Metropolitan Domestic Water Improvement District
Long Range Water Resources Plan
October 2022

Introduction

Metropolitan Domestic Water Improvement District (District) has long understood the importance of effectively and efficiently managing its water resources. A water provider cannot serve its customers without responsibly managing its water supplies. Originally dependent upon groundwater as its sole water supply, the District obtained an allocation of Central Arizona Project (CAP) water in 1996, gained approval to use remediated water through 2050, and developed recycled water as a future supply. These sources of water provide a portfolio for the District to successfully meet current and future demands for current and future customers throughout the District's six service areas.

The 2070 Long Range Water Resources Plan (Plan) outlines the District's strategy to manage its water resources for the next 50 years. The Plan demonstrates that the District is in a stable position to meet customer demands but also shows the need for continual planning and evaluation of those resources. With the rising uncertainties resulting from drought, over allocation of the Colorado River System, and other impacts of climate change, continued planning and investment in District assets is essential to delivering safe, reliable water to our customers.

Plan Organization

Water Resources – This section of the report details the District's available water resources. Four sources make up the District's water portfolio: CAP allocation, groundwater, remediated groundwater and recycled water.

Current Challenges and Issues – This section discusses the regional influences impacting the District's water resources, i.e. climate change, persistent drought, water quality impacts and aging well infrastructure.

Supply and Demand Projections through 2070 – This sections provides a projection of demands and how the District's water resources will be deployed to meet these demands. Each of the six service areas is addressed.

Drought Preparedness and Response Plan –This section of the Plan is an updated version for the District that incorporates the triggers that align with the tiers of shortage established for the Colorado River. The Arizona Department of Water Resources (ADWR) requires all water providers to prepare these plans as part of their System Water Plans.

Plan Assumptions

Necessary Infrastructure

The District's general policy on infrastructure is "growth will pay for itself." This means that all necessary infrastructure to meet the needs of new development will be the responsibility of the developer that is building homes or commercial businesses within the District. This includes wells, storage facilities, treatment facilities, transmission and other distribution facilities that are necessary to provide water to the future customers in the new development without deleterious impacts to existing customers.

Demand and Supply Projections

There are many challenges to Arizona's water supplies as a result of climate change, a persistent drought and over allocation of the Colorado River System. The continued planning and conservation measures that the District will continue to implement, provide for a reliable water future for its customers. This Plan will illustrate how the District has managed a robust portfolio of water supplies to reach that goal.

Since the District's CAP allocation availability is dependent on shortfalls to the Colorado River Basin, this Plan utilizes the results from the United States Bureau of Reclamation (BOR) study that has been developed for the Tucson region. The Lower Santa Cruz River (LSCR) Basin Study's overarching goal is to identify where physical water resources are needed to mitigate supply-demand imbalances due to climate change and other factors, and to develop strategies to improve water reliability for municipal, industrial, agricultural, and environmental sectors. Impacts of climate change and growth were compared to develop six future scenarios for investigation.

For the purposes of this Plan, the highest risk climate scenario from the LSCR Basin Study was used to develop the CAP water availability to meet the District's demand projections and water resource utilization to meet those projected demands for each service area. The climate scenario used projects future shortages to CAP supplies none of which impact the District's ability to meet annual demands with renewable supplies, but does impact the availability of water for the creation of long-term storage credits (LTSC).

For this Plan, it is assumed that a Tier 3 shortage condition for the Lower Colorado River Basin States will take effect in 2024. This results in an 11% reduction from 2024 through 2044, and a 25% reduction from 2025 through 2070 in the District's CAP supply availability. The Arizona Water Banking Authority (AWBA) will firm 100% of any CAP reduction that creates demand shortfalls through the year 2026. The availability of firming water precludes the use of the District's LTSC for that period.

