission Line Extension Summary** presents the transmission line extension projects, lengths, and purposes of the extensions. These transmission mains are typically funded by Marana Water and the cost will be recuperated through gravity storage and renewable water resources fees and infrastructure impact fees. Construction and upgrades of internal distribution systems and main extensions for developments and growth are typically the responsibility of the developers; therefore are not included in this Master Plan.

TABLE 5-11. Transmission Line Extension Summary

Transmission Line Extension	Approximate Length (feet)	Purpose
V Zone 24-inch Gravity Main from V Zone Reservoir	10,600	To provide gravity storage to the V Zone
W+ Zone Marana Road 16-inch Main for Santa Cruz River Crossing	3,000	To provide water to the system on both sides of the Santa Cruz River
W+ Zone Sanders Road 24-inch Main from Airport to I-10	25,400	To provide gravity storage to the W+ Zone
W+ Zone 48-inch Main from Tortolita Mountain W+ Zone Reservoir	11,000	To provide gravity storage to the W+ Zone
W+ Zone 36-inch Main Connecting Sanders Road 24-inch & Tortolita Mountain 48-inch (includes Railroad/I-10 crossing)	3,600	To provide gravity storage to the W+ Zone
W+ Zone 24-inch Main to the north of Village of Tortolita (includes Railroad/I-10 crossing)	30,000	To provide gravity storage to the W+ Zone
X-Zone Sandario Road 24-inch Main from South X-Zone Reservoir	10,300	To provide gravity storage to the X Zone
X Zone 36-inch Main from the Tangerine Road X-Zone Reservoir	7,600	To provide gravity storage to the X Zone
X Zone Tangerine Road 24-inch from the 36-inch Main (includes I-10, CAP, Railroad crossings)	4,800	To provide gravity storage to the X Zone
X Zone 24-inch South of Tangerine Road, includes I-10 crossing at Avra Valley Road	12,000	To provide gravity storage to the X Zone
Z-Zone Camino De Mañana 16-inch Main	7,100	To provide gravity storage to the Z1 Zone
Hartman Vistas to Cortaro/Oshrin PRV and 8-inch Main	1,350	To provide redundant capacity to Y1 Zone
Y-Zone 16-inch Main From Cortaro Farms Road to Linda Vista Blvd	15,500	To provide gravity storage to the Y1 Zone
Y-Zone Twin Peaks 24-inch Main	4,000	To provide gravity storage to the Y1 Zone west of I-10
Y Zone Linda Vista Blvd Parallel 12-inch Main to Hartman Vistas Reservoir	7,200	To provide gravity storage to the Y1 Zone
A Zone 16-inch Gravity Main	4,300	To provide gravity storage to A1 Zone

5.5 PROPOSED FACILITIES – FUTURE SYSTEM REQUIREMENTS

The facilities proposed to meet the buildout system requirements are shown on **Exhibit 5-2: Proposed Buildout Infrastructures by zone** and on **Exhibit 5-3: Proposed Buildout Infrastructures by Funding Mechanism**. "Exhibits 5-2 and 5-3 have been removed for security purposes under the Public Health Security and Bioterrorism Preparedness Response Act." The locations/routings of the proposed infrastructure improvements on these figures are conceptual. The actual locations of these infrastructures will need to be evaluated and determined as the involved CIP projects evolve.

Table 5-12: 10-Year Capital Improvement Projects presents the proposed 10-year capital improvements projects related to future growth for Marana Water. These requirements are based on the assumption that the infrastructure improvements proposed to meet existing system requirements, as listed in Chapter 4, have been constructed.

