

Drought Preparedness Plan

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WATER

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ACRONYMS AND ABBREVIATIONS

AF/YR	Acre-feet per year
ADWR	Arizona Department of Water Resources
AMA	Active Management Area
ARS	Arizona Revised Statutes
BMP	Best Management Practice
BOR	U.S. Bureau of Reclamation
CAP	Central Arizona Project
CAWCD	Central Arizona Water Conservation District
CDC	Center for Disease Control and Prevention
CRB	Colorado River Basin
CLIMAS	Climate Assessment for the Southwest
DAWS	Designation of Assured Water Supply
DCP	Drought Contingency Plan
DPP	Drought Preparedness Plan
ENSO	El Niño Southern Oscillation
GPCD	Gallons per Capita per Day
GSF	Groundwater Saving Facility
ICG	Interagency Coordinating Group
ICS	Intentionally Created Surplus
IGA	Intergovernmental Agreement
LDIG	Local Drought Impact Group
LTSC	Long-Term Storage Credit
M&I	Municipal & Industrial
MTC	Monitoring Technical Committee
NIA	Non-Indian Agriculture
NOAA	National Oceanic and Atmospheric Administration
NPCCP	Non-Per Capita Conservation Program
SWP	System Water Plan
TOM	Town of Marana
US	United States
USF	Underground Storage Facility
WRF	Water Reclamation Facility

1. INTRODUCTION AND CONTEXT

The Town of Marana, (Town or Marana), like many municipalities across the southwestern United States (US), has been in drought for a majority of the past two decades, as shown on **Figure 1**. A Drought Emergency Declaration for the state of Arizona has been in effect since 1999, and the Town is experiencing the negative impacts of long-term local and regional drought in the Colorado River Basin, including cuts to its imported water supplies. The Town adopted its first Drought Preparedness Plan for its Water Department on November 14, 2006; and a revised plan by Mayor & Council on October 16, 2007, in compliance with state planning requirements [1]. This updated Drought Preparedness Plan (2022 Plan) addresses supply portfolio and demand characteristics that have changed since 2007 and provides additional context and strategy for Town and community actions under varying drought conditions.

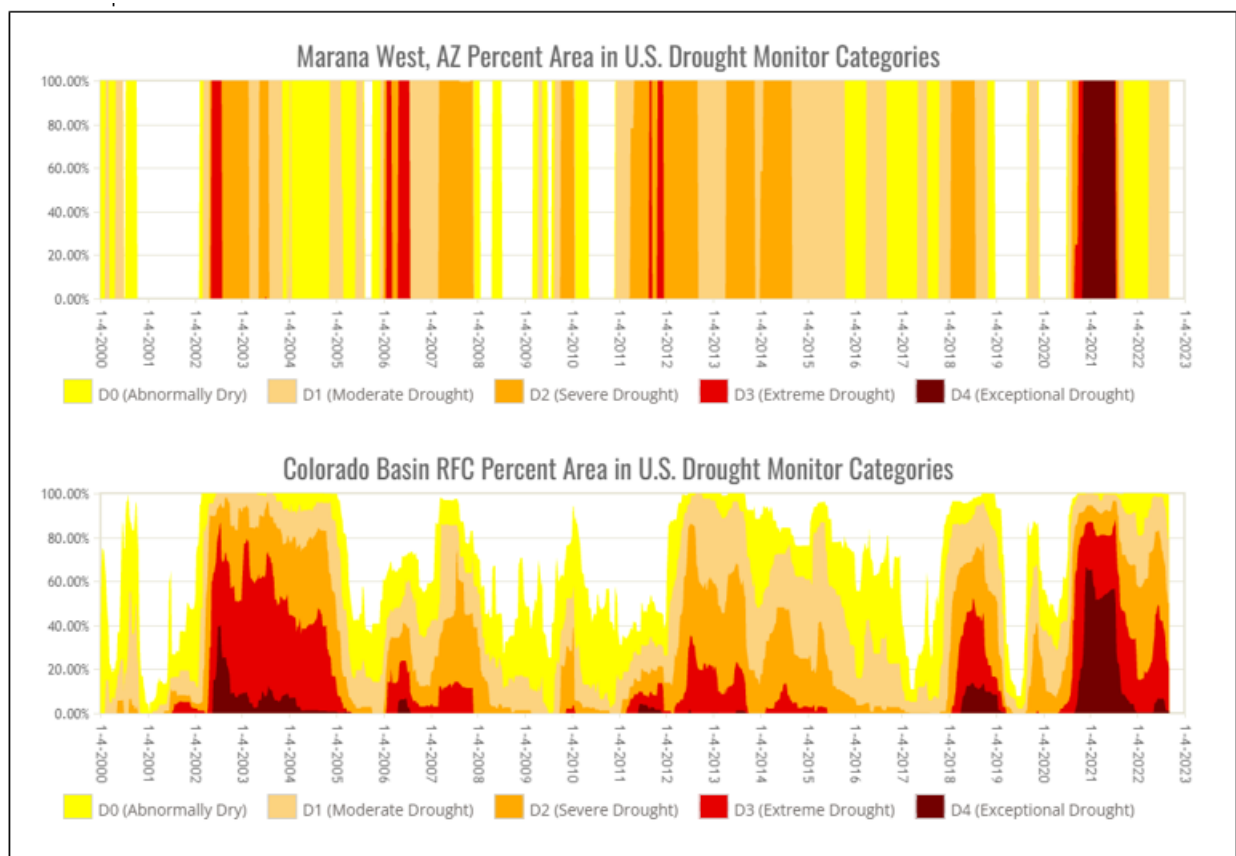


Figure 1. Drought Time Series for Marana and Colorado River Basin January 2000 to Present

As with the 2007 Plan, this 2022 Plan is intended to meet drought planning requirements and water use reporting regulations for community water systems established in 2005 by the Arizona State Legislature to help reduce vulnerability to drought and water shortages. The Arizona Department of Water Resources (ADWR) requires all community water systems to have a drought preparedness plan in place and submitted to ADWR every five years per Arizona Revised Statutes (ARS) §45-342 [8]. Requirements of the plan

include description of the water system's drought stages and triggers, emergency sources of water, customer communication strategies, and other planning actions.

Water providers may face a shortage of water resulting from prolonged drought. While long-term drought does not automatically equate to water shortage, it is critical for water providers to be prepared for this possibility by having a plan in place to mitigate shortage and avoid disruption of water service. As demonstrated in its and the Marana 2040 General Plan, the Town strives for a water management approach that is both reliable and sustainable. To that end, Marana Water subscribes to the growing One Water movement which is an innovative, integrated, and inclusive approach to water stewardship that is driven by the US Water Alliance [19].

To further Town planning efforts, a One Water approach, and responsible water management, the goals of this 2022 Plan are:

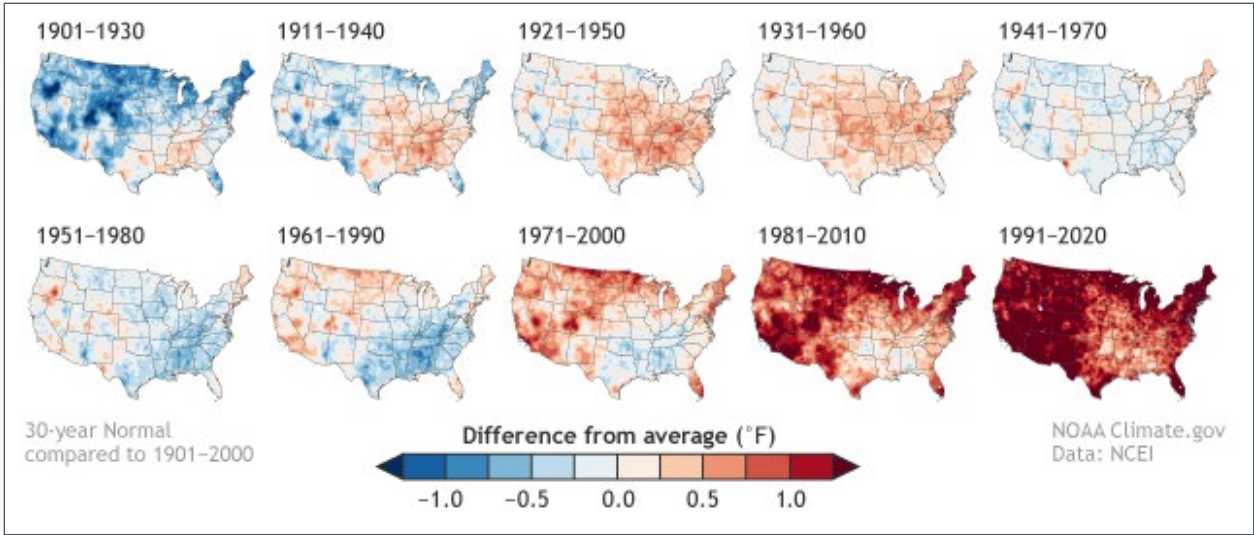
- Protect public health and safety through reliable water service.
- Maintain public trust by providing effective communication.
- Mitigate negative impacts of supply shortage due to drought.
- Provide straightforward procedures for advancing and retracting drought declarations.
- Define communications for all response measures and enforcement for mandatory ones.
- Provide a framework for water demand reduction at each stage of drought.
- Increase community awareness and encourage ongoing water conservation.