Tables 1 and 2 summarize the projected demands and supplies for the District's six service areas:

TABLE 1. 50 Year Demand and Supply Scenario for Service Areas Without a Designation of Assured Supply

Year	2020	2030	2040	2050	2060	2070
Projected Demand Acre-Feet (AF)						
Metro Hub[1]	862	862	865	865	865	865
Metro Southwest – E&T[1]	99	100	101	101	102	102
Metro Southwest – Lazy B	7	8	8	8	8	8
Total Demand (AF)	968	970	974	974	975	975
Projected Supply (AF)						
Groundwater	962	964	968	968	968	968
Recycled Water Credits[2]	0	0	0	0	0	0
CAP M&I Credits[3]	6.5	6.5	6.5	6.5	6.5	6.5
Total Supply (AF)	968.5	970.5	974.5	974.5	974.5	974.5

[1] Assumes service area buildout in 2040 for Metro Hub and 2020 for Metro Southwest – E&T.

[2] Recycled water deliveries assumed uneconomical since Metro Hub has only 7% of its demand as irrigation use, Metro Southwest – E&T and Metro Southwest – Lazy B have no irrigation use and the service areas are not served by a public sewer system.

[3] Assumes groundwater levels remain stable, so Metro Hub and Metro Southwest – E&T would only utilize the CAP Wheeling Agreement with the City of Tucson for emergencies, such as infrastructure failure. Continues use of Wheeling Agreement to supply Metro Southwest – Lazy B.

TABLE 2. 50 Year Demand and Supply Scenario for Service Areas With a Designation of Assured Water Supply.

Year	2020	2030	2040	2050	2060	2070
Projected Demand (AF)						
Metro Main[1]	7,476	7,494	7,261	7,270	7,270	7,270
Metro Southwest – Diablo Village	465	2,165	2,242	2,319	2,396	2,473
Metro West	0	47	51	60	66	70
Total Demand (AF)	7,941	9,706	9,554	9,649	9,732	10,233
Projected Supplies (AF)						
CAP[2]	9960	11,979	11,979	10,095	10,095	10,095
Recycled Water	500	500	500	500	500	500
Remediated Water[3]	668	668	668	0	0	0
Total Supply (AF)	11,128	13,147	13,147	10,595	10,595	10,595
Credits Stored (AF)	3,187	3,441	3,593	946	863	362

[1] Assumes Metro Main service area buildout in 2050.

[2] Assumes a Tier 3 shortage declaration by BOR in 2024. This results in a 15% reduction in 2024 to a 28% reduction in 2045 in the District's CAP supply availability.

[3] Remediated groundwater waiver expires in 2050.

Water Resources

The District has four supplies of water: CAP water, groundwater, remediated water, and recycled water. Groundwater was the predominant supply prior to 1996; however, the District has been working to increase the use of its allocation of CAP water to lessen the reliance on groundwater. The District has also explored ways to increase utilization of recycled water.

Groundwater

The District is currently meeting approximately 10% of demand with groundwater that does not require replenishment or remediated groundwater. Groundwater levels fluctuate, but are generally stable in Metro Hub and Metro Southwest service areas, but are declining between 1 to 1.5 feet per year in Metro Main. As groundwater levels decline, well productivity decreases. The rate of water level declines in Metro Main has slowed in the past 10 years due to increasing degrees of customer conservation. Additionally, wells are impacted by time and eventually must be replaced. The average age of Metro Main wells is over 40 years as of 2022.

Five out of the six District service areas have service area rights to pump groundwater. Metro Southwest – Lazy B is presently served by an exempt well and a CAP wheeling agreement with the City of Tucson.

Sixteen of the 26 Metro Main wells are Pre-Code wells. A Pre-Code well is a well permitted by the ADWR before the enactment of the Groundwater Management Act (June 1980). Pre-Code wells have no annual pumping limit unless they are replaced by the owner. Replacement wells must be within 660 feet of the original well. The annual pumping limit for replacement wells for Pre-Code wells is the historic maximum pumping rate with an assumed duty cycle of 100%. The other 10 non-Pre-Code wells in Metro Main have an annual pumpage limitation.

In past five years, several older production wells have had casing patches or liners installed to gain an additional five or more years of production life. These are the last measures taken for decaying wells before they require replacement or alternate supplies are developed.