TABLE 5-12. 10-Year Capital Improvement Projects

Wells
New W+ Zone North Sanders Water Plant Well
New W+ Zone Barnett Well & Pipeline to Marana Park Reservoir
Re-equip the existing Y Zone Twin Peaks Well
New Y Zone Twin PeaksWell (Re-drill & Equip)
Equip Cortaro-Oshrin (Y-Zone) Well
CMID Well Purchase
Reservoirs
New 1.0 MG W+ Zone North Sanders Water Plant Forbay Reservoir
New 1.0 MG W+ Zone Airport Elevated Floating Reservoir
New 1.0 MG W+ Zone Marana Park Forbay Reservoir
New 1.0 MG X Zone Tangerine Road Floating Reservoir
New 1.0 MG Z Zone Camino De Mañana Floating Reservoir
New 0.25 MG Y Zone Pioneer Well Forbay Reservoir
New 0.25 MG Y Zone Cortaro-Oshrin Forbay Reservoir
Booster Stations
New 3,000 gpm W+ Zone North Sanders Water Plant Booster Station
New 2,000 gpm W+ Zone Airport Booster Station
New 2,000 gpm Tangerine Road W+ to X Zone Booster Station
New 2,000 gpm X-Zone Booster Station at Airport SE Well Site
New 2,000 gpm Pioneer Well Site Booster Station
New 2,000 gpm Y-Zone Cortaro-Oshrin Booster Station
Upgrade 800 gpm Continental Reserve to Picture Rocks Booster Station to 1500 gpm (by Mira Vista)
Mains
W+ Zone Sanders Road 24-inch Main from Airport to I-10
X Zone Tangerine Road 24-inch Main Crossing I-10, CAP, and Railroad
X Zone 36-inch Main from Tangerine Road X Zone Reservoir
X Zone Tangerine Road 24-inch Main from 36-inch Main to I-10
Z Zone Camino De Mañana 16-inch Main
Hartman Vistas to Cortaro/Oshrin PRV and 8-inch Main
Y Zone 16-inch Main From Cortaro Farms Road to Linda Vista Blvd
Y Zone Twin Peaks Road 24-inch Main
Picture Rocks 2358- Zone 8-inch Main from Wade/Ina Road to the Springs Reservoir

Table 5-13: Buildout Capital Improvement Projects presents the capital improvement projects for Marana Water at buildout, assuming the 10 year capital improvement projects have been completed and in operation.

TABLE 5-13. Buildout Capital Improvement Projects

Wells
44 new 1,500 gpm Wells
New 700 gpm Y3 Zone Well (the Springs system)
Reservoirs
49 MG Forbay Storage in V, W+, X, Y1, and Y2
2.0 MG V Zone Elevated Reservoirs
8.5 MG W+ Zone Tortolita Mountain Reservoir
6.5 MG X Zone Tangerine Road Reservoir
2.0 MG X Zone South Floating Reservoir
1.0 MG Z1 Zone Camino De Mañana Reservoir
3.0 MG A Zone Tangerine Road Floating Reservoir
Booster Stations
17 new 3,000 gpm booster stations in V, W+, X, and Y2
New 2,000 gpm X to Y1 Zone Inline Booster Station
New 2,000 gpm Y1 Zone Booster Station at Tangerine Road X Zone Reservoir
New 2,000 gpm Z1 Zone Booster Station at Tangerine Road X Zone Reservoir
New 2,000 gpm Z1 to A1 Zone Inline Booster Station
New1,500 gpm B1 Zone Booster Station at Camino De Mañana Z Zone Reservoir
New 1,500 gpm B to C Zone Inline Booster Station
New 1,500 gpm B Zone Booster Station at Tangerine Road A Zone Reservoir
New 1,500 gpm C Zone Booster Station at Tangerine Road A Zone Reservoir
New 2,100 gpm Y1 to Z3 Zone Inline Booster Station
New 2,100 gpm Y2 to Z2 Zone Inline Booster Station
Mains
V Zone 24-inch Gravity Main from V Zone Reservoir
W+ Zone Marana Road 16-inch Main for Santa Cruz River Crossing
W+ Zone 48-inch Main from W+ Zone Tortolita Mountain Reservoir
W+ Zone 36-inch Main Tortolita Mountain 48-inch Main to I-10/Rialroad Crossings
W+ Zone 24-inch Main –North Route of Village of Tortolita
X Zone Sandario Road 24-inch Main from South X-Zone Reservoir
X Zone 24-inch Main South of Tangerine Road 36-inch Main
Y Zone Parallel 12-inch Main along Linda Vista Blvd to Hartman Vistas Reservoir
A Zone 16-inch Gravity Main from Tangerine Road A Zone Reservoir