1.1. CLIMATE CHANGE AND DROUGHT MONITORING

The National Oceanic and Atmospheric Administration (NOAA) State Climate Summary 2022 for Arizona reports the beginning of the 21st century being the warmest period on record in the history of the state [12]. The Climate Assessment for the Southwest's (CLIMAS) three-month seasonal forecast for August through October 2022 shows temperatures ranging from above average to much above average throughout Arizona, with below average precipitation for most of Arizona [15]. Climate change impacts include increased average surface temperatures, decreased average annual precipitation, increased surface evaporation, reduced surface water flows due to runoff and snowpack impacts, and increased weather variability including monsoons. These impacts can result in more intense and prolonged drought conditions and can also negatively affect both water quality and air quality, which in turn, can have a negative effect on public health.

Public health impacts of climate change in the southwest include increases in heat related death and illness, increases in vector-borne diseases such as hantavirus pulmonary syndrome, and water related illnesses due to decreased availability and quality [10]. Additional water quality concerns may stem from decreasing water tables which requires utilities to monitor changing levels of dissolved solids such as metals and

minerals within the groundwater. Many surface water sources also require monitoring as temperature increases may lead to higher dissolved concentrations of contaminants such as nitrate. At this time, there are no immediate water quality issues anticipated in Marana. The water quality aspects of the Town's master planning efforts will address vulnerabilities and mitigations.

Both climate change and drought can have negative effects on the availability and quality of a community's water supply, and climate change may prolong or intensify drought, but it is possible for a drought to improve despite ongoing climate change. For example, if observed precipitation increases enough to change the [US Drought Monitor's](#) designated drought intensity rating, then the stage of drought may de-escalate, even though climate change has not ceased. It should also be acknowledged that a hotter and drier climate is the new normal against which drought is measured. Updated every ten years, the [US Climate Normals](#) are 30-year periods of climate data used as a basis for judging how climate conditions compare to what is normal for a given location in today's climate [18]. The new US normal (1991-2020) is drier in the southwest and warmer almost everywhere in the US, as shown in  **Figure 2**.

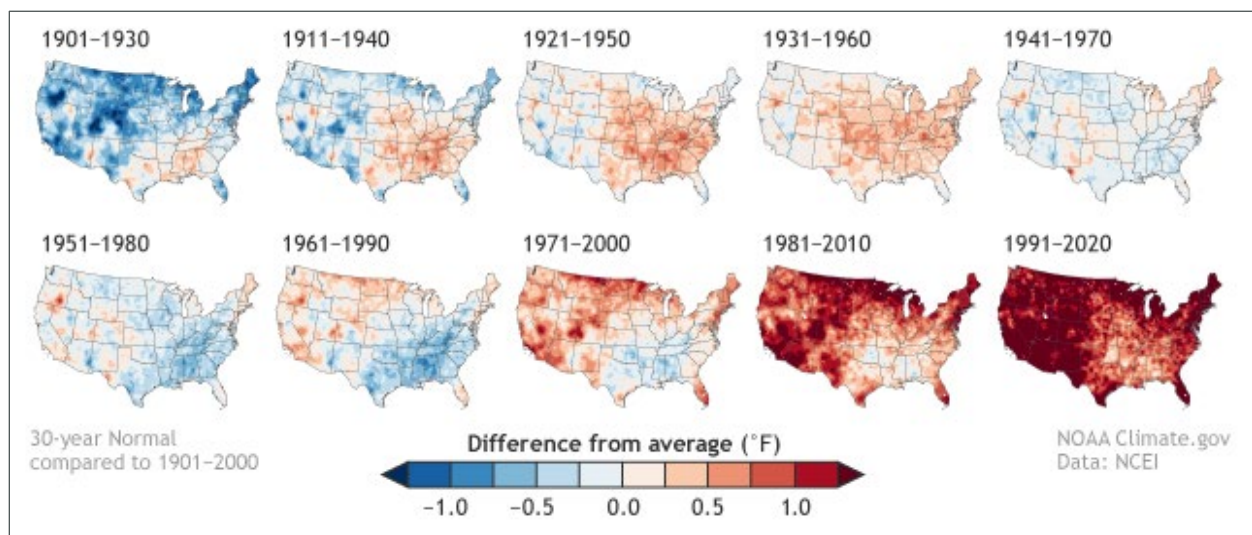


Figure 2. US Temperature Normals Compared to 20th Century Average

An additional distinction is that of drought and water shortage. Given sufficient planning and foresight, a community undergoing a prolonged drought can avoid water shortage through improvements in supply capacity and distribution, and adjustments in demand through community responsiveness. Consistent public messaging about drought monitoring and water conservation can significantly decrease the effects of drought on a water supply in addition to affecting a quicker public response when needed. **Section 2** of this plan describes Marana's efforts in these areas.

1.1.1. Drought Monitoring Groups

There are three separate groups of stakeholders that closely monitor drought and climate in Arizona collectively referred to as the Arizona Drought Working Groups. The Arizona Drought Working Groups

include the Monitoring Technical Committee, the Interagency Coordinating Group, and the Local Drought Impact Group. The Town looks to these groups for data to assess drought conditions within its service area.

The Monitoring Technical Committee (MTC) gathers data on Arizona drought, climate, and weather. Weekly drought status reports from the MTC advise the authors of the US Drought Monitor. The US Drought Monitor identifies general areas of drought and categorizes drought intensity (**Figure 3**). The data and corresponding maps are updated weekly and produced through a partnership between the National Drought Mitigation Center at the University of Nebraska-Lincoln, the US Department of Agriculture, and the National Oceanic and Atmospheric Administration. The MTC also gives recommendations about the position of the drought boundaries for Arizona [4]. The MTC is comprised of stakeholders from various industries and entities including universities, NOAA, ADWR, Navajo Department of Water Resources, USDA, Arizona State Parks, etc. The MTC and ADWR coordinate to improve accessibility to drought information by land managers, policy makers, and the public.

Category	Historically observed impacts
D0 Abnormally Dry	Forage is limited; soil is dry Fire risk increases
D1 Moderate Drought	Plants are stressed; hillsides are unusually brown Stock ponds and creeks are nearly dry; some springs are dry
D2 Severe Drought	Water and feed are inadequate for livestock Fire danger is high; fire crews are mobilizing Little forage remains for wildlife; pine trees are losing needles
D3 Extreme Drought	Ranching operations are affected Fire preparedness increases; fire restrictions are implemented early Skiing tourism is low; snowpack is extremely low Wildlife encroach on developed areas in search of food and water Native plants are stressed
D4 Exceptional Drought	Livestock do not have adequate water; runoff is short; conditions are dusty Fire restrictions increase; large fires occur year-round Vegetation green-up is poor; native plants are dying Lakes, ponds, and streams are dry

Figure 3. Arizona Drought Monitor Intensity Rating

The Interagency Coordinating Group (ICG), established by the 2004 Arizona Drought Preparedness Plan, is an advisory body to the Arizona governor on status, impacts, and necessary preparedness and response actions related to drought. The ICG meets twice per year and is comprised of state, federal, and non-governmental organizations. The group is co-chaired by ADWR and the Arizona Division of Emergency Management. The ICG evaluates drought conditions and considers recommendations to the governor, providing a mechanism to coordinate and integrate drought planning and management on all lands within Arizona.

The [ADWR Drought Status webpage](#) holds information about the drought working groups, drought status, drought management, and drought resources. Drought status is updated on a weekly, monthly, and quarterly basis. The weekly update occurs every Thursday, automatically updating the U.S. Drought Monitor map of Arizona. The monthly update occurs at the end of each month, with a web-based, short-term drought status update based on the past four weeks of U.S. Drought Monitor maps. This monthly update includes an explanation of how drought conditions have changed over the preceding month. The quarterly update (**Figure 4**) is a thorough long-term drought status report that is posted on the ADWR Drought Status webpage on the following schedule: in April (for January-March); July (for April-June); October (for July-September); and January (for October-December).

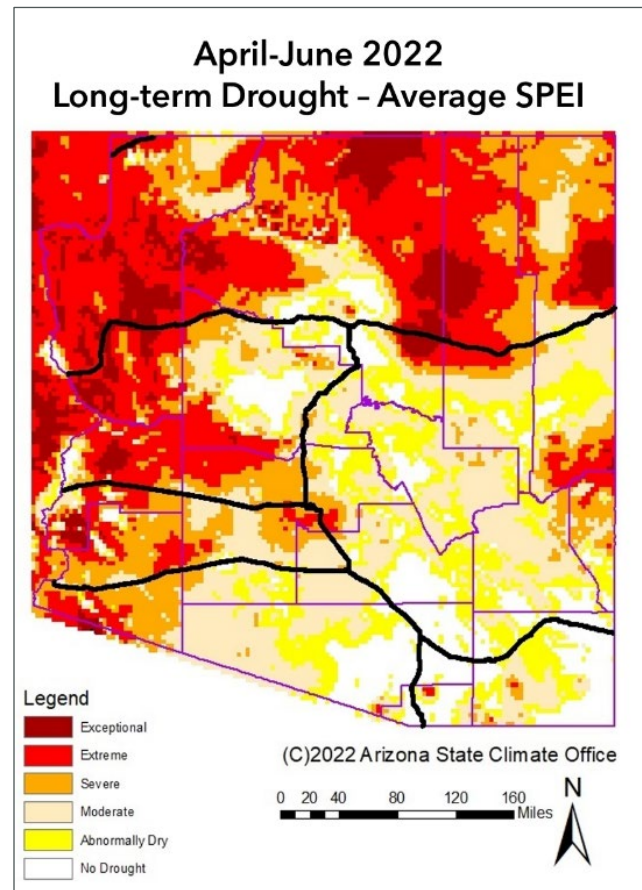


Figure 4. Quarterly Drought Status Update
SPEI: Standard Precipitation Evapotranspiration Index

[Local drought impact groups](#) (LDIG) are county-level groups that are coordinated by local representatives of Arizona Cooperative Extension and County Emergency Management, while being supported by ADWR's Drought Program. The LDIGs coordinate drought public awareness, provide impact assessment information to local and state leaders, and implement and initiate local mitigation and response options. There were ten LDIGs created in 2006 and 2007; however, Pima County is currently the only active LDIG.