Three of the five Metro Hub wells are Pre-Code wells. Metro Southwest – Diablo Village has one Pre-Code well and one non-Pre-Code well, which is also the case at Metro Southwest – E&T. New developer financed wells are planned to be installed in Metro Southwest – Diablo Village to provide production capacity for new housing construction. Metro West has no serviceable production wells, the developer will provide the District with necessary wells and distribution infrastructure when development begins.

Central Arizona Project Water

The Central Arizona Water Conservation District (CAWCD) is the agency who manages the CAP canal and the subcontracts for Municipal and Industrial (M&I) supplies from the Colorado River via the CAP canal. The District has an M&I CAP water subcontract for 13,460 acre-feet (AF) per year, which is the principle resource for reducing the District's dependence upon groundwater. The District's subcontract is restricted for use at its service areas having a Designation of Assured Water Supply (DAWS), which are Metro Main, Metro Southwest – Diablo Village and Metro West. Metro Southwest – Diablo Village has not been annexed into the District and purchases annually stored CAP credits from Metro Main to offset the groundwater pumped each year. Metro Hub has stable groundwater levels and very little growth potential so the District does not intend to pursue a DAWS. Metro Southwest – E&T and Metro Southwest – Lazy B have not been annexed into the District and are dependent on groundwater; however, Metro Southwest – Lazy B has a wheeling agreement with the City of Tucson. Metro Southwest – Lazy B purchases CAP credits from Metro Main that are stored in Tucson Water's Southern Avra Valley Storage and Recovery Project (SAVSARP) facility.

The District has recharged its CAP water at the Avra Valley Recharge Project (AVRP), which the District acquired in 2011, and at Groundwater Savings Facilities (GSF). By doing this, the District has accrued credits that are part of the District's long-term supplies. The CAP water delivered to these facility accrue credits that are partially used each year as annual storage and recovery to offset groundwater pumping; the remainder are stored as LTSC for future use. To more directly use its stored credits, the District is implementing the Northwest Recharge, Recovery, and Delivery System (NWRRDS) in partnership with the Town of Marana and the Town of Oro Valley. This Project will allow for the District's CAP water allocation to be delivered within its Metro Main service area. This is accomplished by recovering CAP water in the vicinity of AVRP and then delivering it through a 13 mile transmission main line to be blended with groundwater at the Herb Johnson Reservoir.

With the importation of CAP water into the Herb Johnson Reservoir, an equal volume of water will no longer need to be pumped from Metro Main production wells. It is expected that this will result in the cessation of groundwater declines seen over the past several decades. There is also the possibility of groundwater level recovery in some areas due to the reduction in pumpage in the Metro Main service area.

In 2019, the Drought Contingency Plan (DCP) was signed by all of the seven Colorado River Basin States. The DCP outlined levels of shortage to be borne by the Lower Basin States, which includes Arizona, based on water elevations in Lake Mead. The reductions in Arizona's allocation will only affect CAP water supplies available to central Arizona water users. To make up the needed reductions in CAP supplies necessary to meet DCP reductions, CAP entered into a number of

compensated system conservation programs. Most were accomplished with agricultural fallowing. The District proposed a Compensated System Conservation (CSC) agreement with CAP in 2019 and was the first M&I subcontractor to enter into such an agreement with CAP.

The District has been providing 3,500 AF of its allocation for CSC since 2020. The remaining 9,960 AF of the District's CAP allocation has been requested to be delivered to GSFs, on an annual basis since 2020, to mitigate Pima County agriculture firming needs. This has resulted in 100% of the District's CAP allocation supporting the DCP while also benefiting District customers.

In 2021, the BOR and the Lower Colorado River Basin States (Arizona, California and Nevada) determined that an additional 500,000 AF of water was needed to stay in Lake Mead starting in 2022. The 500 Plus Plan was developed to provide this water with additional compensation to water users that contributed to the needed water savings. The District's 3,500 AF was added into the 500,000 AF and will continue at least through 2023.

Even with the 500 Plus Plan, the water levels in Lake Mead are projected to continue declining. It is expected that a Tier 3 shortage condition could be declared for the Lower Basin States as early as 2024. This would result in an 11% (1,481 AF) reduction from 2024 through 2044, and a 25% (3,365 AF) reduction from 2025 through 2070 in the District's CAP supply availability.