M:\projects\527.21\GIS 2010\MXD\2010 Master Plan\Revised 5-24-10\Figure 5-1.mxd

Pinal County
Pima County

THE VILLAGES OF TORTOLITA SPECIFIC PLAN
SANDERS GROVE
UPTOWN AT MARANA
SAN LUCAS
BARRIOS DE MARANA
RANCHO MARANA (EAST)
MARANA GARDENS
RANCHO MARANA (WEST)
GLADDEN FARMS II
TANGERINE COMMERCE PARK
CONTINENTAL RANCH
SAGUARO SPRINGS
CONTINENTAL RANCH
PIMA FARMS NORTH
PIMA FARMS
CONTINENTAL RANCH
DOVE MOUNTAIN
FOOTHILLS
TORTOLITA VISTAS
THE ESTATE LOTS AT TORTOLITA PRESERVE
CASA SEVILLA
TANGERINE THORNYDALE
FOREST CITY
SKY RANCH
CASCADA
CONTINENTAL RANCH
MARANA SPECTRUM
DE ANZA
CONTINENTAL RANCH

W+
X
Y1
Y2
Y3
Z1
Z2
A
B
C
CR
PR

LUCKETT RD
SANDERS RD
WENTZ RD
POSTVAIL RD
TANGERINE RD
TANGERINE FARMS RD
SILVERBELL RD
WONG WY
AVRA VALLEY RD
SANDARIO RD
AVRA RD
CLAYTON RD
EL PASO GAS RD
GARVEY RD
TWIN PEAKS RD
QUARRY RD
OWL HEAD RANCH RD
COCHIE CANYON TRL
SAGEBRUSH RD
MARANA RD
GRIER RD
KIRBY HUGHES RD
CAMINO DE OESTE
BLUE BONNET RD
CAMINO DE MANANA
WASSON AV
10

Legend

- Marana Town Limits
- Pima/Pinal County Line
- 2010 Water Master Planning Area Boundary
- Pressure Zone Boundaries

General Plan 2007

- Airport
- Commercial
- Floodway
- Industrial
- Industrial (Low Density)
- Low Density Residential
- Medium Density Residential
- Mixed Rural
- Park
- Rural Density Residential
- Special Planning Area
- Specific Plan Area

CASCADA — Specific Plan Name

N

0 0.5 1 2 Miles

TOWN OF MARANA 1977 ARIZONA

Town of Marana General Plan 2007 and Specific Plans

2010 Marana Water Master Plan

Exhibit 5-1

WestLand Resources, Inc.
Engineering and Environmental Consultants

This chapter presents the cost estimates for the infrastructure improvements recommended in both Chapter 4 (bases on existing system requirements) and Chapter 5 (based on future system requirements) for Marana Water. The 10-year and buildout CIP, as well as associated cost projections are provided in **Table 6-1: Marana Water 10-Year (2020) Capital Improvement Projects** and **Table 6-2: Marana Water Buildout Capital Improvement Projects** following the text of this Chapter. The following sections present the assumptions made in projecting the infrastructure costs.

6.1 Cost Projection Assumptions and Criteria

Cost projections for construction of the proposed water infrastructure are provided as a basis for financial planning for Marana Water. The cost estimates are based on construction of the projects at present day prices. Appropriate inflation factors should be added when using these estimates for CIP budgeting and financial planning.

Over the past several years, Marana Water has bid several reservoir, booster station, well, and transmission main projects. The bid schedules from those projects were used as a basis for determining the costs of the proposed water infrastructure. Actual costs may vary depending on extreme site conditions, site acquisition, soil conditions, security measures, and replacement and/or disposal costs for existing facilities

6.1.1 Pipeline Replacement

Projections in the Master Plan indicate that some existing 4-, 6-, and 8-inch water mains within the Marana Water's old service areas will need to be replaced as Marana Water has determined the existing mains are undersized and have exceeded their useful service life. Per Marana Water, the estimated main replacement cost within the next 10 years will be approximately $5 million. This cost assumption includes valves, fittings, fire hydrants, appurtenances and minor pavement replacement required for the installation of the proposed water mains. The cost assumption does not include easement acquisition.