Pima County LDIG was created in 2006 when the Pima County Board of Supervisors adopted the [Drought Response Plan and Water Wasting Ordinance \(Chapter 8.70\)](#). The LDIG is comprised of local, state, and federal agencies who meet every other month to monitor drought status, discuss drought impacts on various sectors in Pima County, and coordinate drought declarations and responses. The LDIG also monitors the status of the Colorado River, the summer monsoons, the El Niño Southern Oscillation (ENSO), and other climate weather patterns that affect drought conditions in Pima County. Additionally, the LDIG convenes roundtable discussions of drought and water conservation outreach programs [20].

1.1.2. Drought Indicators

Indicators and associated triggers are important tools used in drought management. Indicators are variables used to describe or communicate drought conditions while triggers are specific values of those indicators, primarily used in response to developing or receding drought conditions [13]. Triggers provide a means of establishing actionable responses to drought conditions. Some examples of drought indicators are temperature, streamflow, precipitation, and groundwater or reservoir water levels.

Under the 2022 Plan, the Town uses both local and regional indicators to monitor potential impacts from drought on the Town's water supply and distribution system. Local system indicators include annual potable demand, gallons per capita per day (GPCD), aquifer levels, and water production and distribution capacity. System indicators such as annual demand and GPCD can help determine whether the Town's response measures are producing the intended effect. Regional indicators reflect performance of the Colorado River Basin System and its reservoirs, Lake Powell and Lake Mead.

1.1.2.1. Local Indicators

Local drought indicators are used to monitor impacts within the groundwater sub basin, and specifically, within the Marana Water service area. The Town is located within the Tucson Active Management Area (AMA) and draws its groundwater from the Avra Valley sub basin within the Tucson AMA groundwater basin. The Town's local system indicators include annual potable demand, GPCD, groundwater levels, and potable and reclaimed production and distribution capacity. These local indicators assist the Town in managing drought by forecasting potential impacts and implementing appropriate response measures.

The primary local indicator of concern for the Town, used in the 2022 Plan, is the groundwater level, as measured in its wells. A decline in groundwater levels may trigger the enactment of drought stages, depending on the amount of decline. Since the Town draws its groundwater from the Avra Valley sub basin, the groundwater levels within the sub basin must be monitored at regular intervals to determine whether a decline has occurred.

Marana Water staff measures static groundwater levels from each of its production wells on a quarterly basis. The fourth quarter measurements are used to calculate the change in water level of each well from the previous year, and an average of all well level changes is used to determine the annual groundwater level change. The specific levels of annual groundwater decline that would trigger a drought stage are described in **Section 2**.

1.1.2.2. Regional Indicators

Regional drought indicators are used to monitor impacts in the Colorado River Basin. The key regional drought indicators of the Colorado River Basin are the water elevations in Lake Mead and Lake Powell, as projected by the US Bureau of Reclamation (BOR) in its August 24-month study. The 2007 Interim

Guidelines (**Section 1.2.2.1**) approved by the Secretary of the Department of the Interior describe the implementation of operational guidelines for managing the Colorado River as well as operating Lake Powell and Lake Mead during the ongoing drought. As part of the guidelines, Lake Mead will be considered at normal, surplus, or shortage conditions as determined by elevation of the lake surface as projected by the BOR in its August 24-month study for the following year. The guidelines begin triggering tiers of shortage on the Lower Colorado River should the water elevation of Lake Mead be at or below 1,075 feet above sea level. Shortage triggers may ultimately result in curtailment of Arizona's Central Arizona Project (CAP) deliveries.

Due to years of severe drought conditions in the Colorado River Basin, Lake Mead approached shortage conditions faster than anticipated after the signing of the 2007 Interim Guidelines. The 2019 Lower Colorado River Basin Drought Contingency Plan (DCP; **Section 1.2.2.2**) is an agreement signed by American Indian Tribes, Mexico, and the Upper and Lower Basin states to protect the key water levels and reduce risk of further shortage triggers. Under the DCP, Arizona agreed to make voluntary contributions to Lake Mead that result in increasing cuts to Arizona's CAP deliveries.

The 2007 Guidelines remain in effect until 2025, after which a new set of guidelines and operational strategies being developed by the BOR will be enacted. These new guidelines may lead to changes in shortage conditions and responses, as well as the operational strategy for managing the Colorado River, which may require a prompt update to the Town's drought preparedness plan. Maintaining awareness of the changes to the operation of Arizona's key water source is critical to developing a realistic drought plan.

1.2. REGIONAL DROUGHT AND WATER SHORTAGE DECLARATIONS

Though they are intertwined, drought and water shortage are not indistinguishable. A community undergoing a prolonged drought can avoid water shortage through effective planning and water resources management, improvements in supply capacity and distribution, and adjustments in demand through community responsiveness.

Though Arizona has been in a declared drought since 1999, the Town has not experienced source water shortages in its potable water systems. This is largely due to the health of the naturally and artificially recharged aquifer from which the Town withdraws water for system supply.

1.2.1. Arizona Drought Declaration

On June 23, 1999, the Governor of Arizona issued a Drought Emergency Declaration (PCA 99006) activating the Arizona Emergency Response and Recovery Plan and invoking ARS §26-309 to provide mutual aid assistance to stricken areas of the state [2]. In 2007, the declaration was continued with Executive Order 2007-10. In addition to the actions of the original declaration, the 2007 Executive Order also requested assistance from the federal government for the appropriate federal disaster programs,

ordered state agencies to implement their water use reduction plans and assist in drought planning efforts across the state, urged water facilities to develop and implement more aggressive drought and conservation plans and monitor water use; and called upon citizens, businesses, schools, institutions of higher learning, local governments and federal agencies to increase water conservation efforts. The 2007 Executive Order will remain in effect until the Governor rescinds it.

1.2.2. Colorado River System Shortage Declarations

In August 2021, the US Secretary of the Interior declared the first ever Tier 1 shortage on the Colorado River, to begin in 2022. In August 2022, the first ever Tier 2a shortage on the Colorado River was declared for calendar year 2023. The Tier 1 and Tier 2a declarations of shortage equate to curtailment of CAP water deliveries as described below.

1.2.2.1. 2007 Interim Guidelines

The 2007 Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead (2007 Interim Guidelines) implemented interim operational guidelines for Lake Powell and Lake Mead during a drought [21]. These guidelines established storage volumes at the lakes representing normal, surplus, and shortage conditions that are determined by the elevation of the lake surface as projected by Bureau of Reclamation (BOR). Every August the BOR puts out its 24-month study which projects the elevation of the lake at the start of the following year. Under the 2007 Guidelines, a Lake Mead elevation at or below 1,075 feet above mean sea level (amsl) will trigger a shortage condition on the Lower Colorado River. The 2007 Interim Guidelines also incentivized conservation through the mechanism of Intentionally Created Surplus (ICS) where entities intentionally leave portions of their entitlements in the lake to help prevent the elevation from dropping to critical levels.

The 2007 Interim Guidelines were established for operations through 2025 and will remain in effect until new guidelines are recognized. The [Arizona Reconsultation Committee](#), led by ADWR and CAP, was established to inform and guide Arizona's participation developing new guidelines.

1.2.2.2. 2019 Drought Contingency Plan

Recognizing the reality that Lake Mead would approach elevation 1,075 feet more quickly than originally anticipated, each of the seven Colorado River Basin (CRB) states took part in negotiating new plans designed to protect Lake Mead and Lake Powell beyond what was specified in the 2007 Interim Guidelines. The upper basin states (Colorado, New Mexico, Wyoming, and Utah) created the Upper CRB Drought Contingency Plan, and likewise, the lower basin states (Arizona, Nevada, and California) created the Lower CRB DCP [17].

The 2019 Lower Basin DCP was established to prevent, or at least delay, the elevation of Lake Mead from reaching critical levels and triggering CAP delivery reductions. Under the 2019 DCP, Arizona voluntarily

agreed to take additional cuts to its Colorado River water supply by leaving the water in Lake Mead to prevent its elevation from dropping to a critical level (as identified in the DCP shortage tiers) which would trigger a shortage (**Table 1**). These additional cuts were in addition to the reductions from the 2007 Interim Guidelines.

The Arizona Steering Committee was formed to discuss and recommend how to adopt and implement the Lower Basin DCP in an acceptable way for Arizona water users. The Steering Committee is comprised of key water leaders, water users, and representatives from across Arizona. **Table 1** outlines the shortage tiers of the Lower Basin DCP. Beginning January 2023, a Tier 2a shortage will be in effect.