Conditions are changing rapidly in the Colorado River Basin. The entire operation plan for Lake Mead and Lake Powell is scheduled for revision in 2026. More drastic measures are likely needed beyond the 500 Plus Plan and the Tier 3 DCP reduction to stabilize the water levels in both reservoirs. Eventual mandatory reductions in M&I CAP supplies greater than the DCP volumes will likely be required, but the magnitude and timing of these further reductions is unknown at the time this Plan was approved.

Remediated Water

ADWR and Arizona Department of Environmental Quality (ADEQ) provide incentives to water providers to use treated groundwater impacted by a State superfund site. ADEQ paid for the design, construction, and operation of the treatment system on the South Shannon well, and ADWR does not count the groundwater pumpage as needing replenishment by the District. ADEQ funded $1 million for the wellhead treatment system and annually pays the operation and maintenance costs of approximately $100,000. ADWR has given the District an annual groundwater pumpage exemption of up to 1,048 AF from the South Shannon well. This exemption was extended from 2025 to 2050 in statute during the 2020 Arizona Legislative session.

With the discovery of 1,4-dioxane in the South Shannon well, operations have been adjusted to provide blending at the Deconcini Reservoir. However, as the concentration of 1,4-dioxane has risen in South Shannon and in blending wells, the flow rate in South Shannon must be reduced.

The District installed a variable frequency drive controller on the well to make it easier to vary the flow rate and match needed blending from other wells to reduce 1,4-dioxane concentrations below the Health Advisory Level (HAL) of 0.35 ug/L. However, reduced flow rates from the South Shannon well greatly impacts the effective capture of contaminants in the groundwater, and extends the duration of remediation that has to occur. The District is in negotiations with ADEQ to design and implement advanced oxidation treatment technologies to add to the existing treatment at South Shannon that will remove the 1,4-dioxane and allow the South Shannon well to pump at its full capacity to increase the effective capture and remediation of the entire contaminant plume. The treatment system has been designed and construction may begin in 2023 depending on ADEQ funding.

The US Environmental Protection Agency (EPA) recently proposed new HALs for Per- and Polyfluoroalkyl Substances (PFAS) compounds. Treatment at South Shannon removes these compounds, but other wells in the Metro Main service area may be affected and could require well head treatment to meet evolving PFAS HALs or potential regulated standards in the future.

Recycled Water

The District has entitlement to approximately 4,000 AF of effluent generated from the Metro Main and Metro Hub service areas based on an Intergovernmental Agreement (IGA) with the City of Tucson. The District has worked with other regional water providers to establish a joint managed effluent recharge project in the Santa Cruz River that allows the District to obtain 95% credit for the effluent recharged, which could range from 450 to 950 credits annually after the cuts associated with the managed in-channel recharge facility are taken into account. The District constructed a reclamation line that can deliver approximately 250 AF of reclaimed water to the Omni Tucson National's new nine golf holes and replace groundwater irrigation to that facility starting by December of 2023.

The 2000 Supplemental City of Tucson/Pima County IGA defers control of effluent outside of the Tucson Metropolitan area to Pima County. The Avra Valley Water Reclamation Facility (AVWRF) lies outside the Tucson Metropolitan area. Wastewater generated by Metro Southwest – Diablo Village customers is treated at AVWRF and disposed of by percolation basins that are now permitted as an Underground Storage Facility (USF). The IGA states every reasonable effort should be made to use effluent to replace current groundwater uses within the service area of the Water Provider, which provides the water from which the effluent is derived. In addition, the agreement states that reasonable efforts should be made, consistent with the principles and purposes of this Supplemental IGA, to give other Water Providers reasonable access to effluent derived from the water they supply, so long as they pay all costs associated with the use of the effluent.

The District has recommended the County establish a policy that provides effluent entitlements to water providers with a DAWS that contribute effluent to County wastewater reclamation facilities outside the Tucson Metropolitan area.