6.1.2 Installation of Water Mains

This Master Plan projects both the need for new water main installations within the 10-year CIP and, the installation of transmission mains required for distributing gravity storage within the buildout CIP. Based on recent bids of similar projects for Marana Water and standard assumption of soil conditions, the following costs were used as baseline numbers for water main installation cost estimates:

- $150 per lineal feet (lf) of 8-inch water main from Wade Road/Ina Road to the Springs Water Plant site, and from Hartman Vistas service area to Cortaro/Oshrin service area along Hartman Lane.
- $160 per lf of 12-inch water main parallel to the existing 12-inch main at Linda Vista Blvd
- $170 per lf of 16-inch water main throughout Marana Water's service area
- $200 per lf of 24-inch water main throughout Marana Water's service area
- $250 per lf of 36-inch water main throughout Marana Water's service area
- $300 per lf of 48-inch water main throughout Marana Water's service area

The above cost assumption includes valves, fittings, fire hydrants, and appurtenances required for the installation of the proposed water mains. Depending on the specific site conditions such as the number of wash crossings, and pavement replacement, the cost estimate assumptions may vary.

6.1.3 Installation of Welded Steel Reservoirs

Projections of the storage requirements indicate 77 million gallons of storage, in addition to its existing storage capacity, will be required for Marana Water at buildout. The two most commonly used types of storage facilities are welded steel reservoirs and below ground concrete reservoirs. Welded steel reservoirs are generally less expensive to install than concrete reservoirs. A welded steel storage reservoir is typically no larger than one million gallons in size. Based on recent bids for Marana Water and standard assumption of soil conditions, the following costs were used for welded steel reservoirs:

- $300,000 to $350,000 for a 250,000 gallon reservoir depending on specific site conditions.
- $800,000 for a one million gallon reservoir.

The above cost assumption includes the steel reservoir, required site work, site piping, telemetry, site grading, block walls, and landscaping. This cost does not include site acquisition.

6.1.4 Installation of Buried Concrete Reservoirs

As the size of reservoirs increases, the aesthetic impacts of larger aboveground reservoirs increase. In high-profile areas, it becomes difficult to install aboveground steel reservoirs. To address public concerns, most municipal water providers have specified buried, concrete reservoirs wherever possible to minimize the aesthetic impacts to the neighbors. The site acquisition and construction costs increase for the installation of buried, concrete hopper-bottom reservoirs. Out of the 77 million gallons of storage proposed, it is estimated that 15 million gallons (W+ Zone Tortolita and X Zone Tangerine Road reservoirs) will be stored in buried concrete reservoirs with steel roof structures. A cost of $1.50 per gallon of storage is estimated for buried concrete reservoirs proposed in the Master Plan. This cost assumption includes the concrete reservoir, steel roof structure, excavation, site work, site piping, telemetry, and block walls. This cost does not include site acquisition.

6.1.5 Installation of Elevated Reservoirs

Two elevated storage reservoirs (the 1.0 million gallon W+ Zone Airport Reservoir and 2.0 million gallon V Zone reservoirs) are recommended in this Master Plan. A cost of $2.0 per gallon of storage is estimated for the elevated storage reservoirs. This cost assumption includes the reservoir, steel roof structure, riser column, site work, site piping, and telemetry. This cost does not include site acquisition.

6.1.6 Well Installations

It is projected that approximately 47 new wells at 1,500 gpm each will be required to meet the supply demands of Marana Water at buildout. Based on recent bids for Marana Water and applying standard assumptions for drilling rig requirements for access, a cost of $800,000 was assumed to drill and equip a new well. This cost includes standard drilling operations, well casing, sanitary seal, well column tube and shaft, and pump motor bowl assembly, assuming the wells are to be drilled using the reverse circulation air rotary drilling rig.