Table 1. DCP Shortage Tiers and Arizona CAP Water Delivery Reductions

Tier	Elevation of Lake Mead (ft)	Total Arizona CAP Reductions (ac-ft)
Tier 0	1,090	192,000
Tier 1	1,075	512,000
Tier 2a	1,050	592,000
Tier 2b-e	1,045	640,000
Tier 3	1,025	720,000

1.2.2.3. Supplemental Environmental Impact Statement (underway)

As a result of “dire hydrologic and climate conditions” in the period since adoption of the 2019 DCPs, BOR is preparing a Supplemental Environmental Impact Statement (SEIS) to prioritize near-term actions that may be required in addition to the 2019 DCPs. Development of post-2026 operations will proceed on a parallel timeline. The draft SEIS is slated for public review in Spring 2023, with the goal of a final SEIS and Record of Decision in late Summer 2023, enabling decisions for 2023-24 operations. Additional information on this undertaking can be found on the [BOR’s Notice of Intent \(NOI\)](#) to prepare the SEIS.

1.3. TOWN OF MARANA WATER SUPPLIES AND DISTRIBUTION

The Marana Water Department (Marana Water) is a municipal water utility, which serves customers through approximately 10,500 residential, commercial, and industrial connections and is located primarily within the corporate limits of the Town of Marana (Town). The water distribution system is fed exclusively by water pumped from its wells. The wells are located throughout the water service area, in the interconnected and shared aquifers of the Tucson Basin and Avra Valley. The Town has a diversified water supply portfolio which includes naturally occurring groundwater, as well as supplies used to recharge the aquifer: effluent (recycled water), long-term storage credits (LTSCs), and imported Colorado River water. Having a diversified water supply portfolio enables flexibility and responsible water resource management. Local and regional drought may have differential effects on different supply types. Marana Water monitors a range of potential negative impacts, from physical supply restrictions to increased cost of supply.

1.3.1. Assured Water Supplies

The Town holds a Designation of Assured Water Supply (DAWS) with Arizona Department of Water Resources (ADWR) that recognizes the Town's ability to safely and reliably serve up to 7,580 acre-feet per year (ac-ft/yr) for 100 years. An application for a modification to its DAWS has been submitted to ADWR for approval of 15,660 ac-ft/yr through 2041 and is awaiting approval. The existing DAWS of 7,580 ac-ft/yr is comprised of 3,394.39 ac-ft/yr of groundwater, 1,681 ac-ft/yr of effluent, 2,336 ac-ft/yr of CAP water, and 168.61 ac-ft/yr of LTSCs. **Table 2** summarizes the different water sources within the existing and the modified DAWS.

Table 2. Summary of DAWS Portfolio

Water Source	Existing DAWS (ac-ft/yr)	Modified DAWS ¹ (ac-ft/yr)
Groundwater	3,394.39	9,505.95
CAP water	2,336	2,578.05
Effluent	1,681	3,576
LTSCs	168.61	
TOTAL	7,580	15,660

¹ Application pending with ADWR.

1.3.1.1. Groundwater

Naturally occurring groundwater is considered a non-renewable, or finite, resource. Since approximately 1940, the water that is pumped from the ground in the Marana area is not naturally replenished at the same rate. In fact, while natural recharge and underflow into the aquifer contribute to the aquifer each year, much of the existing groundwater has been slowly accumulating for thousands of years. The Town's existing DAWS includes 3,394.39 ac-ft/yr of groundwater. To meet requirements of the Assured Water Supply program, the Town has demonstrated that this amount of groundwater will be physically, legally, and continuously available for 100 years, and replenishment of the groundwater would make its use consistent with the management goal of the Tucson AMA. The Town's pending 2021 DAWS modification proposes to use up to 9,505 ac-ft/yr of groundwater (an additional 6,110.61 ac-ft/yr), which the hydrogeologic study performed for the application shows to be consistent with assured water supply requirements.

The Town has multiple production wells, included under its Service Area Right (56-000107.0000), that are used to pump the groundwater and serve customers via Marana's distribution system. As the Town expands its service area, additional service area wells may be transferred to or constructed for the Town through development agreement or may be constructed by the Town through its capital improvement project planning. These wells are proven to have sufficient capacity to serve the proposed groundwater uses for the Town for the next 100 years.

1.3.1.2. Colorado River Water

Water from the Colorado River is delivered to water providers throughout Arizona via the CAP. CAP water is considered a renewable water source since it is replenished each year by way of snowmelt from the Upper Basin mountain ranges.

The Town holds a long-term subcontract with the Central Arizona Water Conservation District (CAWCD) for 2,336 ac-ft/yr of Municipal and Industrial (M&I) Priority CAP water. Per the Town's existing DAWS, it has demonstrated that 2,336 ac-ft/yr of stored and recovered M&I Priority CAP water is physically, legally, and continuously available for the next 100 years. The Town uses this supply each year to recharge the shared aquifer.

Through separate subcontract with CAWCD, the Town is also entitled to an additional 515 ac-ft/yr of Non-Indian Agriculture (NIA) priority CAP water. However, it is anticipated that the Town will not regularly receive its full annual NIA allocation because those resources are subject to cuts in the earliest stage of shortage. Instead, the Town is anticipating, at most, an average of 242 ac-ft/yr (about 47% availability). The Town also uses this supply to recharge the shared aquifer. The Town's pending 2021 DAWS modification application requests the recognition of 2,578 ac-ft/yr of CAP water (2,336 ac-ft of M&I water plus 242 ac-ft of anticipated NIA water).

1.3.1.3. Effluent (Recycled Water)

The Town owns and operates the Marana Water Reclamation Facility (WRF) which collects and treats wastewater to produce Class A+ reclaimed water. The effluent produced at the WRF is recharged into the ground via recharge basins located at the WRF Recharge Project USF, to later be recovered via recovery wells and distributed (potable water) to customers as needed. Marana's effluent will be physically, legally, and continuously available to meet demands, regardless of fluctuations in production of effluent. Distribution of effluent via aquifer storage and recovery allows the Town to handle daily, seasonal, and annual supply and demand fluxes.

The WRF will eventually have the capacity to treat up to 3,360 ac-ft/yr of effluent. Per the Town's existing DAWS, it has demonstrated that 1,681 ac-ft/yr of effluent to be stored and recovered is physically, legally, and continuously available for the next 100 years. With planned WRF expansion, it will treat an additional 1,680 ac-ft/yr, for a total capacity of 3,360 ac-ft/yr. The WRF expansion is anticipated to be completed prior to 2041.

The Town holds additional effluent entitlements for effluent produced from wastewater that originates from sites that are provided water service by Marana Water and wastewater service by Pima County. Currently, Marana is utilizing this effluent in the Lower Santa Cruz River Managed Recharge Project USF and estimates typical annual storage in that project will be approximately 216 ac-ft/yr for the Town by 2031. The

Town's pending 2021 DAWS modification application requests the recognition of 3,576 ac-ft/yr of effluent (3,360 ac-ft of Marana WRF effluent plus 216 ac-ft of Lower Santa Cruz River Managed Recharge Project effluent).

1.3.1.4. Long-term storage credits

LTSCs are accumulated by recharging surface water or effluent (renewable water) into the ground for storage. If that water remains stored in the ground for longer than one year, it becomes a LTSC. When LTSCs are recovered, they maintain their original legal character (effluent or CAP water). For example, if the Town recharges effluent and then recovers that water after several years, it is still considered as effluent. As long as the Town recharges water and does not recover it within the same year, it will accumulate LTSCs. These credits can be recovered as needed, per the Town's discretion. They do not expire and can continue to accumulate via additional recharge. Per the Town's existing DAWS, it has demonstrated that 168.81 ac-ft/yr of LTSCs are physically, legally, and continuously available for the next 100 years.

1.3.2. Water Demand, Production and Distribution

Marana Water's service area is comprised of seven individual water systems- North Marana, Tangerine Business Park, Hartman Vistas, Picture Rocks, Saguaro Bloom, Marana Airport, and Palo Verde (**Figure 5**). Most of these separate systems are planned to be combined within the next ten years, except for Palo Verde and Marana Airport (**Figure 6**). Connecting the systems will improve redundancy which is a vital aspect of drought preparedness.