Metro West lies outside of Pima County Regional Wastewater Reclamation Department's (PCRWRD) wastewater management area but within the Town of Marana's wastewater management area. The service area when developed will give the District an opportunity to execute an effluent entitlement with the Town of Marana. The developer's agreement with the Town of Marana requires the effluent to be treated at the Marana Wastewater Reclamation Facility (WRF). The Town of Marana has built recharge basins at the Marana WRF that are in operation today, and would be able to recharge Metro West's effluent entitlement. Effluent storage credits earned at the WRF recharge facility and in the LSCR managed recharge facility will be recovered to meet the water demands for future development at Metro West.

Residents in Metro Southwest – E&T and Lazy B service areas rely on septic tanks and are generally not connected to a public sewer system. Thus, the two service areas are not eligible for an effluent entitlement.

Current Challenges and Issues

Regional Influences

The District is affected by the activities of others in Southern Arizona and throughout the State. Policies and decisions made by ADWR and CAWCD impacts the District's water resources as does its working relationship with other water providers and public opinion regarding water issues.

Demand Decline

Over the 15 years, two key developments have evolved that will have a lasting influence on water resource planning. First, water consumption has steadily decreased. This trend is occurring throughout Arizona as well as the United States and is evident with the District's water consumption in calendar year 2021 being less than in the early 1990s. The decline in water consumption is due to a combination of factors that include the rise in low water use fixtures and appliances, and public awareness of the on-going drought and conservation messages.

Climate Change and Drought

The second development is the on-going drought in the Southwest, which has been more severe and lasted longer than expected, impacting both the Colorado River Basin and Southern Arizona.

With the significant supply and demand imbalance in the Colorado River system, the current drought impacts are expected to extend well into the future. With the District's CAP allocation linked to the Colorado River, the events in the Colorado River Basin have a direct impact on the District.

With the completion of the Lower Basin States DCP in 2019, new tiers of shortage were established for Arizona, Nevada and California. In 2020 a Tier Zero shortage was declared, which reduced Arizona's allocation of river water by 192,000 AF per year. In August of 2020 the BOR declared a Tier 1 shortage on the Colorado River for 2021. As of August 2022, at Tier 2a shortage has been declared for 2023. This increased the shortages to Arizona to a total of 592,000 AF per year. All of these reductions are borne by the CAP system. The cuts to CAP have so far impacted agricultural users but have yet to impact water supplies to M&I subcontractors. Yet, with less water being delivered through the CAP system, CAP operational and maintenance costs will have to be borne by fewer customers, which mean an increase in costs to those M&I subcontractors. Tier 1 and Tier 2 shortages could have impacts to M&I CAP supplies; however, due to reduced orders by subcontractors, there has been no impact to the District's supply. The District anticipates that by calendar year 2024, a Tier 3 shortage could be declared that will impact M&I CAP supplies.

In October of 2021, the Bureau of Reclamation and the Lower Basin States of Arizona, California and Nevada announced the 500 Plus Plan to leave an additional 500,000 AF of water in Lake Mead above the volumes dictated by the DCP to reduce the likely hood of a Tier 3 shortage being declared before 2026. Predictions of reaching an elevation of 1,030 feet elevation in Lake Mead before 2026 initiated the need for additional measures and the initiation of the formal re-consultations for how to operate Colorado River Basin system after 2026.

The drought has heightened the awareness that water supplies can be limited by nature despite various proactive efforts. For the region and State, it also raises questions about augmenting other water sources and increasing the use of recycled water. While the District has adequate supplies to meet current and future demands, a continued drought on the Colorado River could still financially impact the District. State-wide efforts to pursue desalination, water transfers, weather modification, and other ways to augment current supplies could have indirect impacts through higher CAP water rates.

In an effort to let water providers from different parts of Arizona prepare collaboratively for possible shortages of CAP water, the District and the City of Tucson have each approved agreements with the City of Phoenix to initiate water management concept, known as Inter-AMA Firming. Specifically, Inter-AMA Firming allows the City of Phoenix to store or firm water at the District's and Tucson's recharge facilities in advance of a shortage. During a shortage year, Phoenix would directly receive an amount of CAP water from the District and Tucson with the equivalent amount of credits transferred from Phoenix. This ensures that each region will have no interruption of water during a shortage. To date, the City of Phoenix has stored a total of 22,650 AF of CAP water at AVRP.