It is assumed that two wells would typically pump to a water plant storage facility, with one well at the plant site and the second well approximately 1,000 feet apart. Assuming a 12-inch dedicated water line is used to collect the well water to the reservoir, an additional $200,000 is required for the offsite well construction. For the purpose of cost estimates in this Master Plan, the calculation was simplified by increasing the cost to $900,000 for drilling and equipping each new well.

6.1.7 Booster Stations

In addition to the existing booster capacities of Marana Water, this Master Plan projects twenty (20 new) 3,000 gpm booster stations, eleven (11 new) 1,500 to 2,000 gpm booster stations, and four (4) 1,500 to 2,000 gpm in-line new booster stations at buildout. Based on recent bids and standard assumption of soil conditions, of the cost estimates range from $400,000 to $900,000 each new booster station, depending on the size and location of the facility.

6.1.8 Interstate 10, Railroad, and CAP Crossings

This Master Plan projects several water line crossings over Interstate 10, Union Pacific Railroad (UPRR), and CAP canal. The installation of these crossings is assumed to be by "jack and bore". The cost estimates for those crossings range from $1 million to $1.5 million depending on the size and location of the water lines. This cost assumption does not include site or easement acquisition.

6.1.9 Engineering and Contingencies

Due to the planning nature of the locations of the facilities proposed in this Master Plan, contingencies are added to reflect unforeseen conditions that may affect the individual projects. Unforeseen conditions can range from environmental issues that may need to be addressed in individual projects, to easements that may need to be acquired for pipeline construction. This cost component also includes engineering fees, permits, inspection, and project management. The cost assumptions provided above include 20 percent engineering and contingencies.

6.2 10-YEAR (2020) CAPITAL IMPROVEMENT PLAN COST PROJECTION

Table 6-1 lists the 10-year (2020) CIP for Marana Water. The cost estimates for these projects, based on the present day price is approximately $33.5 million, out of which, $7 million is allocated to the upgrades required to bring the existing system up to current standards, and $26.5 million is allocated to growth related system upgrades.

6.3 BUILDOUT CAPITAL IMPROVEMENT PLAN COST PROJECTION

Table 6-2 lists the buildout capital improvement plan for Marana Water, assuming all the 10-year CIP have been completed. The cost estimates for the buildout CIP, based on present day prices, is approximately $143 million.