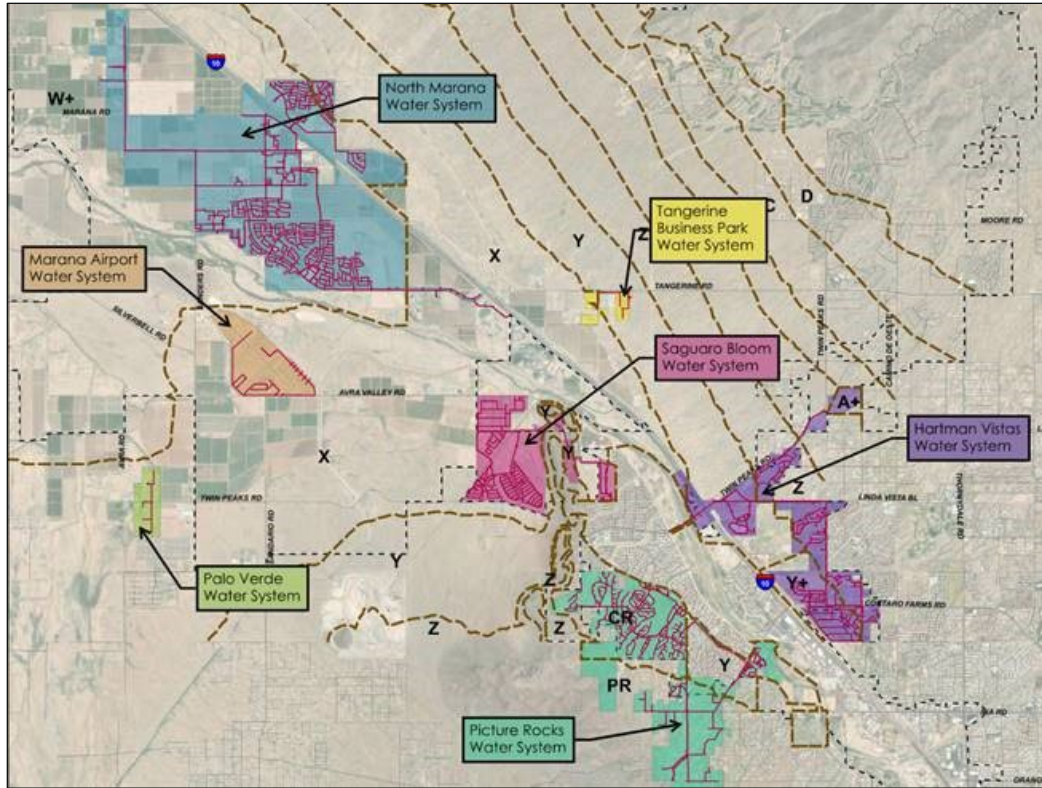


Figure 5. Marana Water's Separate Water Systems

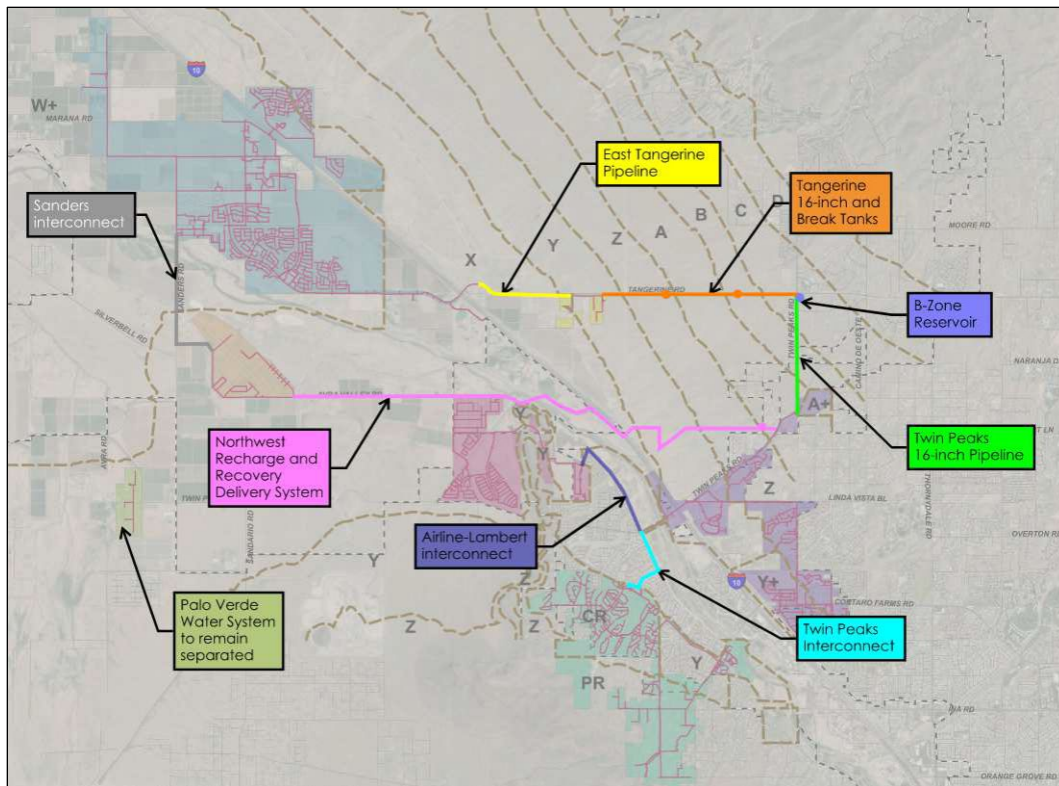


Figure 6. Marana Water's Connected Water Systems (future)

Marana Water's water service area is not congruent with the Town boundary. There are unserved areas within the Town and also areas that are served by other providers. In addition, Marana Water serves in areas located outside of Town boundaries. A significant portion of Marana is served by Tucson Water, through Intergovernmental Agreements (IGA) between Marana and Tucson. In other words, Marana Water's resources are delivered, or wheeled, to the Marana Water service area via Tucson Water's infrastructure. Per the City of Tucson-Town of Marana Intergovernmental Agreement Relating to Effluent (Effluent IGA), Marana Water receives effluent LTSCs from effluent that is treated at a non-Marana owned treatment facility because a portion of the effluent treated at the facility was derived from customers served by Marana Water supplies.

2. MARANA DROUGHT PREPAREDNESS APPROACH

The focus of the Town's 2022 Plan is to continue its overall objective of sound water management by ensuring uninterrupted water service to its customers. In the early stages of drought, the Town will rely on its customers to voluntarily comply with requests for water use reduction. As the stages of drought escalate from one through four based on local and regional indicators (**Section 1.1.2**), mandatory response measure options increase. The Drought mandatory response measures of the later stages rely on Mayor and Council action under the Emergency Water Conservation Response (Marana Town Code Chapter 14-7). **Table 3** provides a summary of Marana's drought stages, while the following sections provide more detail.

Table 3. Marana's Drought Indicators and Response Measures

Drought Stage	Local Trigger	Regional Trigger	Response Measure
Stage 1	<ul style="list-style-type: none"> Overall Groundwater levels 1.0 - 2.0 foot annual decline 	<ul style="list-style-type: none"> Water level in Lake Mead is between 1,090 and 1,075 feet (DCP Tier 1). 	<ul style="list-style-type: none"> Voluntary measures of Stage 1.
Stage 2	<ul style="list-style-type: none"> Overall Groundwater levels 2.1 – 3.0 foot annual decline 	<ul style="list-style-type: none"> Water level in Lake Mead is between 1,075 and 1,045 feet (DCP Tier 2a) 	<ul style="list-style-type: none"> Voluntary measures of Stage 1. Voluntary measures of Stage 2.
Stage 3	<ul style="list-style-type: none"> Overall Groundwater levels 3.1 – 4.0 foot annual decline 	<ul style="list-style-type: none"> Water level in Lake Mead falls below 1,045 feet (DCP Tier 2b) 	<ul style="list-style-type: none"> Mandatory measures of Stage 3 include expansion of Stage 2 measures.
Stage 4	<ul style="list-style-type: none"> Overall Groundwater levels more than 4 feet annual decline 	<ul style="list-style-type: none"> Water level in Lake Mead falls below 1,025 feet (DCP Tier 3) 	<ul style="list-style-type: none"> Mandatory measures of Stage 4 include expansion of Stage 3 measures.

2.1. DROUGHT RESPONSE MEASURES

This Drought Preparedness Plan implements four stages of drought response measures from the Town. Each stage, and corresponding response measures, is determined by the following indicators: annual decline of the overall groundwater levels in the Town (local), and elevation in Lake Mead (regional). When either one of these indicators meets the trigger level identified within one of the Town's drought stages, the response measures in that stage will be initiated. Marana Mayor and Council will authorize enactment of each drought stage, upon the recommendation of the Water Director. Likewise, Marana Mayor and Council will also authorize the termination of a drought stage, upon the recommendation by the Water Director. The drought response measures are intended to supplement ongoing conservation and education efforts.

2.1.1. Drought Management Team

To lead by example and to closely monitor impacts of climate change, as well as to aid in implementation of the 2022 Plan, The Town's Drought Management Team will be activated for all four drought stages, expanding its involvement in stages 3 and 4. This team will be comprised of representatives from multiple Town departments. Through all four drought stages, this team will be responsible for public outreach and enforcement, as well as making necessary decisions related to implementation of the 2022 Plan. The team

may also work with neighboring water providers to look at cooperative efforts. Each department has expertise in different areas; therefore, it is important to have the Drought Management Team comprised of individuals from various departments as they can each contribute in diverse ways to the overall effort. Error! Reference source not found. summarizes the roles that each department may play on the Drought Management Team.

Table 4. Drought Management Team Members and Roles

Role	Town Department												
	C E	C o m m	C & N S	D S	E n g	F M	L e g a l	P & R	P o l i c e	P W	T M	W a t e r	
Lead & manage response effort													x
Maintain primary means of customer contact													x
Monitor water supply & demand													x
Provide guidance on modifying or curtailing water intensive activities at Town facilities & rights-of-way			x			x		x		x			x
Provide information on Town planning and development efforts & effect on water supply				x	x						x		x
Help deliver drought-related messaging in consistent and effective ways.		x	x					x					x
Coordinate and disseminate information		x	x					x					x
Manage social media and press releases, etc.		x											x
Provide compliance oversight and enforcement assistance	x		x						x				x
Guide direction of response efforts & coordinate with Town Council, including recommendation to declare a water emergency											x		x
Review legality and/or help implement shortage and waste ordinances, drought surcharges, etc.							x	x		x			x
CE- Code Enforcement Comm- Communications C&NS- Community & Neighborhood Services DS- Development Services Eng- Engineering FM- Facilities Management P&R- Parks & Recreation PW- Public Works TM- Town Manager													

Each stage of drought is triggered by a local and/or regional indicator that reflects water supply availability and the Town’s ability to meet the water demand of its customers. Adaptive management provided by the

Drought Management Team, together with options for mandatory measures provide important flexibility in the response measures at different stages. For example, if a Town-declared drought stage does not prove sufficient to enable the Town to meet its customer's water demands, the Town Manager can recommend that Mayor and Council use the Emergency Water Conservation Response Chapter to enact more stringent response measures.