The District has managed the portfolio water resources within the framework created by the State's Groundwater Management Code and within ADWR's Assured Water Supply Rules and its Management Plan for the Tucson Area. The District believes this structure has been beneficial for propelling the utilization of renewable supplies and reducing the use of groundwater. The District remains alert to future efforts in the region as well as actions by the Arizona Legislature, which could have an impact on the management of water resources.

To remain alert and prepared for local and regional impacts to the District's water supplies, District staff continue to participate in a number of State level committees that are looking at the future of water security. In 2018, the General Manager and the Water Resources Manager were delegates on the DCP Committee, and helped develop Arizona's plans to mitigate the impacts of shortages on the Colorado River. In 2020, the DCP Committee was re-tooled into the Arizona Reconsultation Committee (ARC). The General Manager and the Water Resources Manager are continuing as delegates on the ARC, as well as, members of the Modeling Analysis Working Group (MAWG) that serves as the technical arm of the ARC. In 2021, the General Manager was appointed to the AWBA's Commission. The AWBA Commission looks at projections of future water firming requirements for municipal CAP allocation reductions due to shortage declarations.

In 2020, a CSC plan was created by the District and CAP. The District has been contributing 3,500 AF of the District's CAP allocation to this CSC program to shore up Lake Mead or to firm higher priority users that have their CAP supply reduced due to DCP shortages. The District converted its contributions into the 500 Plus Plan in 2022 and expects to participate in this plan again in 2023.

With the growing uncertainties associated with climate change impacts to the Colorado River, it remains important for the District to maintain positive relationships with the Southern Arizona Water Users Association (SAWUA), ADWR, CAWCD, the State Legislature and other relevant organizations to ensure that its water resources are protected and continue to be proactively managed.

Quality Impacts on Supply

The quantity of water resources is directly impacted by its quality. The District maintains a proactive approach to ensuring that its drinking water complies with the Safe Drinking Water Act. The EPA and ADEQ are continuously reviewing and updating its list of emerging contaminants that water providers must test for in their water supplies. This can mean increased costs for testing and possible treatment as well as limit the use of certain water supplies.

The District is in negotiations with ADEQ to design and implement advanced oxidation treatment technologies to add to the existing treatment at South Shannon that will remove the 1,4-dioxane and allow the South Shannon well to pump at its full capacity to increase the effective capture and remediation of the entire contaminant plume. The District will continue to work with ADEQ to ensure that the superfund site area does not impact to other District wells.

The EPA is currently looking at a number of emerging contaminants and making possible changes to the drinking water standard levels for various contaminants. The District may have to make adjustments to its water quality testing and treatment efforts depending on future decisions made by the EPA and ADEQ. Recently, the EPA proposed new HALs for Per- and Polyfluoroalkyl Substances (PFAS) compounds. Treatment at South Shannon removes these compounds, but other wells in the Metro Main service area may be affected and require well head treatment to meet evolving PFAS standards.

Well Maintenance and Replacement

The District's production wells are critical infrastructure to ensure that water is pumped from the below the ground and delivered to residents and businesses. While the District is moving forward with the NWRRDS for Metro Main and wheeling its CAP water through Tucson Water for Metro Southwest, the District's wells will remain essential parts of the District's water supply system. The recovered CAP water would be blended with groundwater and Metro Main wells would continue to serve as recovery wells for stored CAP water credits.

A well's production performance (specific capacity) and well depth changes as a function of age. As water levels drop each year, well production decreases as does the saturated thickness the well penetrates. Well depth can also be a function of the straightness of the borehole. Gyroscopic surveys completed on many of the District wells have been found to have a limited depth to which a pump can be lowered. Well capacity is tied to the aquifer material, which decreases with time as the more productive units are dewatered each year. The physical life of a well is also a function of time; as the well ages, its physical integrity decreases. In the Southwest, the average useful and economic life of a municipal well is 45 years.