Table 6-1
MARANA WATER 10-YEAR (2020) CAPITAL IMPROVEMENT PROJECTS

	Project	Year	Capacity	Pipe Length (feet)	Existing System Upgrade Cost	Expansion Related Cost	Remarks
Wells	New W+ Zone North Sanders Water Plant Well	2017	1,500 gpm	-	-	$800,000	Approximately 1,500 gpm new well feeds to a new onsite reservoir.
	New W+ Zone Barnett Well & Pipeline to Marana Park Reservoir	2012	1,500 gpm	-	-	$1,300,000	Approximately 1,500 gpm new well feeds to the Marana Park reservoir via dedicated well collection line.
	Re-equip Y-Zone Pioneer Well	2012	350 gpm	-	-	$250,000	
	New Y-Zone Pioneer Well Re-drill & Equip	2017	500 gpm	-	-	$500,000	
	Equip Cortaro-Oshrin (Y-Zone) Well	2015	1,500 gpm	-	-	$250,000	Approximately 1,500 gpm existing well feeds to a new onsite reservoir.
	CMID Well Purchase	2011	_	-	-	$1,500,000	
Reservoirs	New W+ Zone North Sanders Water Plant Forbay Reservoir	2017	1.0 MG	-	-	$800,000	Located at the new Water Plant site east of Sanders Grove development.
	New W+ Zone Airport Elevated Floating Reservoir	2020	1.0 MG	-	-	$2,000,000	Located at the Marana Regional Airport NW Water Plant site.
	New W+ Zone Marana Park Forbay Reservoir	2013	1.0 MG	-	-	$800,000	
	New X-Zone Tangerine Road Floating Reservoir	2015	1.0 MG	-	-	$800,000	
	New X-Zone Forbay Reservoir at Airport SE Well Site	2020	0.25 MG	-	$300,000	-	For 4-log virus treatment compliance
	New Z-Zone Camino De Mañana Floating Reservoir	2012	1.0 MG	-	-	$800,000	
	New Y-Zone Forbay Reservoir at Hartman Vistas Well Site	2015	0.25 MG	-	$300,000	-	For 4-log virus treatment compliance
	New Y-Zone Pioneer Well Forbay Reservoir	2017	0.25 MG	-	-	$300,000	
	New Y-Zone Cortaro-Oshrin Forbay Reservoir	2015	0.25 MG	-	-	$300,000	New Water Plant at Oshrin Park
	New Picture Rocks Reservoir	2012	0.25 MG	-	$140,000	$210,000	
Booster Stations	New W+ Zone North Sanders Water Plant Booster Station	2017	3,000 gpm	-	-	$600,000	Located at the new Water Plant site east of Sanders Grove development.
	New W+ Zone Airport Booster Station	2018	2,000 gpm	-	-	$600,000	Located at the Airport NW Water Plant, pumps to W+ Zone
	New Tangerine Road W+ to X Zone Booster Station	2012	2,000 gpm	-	-	$900,000	Inline booster station, also includes a PRV for delivering water to W+ Zone in case of emergency
	New X-Zone Booster Station at Airport SE Well Site	2020	2,000 gpm	-	$200,000	-	For 4-log virus treatment compliance
	New Y-Zone Booster Station at Hartman Vistas Well Site	2015	2,000 gpm	-	$200,000	-	For 4-log virus treatment compliance
	New Pioneer Well Site Booster Station	2017	2,000 gpm	-	-	$200,000	
	New Y-Zone Cortaro-Oshrin Booster Station	2015	2,000 gpm	-	-	$200,000	
	Upgrade 800 gpm Continental Reserve to Picture Rocks Booster Station to 1500 gpm (by Mira Vista)	2012	1,500 gpm	-	-	$40,000	
Pipeline	W+ Zone Sanders Road 24-inch Main from Airport to I-10	2018	-	25,400	-	$4,100,000	Includes Santa Cruz River crossing
	X-Zone Tangerine Road 24-inch Main Crossing I-10, CAP, and Railroad	2012	-	800	-	$1,100,000	Includes I-10, CAP, Rail Road crossing
	X-Zone Tangerine Road 24-inch Main from 36-inch to East I-10	2015	-	4,000	-	$800,000	
	X-Zone Tangerine Road 36-inch Main from X-Zone Tangerine Road Reservoir	2015	-	7,600	-	$1,900,000	Includes I-10, CAP, Rail Road crossing
	Z- Zone Camino De Mañana 16-inch Main	2010	-	7,100	-	$1,100,000	
	Hartman Vistas (Z-Zone) to Cortaro-Oshrin (Y-Zone) PRV and 8-inch Main at Hartman Lane	2011	-	1,350	$47,000	$253,000	Includes PRV
	Y-Zone 16-inch Main From Cortaro Farms Road to Linda Vista Blvd	2020	-	15,500	-	$2,500,000	
	Y-Zone 24-inch Main along Twin Peaks Road	2010	-	4,000	-	$1,600,000	Includes I-10, Rail Road, and Santa Cruz River crossing
	Picture Rocks 2358- Zone 8-inch Main from Wade/Ina Road to the Springs Reservoir	2014	-	5,500	$825,000	-	
	Water Main Rehabilitation Replacement	2012-2017	-	-	$5,000,000	-	
	Total		**-**	**-**	**$7,012,000**	**$26,503,000**	