2.1.2. Stage 1

Stage One (Low) is initiated when either one of the following triggers are present:

- Local Indicator: The annual decline of the overall groundwater level is between 1.0 to 2.0 feet.
- Regional Indicator: Lake Mead elevation is between 1,090 and 1,075 feet (Tier 1; predicted elevation for January).

In Stage One, the Town's Drought Management Team will be activated. Marana will aim to increase customer awareness about the drought and water resources through increased education and outreach efforts. The conservation measures already in place will remain (**Section 2.4.1**) while the Town continues to promote additional conservation practices and water efficiency measures. Water saving tips will be included in bill inserts.

The Town will lead by example, exhibiting leadership and illustrating the severity of the situation. The Town will conduct water audits on its facilities and reduce its water consumption by a targeted 5% for each department. Customers will be requested to follow suit and reduce individual consumption by 5%. Town staff will also be educated on indoor and outdoor water saving techniques. Additionally, the Town plans to initiate a rebate program for water efficient fixtures and other conservation incentives for its water customers.

Industry green measures for hotels and restaurants can contribute to water conservation. Stage One will request that hotels and restaurants continue and/or expand their green measures. Examples of some industry green measures include serving water in restaurants only upon request and hotels washing guest towels less frequently than every day. Marana Water will work with the Drought Preparedness Team, hotels and restaurants to promote participation and increase impact.

In addition to the measures above, residential and commercial water customers will be encouraged to:

- reduce or eliminate use of misting systems,
- reduce or eliminate spraying of impervious surfaces,
- reduce or eliminate use of potable water for construction, and
- restrict irrigation to early morning or evening only.

2.1.3. Stage 2

Stage Two (Moderate) is initiated when either one of the following triggers are present:

- Local Indicator: The annual decline of the overall groundwater level is between 2.1 to 3.0 feet.
- Regional Indicator: Lake Mead elevation is between 1,075 and 1,045 feet (Tier 2a; predicted elevation for January).

The Town's response measures for Stage One remain in place for Stage Two, with escalation of the following measures:

- The Town will reduce its water consumption on Town properties by 10%, as well as ensure that improvements have been made regarding the water audit results from Stage One.
- The Drought Management Team will consider and recommend ways to conserve water use for construction.
- Request that customers limit landscape irrigation to two days per week between 8:00 pm and 8:00 am.
- Request that customers avoid other outdoor water uses such as hosing down walkways and washing vehicles without a bucket and hose with a positive cutoff nozzle.
- Request limiting overseeding and installation of new sod and/or other landscaping.
- Request limiting use of ornamental fountains and filling of pools.

2.1.4. Stage 3

Stage Three (High) is initiated when either one of the following triggers are present:

- Local Indicator: The annual decline of the overall groundwater level is between 3.1 to 4.0 feet.
- Regional Indicator: Lake Mead elevation is below 1,045 feet (Tier 2b; predicted elevation for January).

The Town's response measures for Stages One and Two remain in place for Stage Three, with the addition and/or escalation of the following measures:

- The Town will reduce its water consumption on Town properties by 15%.
- The use of potable water for construction, including for dust control, will not be permitted. Reclaimed water will need to be used instead.
- The Town will consider instituting a drought surcharge.
- Landscape irrigation is limited to two days per week between 8:00 pm and 8:00 am.
- The use of water supplied by the Marana Water Department for the following purposes will be prohibited:

- Misting systems,
- Spraying of impervious surfaces,
- Ornamental fountains,
- Filling of pools, and
- Splash pads.
- The use of water supplied by the Marana Water Department for the following purposes will be restricted:
 - Washing of fleet vehicles,
 - Commercial water hauling,
 - Hydrant flushing (except to maintain water quality), and
 - Fire training and fire hydrant use (except as required for public safety).
- The Town will review its water service area policy and terms of its water service agreements.
- The Drought Management Team will recommend additional conservation programs as appropriate.

2.1.5. Stage 4

Stage Four (Extreme) is initiated when either one of the following triggers are present:

- Local Indicator: The annual decline of the overall groundwater level is more than 4 feet.
- Regional Indicator: Lake Mead elevation is below 1,025 feet (Tier 3; predicted elevation for January).

The Town's response measures for Stages One through Three will remain in place for Stage Four, with the addition of the following:

- The Town will reduce its water consumption on Town properties by 20%.
- The Town will begin the process set forth in ARS 9-463.06 to consider adopting a moratorium on the issuance of permits and approvals for new water-consuming uses and activities.
- The Town will consider instituting additional drought surcharges. Commercial water hauling will be prohibited.
- Customers must limit landscape irrigation ONLY to trees and shrubs one day per week between 8:00 pm and 8:00 am, and no irrigation of turf or ground covers.
- Additional conservation programs will be outlined.

Table 5. Summary of Drought Stage Response Measures

Response Measure	Stage 1	Stage 2	Stage 3	Stage 4
Reduce water consumption on Town properties by a targeted percentage rate.	√	+	+	+
Activate a Drought Management Team comprised of multiple Town departments.	√	√	+	+
Educate Town staff on indoor/outdoor water saving techniques.	√	√	√	√
Conduct water audits for Town facilities/departments (if not already completed).	√	√	√	√
Limit use of splash pads.		√	+	X
Limit washing of fleet vehicles.		√	+	X
Institute drought surcharge			√	+
Limit hydrant flushing (for non-water quality issues)			√	+
Limit use of water for fire training & fire hydrant uses (except those for public safety).			√	+
Increase enforcement of existing water conservation ordinances (water waste fines, etc.).			√	√
Evaluate new water service agreements and water service area policy.			√	√
Develop arrangements for alternative/back up water supplies should they become necessary.				√
Offer rebates for water efficient fixtures; implement conservation incentive programs.	√	√	√	√
Implement public information and awareness campaign.	+	+	+	+
Promote conservation practices and efficiency measures. Include water saving tips in bill inserts.	√	√	+	+
Implement industry green measures for hotels and restaurants.	√	+	+	+
	Requested		Required	
Limit landscape irrigation.	√	+	+	+
Restrict use of misting systems, spraying of impervious surfaces, etc.	√	+	X	X
Restrict potable water use for construction.	√	+	X	X
Restrict access for commercial water haulers.	√	+	X	X
Limit installation of new sod and/or other landscaping. Limit overseeding.	√	+	X	X
Limit use of ornamental fountains and/or filling pools.	√	+	X	X
<p>Green = Actions by Town staff.</p> <p>Orange = Public Engagement (Actions by Town and customers)</p> <p>Yellow = Actions by Marana Water customers</p>	<p>√ = Initiate drought measure</p> <p>+ = Expand drought measure</p> <p>X = Prohibit activity</p>			

2.1.6. Backup Water Sources and Emergency Preparedness

The Town will do all it can to avoid a water shortage and disruption in water service due to drought, as evidenced by this 2022 Plan. It remains necessary, nonetheless, to be prepared for such events by having a plan for a back-up water supply should a shortage be unavoidable.

Marana designs its wells with capacity to serve peak day demand with the largest well out of service. If a well were to go dry, for example, water service would not be disrupted. This applies to all Marana's water systems, except for Palo Verde and Tangerine Business Park. If a well in one of these two systems were to go out of service, it would be necessary to haul water from another system. Additionally, the Hartman Vistas water system is interconnected with the Oro Valley Water Utility, offering a back-up source of water if a well in Hartman Vistas is out of service.

If Colorado River water allocations are reduced or cut completely, the Town can temporarily rely on production of groundwater per its DAWS and recovery of effluent from its recharge project. Additionally, the Water Resource Acquisition Task Force has recently been formed by the Town to facilitate the process of acquiring additional water supplies to meet future demands.

The Town has an [Emergency Operations Plan](#) (EOP) in place for technological, human-caused, and natural hazards such as drought. The EOP provides the structure and controls for operational coordination for incident management. The EOP, along with the Marana Strategic Plan, "helps ensure that the community has adequate water, sewer, transportation, and public safety infrastructure to respond to the challenges of a natural or human-caused disaster" [\[16\]](#).

2.2. PUBLIC AND CUSTOMER NOTIFICATION

Marana Water and the Drought Management Team will work diligently on public outreach to ensure that all Town customers and residents are well informed not only about drought and water conservation, but also about the Town's drought stages and associated response measures; particularly when those stages are enacted. Notifications will be posted on a multitude of platforms, particularly when moving into and out of a drought stage. As drought stages become more severe, messaging will increase in frequency and media source. **Table 6** provides a list of methods that the Town may employ to notify customers and residents.

Table 6. Public Information and Customer Notification Methods

Method	Timing and Frequency
Bill notifications (on printed and electronic bills)	Monthly. Include drought information periodically and as needed.
Water bill inserts and/or postcards	When moving into/out of a drought stage.
Town on-hold phone recording	When moving into/out of a drought stage.
Marana Water Website	Dedicated area for drought info: Update when conditions change.
Social Media	When moving into/out of a drought stage. Increase messaging with each drought stage.
Public Notices / Flyers at Town Facilities	When moving into/out of a drought stage.
HOA newsletters, and/or meeting presentations	Conduct as appropriate, such as when moving into/out of a drought stage.
Public workshop	
Town hall	
Press release	When moving into/out of a drought stage. Additional periodic drought information outreach to media as needed.
Newspapers & publications	
Television	
Radio	
Interview of Water Director	

Response measures for drought stages 1 and 2 are voluntary. Messaging during these stages will aim to increase public awareness on the current drought status, provide guidance to conserve water, and provide information on available rebates for water efficient fixtures. Since response measures at stages 1 and 2 are voluntary, notifications at these stages will request customer compliance with requested measures and strongly encourage additional conservation. Once the Town moves into drought stages 3 & 4, messaging will become more urgent. Response measures for these stages include mandatory measures that will likely need to be enforced. A drought surcharge may also be implemented at these later stages to further encourage responsible water use.

At all stages of drought, the Town will lead by example by auditing Town facilities and reducing its own water use across its various facilities and departments. Conservation and education opportunities will remain an ongoing priority for the Town. **Section 2.4** provides more detail on existing conservation and education efforts.

2.3. ENFORCEMENT

To ensure the response measures detailed in **Section 2.1** are observed when triggered, a comprehensive enforcement plan has been established to identify the party responsible for enforcement, the types of

violation notices provided, and methods for enforcement. Town residents and water customers may call the Water Department to report violations or complaints of improper water use. These complaints will be promptly investigated by enforcement officials. Enforcement officials for the drought stage response measures may include Town staff from the following departments: Water, Code Enforcement, and as a last resort, Police. These enforcement officials will be given the responsibility and authority to identify violations and follow through with enforcement mechanisms. The penalties for these violations are described in Chapter 14-9 of the Marana Town Code.

Violators will be issued a verbal notice upon first violation, either in person or via telephone, and Marana staff will endeavor to find out whether reasonable assistance from the Town could help ensure compliance. Further violations will result in a written notice mailed to the customer billing address to include a description of the violation, procedure for compliance, instructions for presenting objections, and water conservation materials. Repeat violations may result in a civil citation, fine, and/or court appearance. As described by Chapter 14-9-6 of the Marana Town Code, a civil offense shall have a fine of no more than \$250 and each day the violation continues constitutes a separate offense. In the event a customer fails to comply with the mandatory measures activated at stages 3 and 4 of the Drought Preparedness Plan, Title 14-5-8 permits a termination to water service without advance written notice.

2.4. DROUGHT RESILIENCE

The primary objective of this plan is to prepare responses for levels of drought that will protect the Town and ensure a safe and reliable water supply for its citizens. An equally important objective for the Town is to increase its drought resilience through ongoing conservation efforts. Per the Town's 2021 Conservation Efforts Report, it reached over 15,000 people with local and/or regional public awareness messages. An emphasis on educating the population on water use reduction methods will help the Town become more resilient during times of drought and reduce the chance of water scarcity. In addition to increased programming for residential customers, the Town will find ways to engage with its commercial and industrial customers under its expanding Water Conservation Program (**Section 2.4.1**).

2.4.1. Conservation

The Town has taken multiple steps to communicate the importance of water conservation and to provide information to the public on how to manage water utilization. Municipal providers within each AMA are required to establish a public education program under ADWR's Non-Per Capita Conservation Program (NPCCP). In guidance, ADWR offers a list of [Best Management Practices](#) (BMPs) for conservation practices, broken into seven categories ranging from public awareness to installing efficient technology such as smart meters. In addition to educational methods of conservation, the Town will increase resilience through investment in infrastructure that promotes efficiency by reducing water losses. Fixing leaky pipelines, [installing smart meters](#) with customer data portals and promoting low water use fixtures are all

investments that can increase the efficiency of a water system. Smart meter data and analysis is also a tool to identify practical targets for drought preparedness and water conservation. The Town is also working towards implementing rebates and incentive programs for customers to install water efficient fixtures in and around their homes such as high efficiency toilets, water harvesting systems, and landscaping improvements.

ADWR also requires that municipal providers report their effort annually via the Conservation Efforts Report in which all conservation practices are recorded to ensure compliance. Conservation efforts are revisited consistently by the Town to ensure it continues to improve efforts that reduce water usage. During the Town's future five-year updates for this 2022 Plan, conservation efforts should be reviewed to create a long-term evaluation on the success of these efforts.

2.4.2. Education

In support of conservation efforts, the Town has established an educational course, Marana Citizens' Water Academy, for residential customers in which information is shared about the water department, its operations, and methods of water conservation that residential customers can utilize at their homes. The program provides the opportunity for the Town to share information with customers while also collecting data about customer trends, and feedback from customers regarding water practices. In addition to conservation, the program holds lessons on water supply and demand, the natural history and regulatory environment of Arizona's water supply, and water economics.

2.4.3. Next Step Recommendations

While the impacts of climate change as relates to drought are briefly addressed in this 2022 Plan, climate disruption and adaptation can be more fully considered and incorporated in broader planning efforts. It is anticipated that the Drought Management Team will develop additional recommendations on any additional revisions to improve the Town's Drought Preparedness.

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APPENDIX A

Glossary

Glossary

Aquifer- A body of permeable rock or sediments that can contain or transmit groundwater.

Climate- The average course or condition of the weather usually over a period of years as exhibited by temperature, wind velocity, precipitation, etc.

Demand- The amount of water being used. The **Total Demand** for a water provider is the volume of water the provider needs to produce to meet the needs of its customers.

Drought- A prolonged period of abnormally low precipitation, especially one that adversely affects growing or living conditions. Drought can be caused by seasonal or multi-year weather conditions. Drought is not a constant or totally predictable condition in occurrence or duration. There are levels of drought and levels of drought impact, and therefore, levels of demand reduction response.

Effluent- Treated municipal wastewater.

Groundwater- The portion of water beneath the surface of the earth that can be recovered with wells or flows naturally to the earth's surface via seeps or springs.

Indicator- Variable or parameter used to describe drought conditions.

Water Meter- An instrument for measuring and indicating or recording the volume of water that has passed through it.

Ordinance- A municipal regulation.

Potable water- water of sufficiently quality to serve as drinking water, whether it is used for drinking or not.

Recharge- Water that replenishes an aquifer by surface infiltration or by other natural or induced means.

Reclaimed water or treated effluent- water that has been treated or processed by a wastewater treatment plant or an on-site wastewater treatment facility, whether publicly or privately owned and that can be used for non-potable purposes such as irrigation for landscape or non-edible crops, ornamental water features, etc.

Recovery- The practice of pumping water that has been artificially recharged to an aquifer.

Trigger- a threshold of an indicator or index that initiates and/or terminates actions of a drought management plan.

Tucson Active Management Area (Tucson AMA)- The Tucson AMA is one of five AMAs in Arizona established pursuant to the 1980 Groundwater Management Act. The Active Management Areas were established to provide long-term management and conservation of groundwater supplies.

Water Table- The level below the earth's surface at which the ground becomes saturated with water. The water table is set where hydrostatic pressure equals atmospheric pressure.

Watershed- Land area from which water drains toward a common watercourse in a natural basin.

Weather- The state of the atmosphere with respect to wind, temperature, cloudiness, moisture, pressure, etc.

APPENDIX B
Drought and Climate Resources

Climate and Drought Resources

No.	Resource	Description	Link
1	ADWR Groundwater Site Inventory (GWSI)	Data and base map tool query tool for determining aquifer levels in all ADWR registered wells. May be useful for generating well hydrograph charts.	GWSI (azwater.gov)
2	ADWR Interactive Drought Dashboard	Depicts short-term drought conditions in AZ and allows users to explore drought conditions for specific timeframes. Viewers can access drought data by county.	https://new.azwater.gov/drought/drought-dashboard
3	Arizona Drought Monitor	Drought monitoring tool updated weekly showing Arizona's drought conditions in terms of drought intensity. Produced by National Drought Mitigation Center at the University of Nebraska-Lincoln, the USDA, and NOAA.	https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?AZ
4	CoCoRaHS Mapping System- Community Collaborative Rain, Hail and Snow Network	Grassroots volunteer network of backyard weather observers working together to measure and map precipitation in their local communities. Some observers add condition of vegetation, water bodies, and wildlife that reflect drought impacts.	https://maps.cocorahs.org/
5	Desert Water Authority- info on overseeding	Tips to conserve water if overseeding; recommendations to avoid overseeding.	https://dwa.org/conservation/efficient-landscaping/overseeding/
6	Drought Interagency Coordinating Group	Check here for presentations and meeting information from the Drought Interagency Coordinating Group, an advisory body to the governor on Arizona drought issues.	https://new.azwater.gov/drought/interagency-coordinating-group
7	Drought View (UA)	Online tool for collecting drought impact data incorporating remote sensing and climate monitoring products.	https://droughtview.arizona.edu/

No.	Resource	Description	Link
8	Fifth Management Plan for Tucson AMA	Management Plans serve as a tool to assist in achieving the groundwater goals of AMA. Chapter 5 is for municipal providers. Appendix 5B is the Non-Per Capita Conservation Program Best Management Practices.	https://new.azwater.gov/sites/default/files/media/TAMA5MP.pdf
9	Grass-Cast Grassland Productivity Forecast	Tool that managers can use to develop well-informed expectations about grassland productivity. Can be used in the design of proactive drought management plans, trigger dates, stocking dates, and grazing rotations. Gives three what-if scenarios.	https://grasscast.unl.edu/
10	Standardized Precipitation Index (SPI) Explorer	Drought index that can calculate precipitation anomalies at different timescales and interpret SPI units in probabilistic terms.	https://uaclimateextension.shinyapps.io/SPItool/
11	US Climate Normals	The U.S. Climate Normals are a large suite of data products that provide information about typical climate conditions for thousands of locations across the United States.	https://www.ncei.noaa.gov/products/land-based-station/us-climate-normals
12	US Water Alliance/ One Water	The US Water Alliance advances policies and programs that build a sustainable water future for all. One Water is an approach to water stewardship that is innovative, inclusive, and integrated.	http://uswateralliance.org/about-us http://uswateralliance.org/one-water
13	USGS Groundwater Watch	Data and base map tool query tool for determining aquifer levels in all USGS monitoring wells. May be useful for generating well hydrograph charts.	USGS -- Groundwater Watch

APPENDIX C
Town Ordinances

Town Ordinances

Chapter 1-9: Code Compliance

1-9-1 Definition

“Code compliance officer” means any employee designated and authorized by the town manager to administer and enforce any provision of the town code, the land development code or any other town ordinance, or any duly authorized agent or designee of that employee, regardless of the employee’s position title.