Table 6-2
MARANA WATER BUILDOUT CAPITAL IMPROVEMENT PROJECTS

	Project	Quantity	Unit	Present Worth Unit Cost	Present Worth Total Cost	Remarks
Wells	New 1, 500 gpm Wells	44	EA	$800,000	$35,200,000	Approximately 1,500 gpm new well feeds to new onsite reservoir: 6 wells for V1 Zone, 20 for W+ Zone, 14 for X Zone, 2 for Y2 Zone, and 2 for Y1 and upper
	700 gpm Springs Well	1	EA	$500,000	$500,000	Provides suppy to Y3 (the existing Springs system)
	Subtotal	**45**	-	-	**$35,700,000**	
Reservoirs	49 MG Forbay Storage	1	LS	$40,000,000	$40,000,000	Forbay storage: 6.2 MG for V1 Zone, 24.3 MG for W+ Zone, 17.3 MG for X Zone, 1.2 MG for Y2 Zone.
	New 2.0 MG Elevated V Zone Storage	1	EA	$3,500,000	$3,500,000	
	New 8.5 MG Tortolita Mountain W+ Zone Reservoir	1	EA	$13,000,000	$13,000,000	
	New 6.5 MG Tangerine Road X Zone Reservoir	1	EA	$10,000,000	$10,000,000	
	New 2.0 MG South X Zone Reservoir	1	EA	$1,600,000	$1,600,000	
	New 1.0 MG Z-Zone Camino De Mañana Reservoir	1	EA	$800,000	$800,000	
	New 3.0 MG Tangerine Road A Zone Reservoir	1	EA	$2,400,000	$2,400,000	
	Subtotal	-	-	-	**$71,300,000**	
Booster Stations	New 3,000 gpm Booster Stations in V, W+, X, and Y2	19	EA	$600,000	$11,400,000	3 booster station for V1 Zone, 9 for W+ Zone, 6 for X Zone, and 1 for Y2 Zone.
	New 2,000 gpm Y1 Zone Booster Stations at Tangerine Road X Zone Reservoir	1	EA	$200,000	$200,000	
	New X to Y1 Zone 2,000 gpm Inline Booster Station	1	EA	$900,000	$900,000	
	New Y2 to Z2 Zone 2,100 gpm Inline Booster Station	1	EA	$900,000	$900,000	
	New 2,000 gpm Z1 Zone Booster Station at Tangerine Road X Zone Reservoir	1	EA	$200,000	$200,000	
	New 1,500 gpm B Zone Booster Station at Camino De Mañana Z Zone Reservoir	1	EA	$400,000	$400,000	
	New 1,500 gpm B to C Zone Inline Booster Station	1	EA	$600,000	$600,000	
	New 2,000 gpm Z1 to A Zone Inline Booster Station	1	EA	$900,000	$900,000	
	B Zone 1,500 gpm Booster Station at A Zone Tangerine Road Reservoir	1	EA	$400,000	$400,000	
	C Zone 1,500 gpm Booster Station at A Zone Tangerine Road Reservoir	1	EA	$900,000	$900,000	
	Subtotal	**28**	-	-	**$16,800,000**	
Pipeline	V Zone 24-inch Main from Floating Reservoir	10,600	FT	$195	$2,067,000	
	W+ Zone Marana Road 16-inch Main for Santa Cruz River Crossing	1	EA	$500,000	$500,000	Crossing Santa Cruz River
	W+ Zone 48-inch Main from W+ Zone Tortolita Mountain Reservoir	11,000	FT	$300	$3,300,000	Includes CAP crossing
	W+ Zone 36-inch Main near I-10	3,600	FT	$250	$900,000	
	W+ Zone Sanders Road 36-inch Main Crossing I-10 and Railroad	1	EA	$1,200,000	$1,200,000	Includes I-10 and Railroad crossing
	W+ Zone 24-inch Main North Route East of I-10	30,000	FT	$180	$5,400,000	
	W+ Zone 24-inch Main North Route Crossing I-10 and Railroad	1	EA	$1,000,000	$1,000,000	Includes I-10 and Railroad crossing
	X Zone Sandario Road 24-inch Main from South Floating Reservoir	10,300	FT	$195	$2,008,500	Includes CAP crossing
	X Zone 24-inch Main South of Tangerine Road 36-inch Main	9,000	FT	$195	$1,755,000	
	X Zone Avra Valley Road 24-inch Main Crossing I-10 and Railroad	1	EA	$1,000,000	$1,000,000	
	Y Zone Parallel 12-inch Main along Linda Vista Blvd	1,500	FT	$160	$240,000	
	Subtotal	-	-	-	**$19,370,500**	
	Total				**$143,170,500**	