1-9-2 Authority of code compliance officers

Code compliance officers are granted the authority expressly and impliedly necessary for the administration and enforcement of those areas of the town code, the land development code or any other town ordinance that the code compliance officer is responsible for. This authority includes, but is not limited to, authorization to issue uniform civil code complaints, as described in chapter 5-7 of this code, for any violations of the town code, the land development code or any town ordinance that are classified as civil offenses. Code compliance officers may not issue citations for violations that are classified as criminal offenses.

Chapter 14-7: Emergency Water Conservation Response

14-7-1 Declaration of policy

It is hereby declared that because of varying conditions related to water resource supply and distribution system capabilities operated by the town, it is necessary to establish and enforce methods and procedures to ensure that in time of emergency shortage of the local water supply, (1) the water resources available to the customers of the water system are put to the maximum beneficial use, (2) the unreasonable use, or unreasonable method of use is prevented, and (3) the conservation of water is accomplished in the interests of the customers of the town water utility, customers of other water utilities located within the town and for the public health, safety, and welfare of the residents of the town.

14-7-2 Definitions

A. In this chapter, unless the context otherwise requires:

1. “Economic hardship” means a threat to an individual’s or business’ primary source of income.
2. “Notification to the public” means notification through local media, including interviews, and issuance of news releases.
3. “Outdoor watering day” means a specific day, as described in a specific outdoor watering plan, during which irrigation with sprinkler systems or otherwise may take place.

14-7-3 Application

- A. This chapter applies to all municipal and industrial water utility customers who own, occupy, or control water used on any premises as defined in this chapter. This chapter shall not apply to any agricultural use of water furnished by an irrigation district.
- B. No person shall make, cause, use, or permit the use of water received from the town water utility or any other municipally owned or privately owned water utility providing water service within the town for residential, commercial, industrial, governmental or any other purpose in any manner contrary to any provision in this chapter.
- C. Mandatory emergency conservation measures shall be implemented based upon the declaration of an emergency pursuant to section [14-7-4](#).

14-7-4 Declaration of water emergency authorized

The council, or in the absence of a quorum, the mayor or the vice mayor, upon the recommendation of the town manager, is hereby authorized to declare a water emergency and to implement mandatory conservation measures as set forth in this chapter.

14-7-5 Implementation; termination

- A. The town manager shall develop guidelines which set forth general criteria to assist the council, or in the absence of a quorum the mayor or the vice mayor, in determining when to declare a water emergency. Upon declaration of a water emergency, the town manager shall report in writing to the council providing the reasons for and expected duration of the emergency and describing implementation of emergency water conservation measures.
- B. A water emergency may be declared for a specific water utility system, such as, but not limited to, the town water utility system, the city of Tucson water utility system located within the town, or any other public or private water utility system located within the town, which is unable to provide adequate quantities, qualities or pressure of water delivery in compliance with Arizona department of environmental quality standards or regulations, or fire flow requirements, and which constitutes a danger to the public health, safety and welfare of the residents of that water utility system.
- C. The declaration of a water emergency shall be specific to the water utility system which is unable to provide adequate quantities, qualities or pressure of water delivery in compliance with Arizona department of environmental quality standards or regulations, or fire flow requirements, and to the water customers of that water utility system.

D. The owner or operator of a water utility system located within the town boundaries may request, in writing, that the town declare a water emergency pursuant to this chapter for its water utility system, setting forth the reasons and justification for it.

E. The water emergency shall be declared terminated when the condition or conditions giving rise to the water emergency end. The declaration terminating the emergency shall be adopted by the agency with jurisdiction over the emergency, or if none, upon majority vote of the council, or in the absence of a quorum, the mayor or the vice mayor. Upon termination, the mandatory conservation measures shall no longer be in effect.

14-7-6 Mandatory emergency water conservation measures

A. Upon declaration of a water emergency and notification to the public, the mandatory restrictions upon nonessential users set forth in the adopted drought preparedness plan and/or the following restrictions shall be enforced as to the customers of the water utility system for which the water emergency was declared.

1. All outdoor irrigation is prohibited, except for irrigation water provided by an irrigation district for agricultural use. If the town manager deems it appropriate, a schedule designating certain outdoor watering days may be implemented in place of the irrigation ban.
2. Washing of sidewalks, driveways, parking areas, tennis courts, patios, or other paved areas with water, except to alleviate immediate health or safety hazards, is prohibited.
3. The outdoor use of any water-based play apparatus is prohibited.
4. The operation of outdoor misting systems used to cool public areas is prohibited.
5. The filling of swimming pools, fountains, spas, or other related exterior water features is prohibited.
6. The washing of automobiles, trucks trailers and other types of mobile equipment is prohibited, except at facilities equipped with wash water recirculation systems, and for vehicles requiring frequent washing to protect public health, safety and welfare.

14-7-7 Variance

The town manager, or the town manager's designee, is authorized to review hardship cases and special cases within which strict application of this chapter would result in serious hardship to a customer. A variance may be granted only for the reasons involving health, safety, or economic hardship. Application for a variance from requirements of this chapter must be made on a form provided by the town manager.

14-7-8 Violation

A. If there is any violation of this chapter, the water utility for which the emergency was declared shall:

1. Place a written notice of violation on the property where the violation occurred; and
 2. Mail a duplicate notice to:
 - a. The person who is regularly billed for the service where the violation occurred; and
 - b. Any person responsible for the violation, if known to the town or the water utility.
- B. The notice of violation shall:
1. Order that the violation be corrected, ceased, or abated within a specified time the town or water utility determines is reasonable under the circumstances, and
 2. Contain a description of the fees and penalties associated with the violation.
- C. The town or the water utility may disconnect the service where the violation occurred for failure to comply with the order set forth in the notice of violation.
- D. Nothing in this section shall conflict with the rules and regulation and approved tariffs of the Arizona corporation commission as they may apply to public service corporations furnishing water service within the town.

14-7-9 Enforcement

The provisions of this chapter shall be enforced by employees of the water utility that serves the property where the violation occurred.

Chapter 14-9: Violations

14-9-1 Unauthorized installation and repair prohibited

Town utilities shall be connected only by authorized town employees or agents. It is unlawful for any person to connect to or repair any town utility service.

14-9-2 Turning on water without authority prohibited

It is unlawful for any unauthorized person to connect to the town water utility a water service that the water department has disconnected.

Ordinance 2015.015 modified section [14-9-2](#) by changing "utilities department" to "water department"

14-9-3 Escaping water prohibited; applicability; exceptions

Ordinance 2012.12 comprehensively revised section [14-9-3](#), formerly entitled "Escaping water flow or runoff prohibited"

- A. No person shall allow water to escape from his or her premises onto public property, such as drainageways, alleys, roads or streets.
- B. No person shall allow water to escape from his or her premises onto any other person's property without that other person's express written permission.
- C. This section shall apply to all property located within the Marana town limits and to all property located outside the Marana town limits that is served by the Marana water utility.
- D. This section shall not apply to the following:
 - 1. Stormwater runoff.
 - 2. Irrigation of landscaping on public property as expressly authorized by the owner of the public property.
 - 3. Reasonable, short-duration runoff from the washing of vehicles.
 - 4. Broken or malfunctioning irrigation equipment, provided that the escape of water is halted promptly and in any event not more than 24 hours after the responsible party has actual notice of the break or malfunction.
 - 5. Disposal of pool or spa backwash water in conformance with section 314 of the 2006 Marana pool and spa code.
 - 6. Any escape of water which is, in the opinion of the investigating code compliance officer, similar in nature or scope to the exceptions set forth in this section.

Ordinance 2015.015 modified the introductory paragraph of section [14-9-4](#) by changing "utilities department" to "water department"

14-9-4 Interference, tampering with utility facilities

No person shall do any of the following without a permit from the water department or in violation of permit conditions, except under the fire department's direction during a fire:

- A. Open or close any fire hydrant or valve connected to the town's water system.
- B. Lift or remove any valve, shutoff cover, or manhole lid.
- C. Tap into the town water distribution system or wastewater collection system.
- D. Otherwise remove water from the town water utility system.
- E. Otherwise discharge into the town wastewater collection system.

14-9-5 Damaging or defacing facilities

It is unlawful for any person to destroy, deface, impair, damage, or force open any gate, door, reservoir, building, storage tank, manhole, treatment facility, pump station, fence, fixture, or other property appertaining to town utilities.

14-9-6 Penalties

- A. Any violation of this title shall be a civil offense punishable by a fine of not more than \$250. This shall be in addition to any other available remedy. Each day a violation continues is a separate offense.
- B. Under appropriate circumstances a violation of this title may also be prosecuted under the public health security and bioterrorism preparedness and response act of 2002.