7.1 INTRODUCTION

The implementation portion of this document provides a roadmap for Marana Water to facilitate the recommended improvements. A set of baseline evaluations for source, storage, and booster station capacity have been established for use by Marana Water in performing annual evaluations for infrastructure requirements, capital improvements, and required upgrades for both the existing and future system. These infrastructure and cost data will allow Marana Water to continually evaluate the capital components associated with the capacity and operational upgrades of the potable water system. These criteria may then be used to establish and continually evaluate the connection fees within the defined service areas of Marana Water. The criteria may also be used to define capital components for the existing rate payers for infrastructure upgrades required for the existing system to meet its established standard for service. Water Master Plan updates are recommended to be annually completed as part of the Marana Water annual report.

7.2 CAPITAL IMPROVEMENTS IMPLEMENTATION

The 10-year (2020) and buildout CIP, as shown in **Tables 6-1 and 6-2**, identifies the critical capital improvement projects for Marana Water and provides associated cost estimates at the present day's price. The CIP are made based on growth assumptions as of today's conditions. It is important to evaluate growth potential and annual growth so that infrastructure projections can be modified periodically. These projections will dictate the funding requirements and timing associated with each capital improvement. Project timing and land acquisition has been the critical path of the majority of Marana Water's capital improvements.

Historically, it has taken Marana Water approximately one year to design, bid, , and select a contractor to construct a project. Coupled with increased regulatory requirements associated with the environmental impacts of projects and land acquisition, as much as a two to five year timeframe is anticipated for design. Marana Water typically sets the capital improvements implementation schedule in two to three year increments for its most substantial projects, in terms of land acquisition, environmental and cultural resource clearances, Stormwater Pollution Prevention Plan (SWPPP) development and implementation, and design and construction phases of the project, and budgets these phases of implementation accordingly. This extended timeline allows Marana Water to effectively manage its CIP while meeting or exceeding the regulatory standards for the development of required infrastructure.

7.3 SOURCE, STORAGE, AND BOOSTER CAPACITY EVALUATION

Marana Water evaluates its source, storage, and booster capacity requirements continuously to closely monitor its system capacities required for the capital improvements, to ensure these capacities continue to meet the established standards for the system, and to identify the most effective locations to place proposed facilities.

Three tables have been developed to provide an annual evaluation of the source, storage, and booster capacities as shown in **Table 7-1: Marana Water Master Plan Source Capacity Worksheet, Table 7-2: Marana Water Master Plan Storage Capacity Worksheet, and Table 7-3: Marana Water Master Plan Booster Capacity Worksheet.**

"Tables 7.1, 7.2, and 7.3 have been removed for security purposes under the Public Health Security and Bioterrorism Preparedness Response Act."

7.4 CONNECTION FEES AND RATES

The capital improvements and associated costs indicated in this Master Plan are recommended for use by the utility and its rate consultants in the establishment or update of connection fees to the potable water system. These connection fees are for infrastructure required to serve future growth. Infrastructure required for support of the existing system has historically been funded by rates. There are a variety of ways to calculate the connections fees for a utility system. Marana Water is currently using the EDU system.

7.4.1 Infrastructure Impact Fee

The Infrastructure impact fee funds for construction of wells, storage, and booster stations, except those related to gravity storage facilities and distribution. Gravity Storage and Renewable Water Resource Fee

7.4.2 Gravity Storage and Renewable Water Resource Fee

The Gravity Storage and Renewable Water Resource fee funds projects relating to Marana Water's gravity storage and distribution, water rights acquisition, and treatment for the buildout water systems.