The average age of Metro Main wells is 45 years old. The District has six active wells that are over 45 years old, which equate to needing three replacement wells as newer wells typically have higher production capacities. Additionally, within ten years, the District will likely need a total of approximately 3,000 gallons per minute (gpm) of well production from replacement wells due to lost production from older wells if CAP supplies cannot be physically delivered to Metro Main. The total volume equates to as many as nine replacement wells or about one well per year over ten years.

It is anticipated that NWRRDS will deliver CAP supplies directly into the Metro Main service area. With an estimated 2,500 AF of recovered CAP water, the urgency for replacement wells is diminished but not eliminated. There still needs to be sufficient redundancy in supply to meet customer demands, so total well production remains a priority. Therefore, as the District pursues increasing the use of its CAP water, vigilance will still be required to maintain well capacity.

Supply and Demand Projections through 2070

The District with other SAWUA members partnered with the BOR, CAP, ADWR and the University of Arizona to prepare the LSCR Basin Study. The study was conducted to look at future areas of groundwater aquifer imbalances within the Tucson region. The study incorporates differing scenarios of groundwater pumping by comparing and contrasting six climate projections and population growth patterns.

Metro Main

The Metro Main service area has a diverse portfolio of water resources used to meet customer demands that includes: CAP recovered credits, CAP LTSC, recycled water credits, remediated groundwater and allowable groundwater credits. For this Plan, only renewable supplies are used to meet projected demands. Table 3. Summarizes the renewable water supplies available and the projected customer demand in 10-year increments.

TABLE 3. Metro Main Supply and Demand Projection

Year	2020	2030	2040	2050	2060	2070
Projected Demand (AF)[1]	7,476	7,494	7,261	7,270	7,270	7,270
Supplies (AF)						
CAP M&I Recovery	6,808	6,826	6,593	7,270	7,270	7,270
Recycled Water Credits[2]	500	453	449	440	434	430
CAP M&I Credits[3]	6,187	2,046	1,663	770	25	0
Remediated Water[4]	668	668	668	0	0	0
Projected Supply (AF)	14,163	9,993	9,373	8,480	7,729	7,700

[1] Annual demand projected by CAP supply and demand model for very dry, rapid growth scenario.
[2] Annual LTSC assuming District Effluent Entitlement is discharged and stored in the LSCR Managed Project with 95% accrual. Assumes all demands for Metro West are met with annual stored and recovered effluent credits.
[3] Annual LTSC assuming Tier 3 reduction of 1,750 AF in CAP allocation ordered each year. Assumes that the total demand for Metro Southwest – Diablo Village is met with annual storage credit recovery.
[4] Assumes that Advanced Oxidation Treatment for 1,4-dioxane is not implemented.

Figure 1 is a graphical representation of water supplies and demands for Metro Main from 2020 to 2070. The projected demand line corresponds to the volumes in Table 3. The volume to meet these demands is shown as annually stored and recovered CAP (in light blue) and remediated groundwater (in brown) up until 2050. At that point, the remediated groundwater waiver expires and all demand is met with annually stored and recovered CAP credits. Above the demand line is the projected accrual of both CAP LTSCs (in dark blue), and effluent credits (in purple).

The LTSC accrual varies through the projection period for several reasons. In 2019, the District began entered into a CSC agreement with CAP. A total of 3,500 AF of the District's CAP allocation is retained in Lake Mead beginning in 2020. In 2022 an additional agreement was entered for the 500 Plus Plan that could potentially increase the District's contribution to 5,000 AF in 2023.

Two other factors affect the accrual of LTSCs shown on the graph. One is the increasing demands of both Metro Southwest – Diablo Village and Metro West, which will recover CAP and effluent credits, respectively. Another factor is the District anticipates declaration of a Tier 3 shortage on the Colorado River by the BOR in 2024. The percentage of reductions for Tier 3 increase over time as a result of CAP subcontractors slowly increasing their water orders until they reach full allocation in approximately 2045. The increasing percentages and their impacts on the District's LTSC accrual is shown on Figure 1. These reductions have been projected through the planning period to 2070; however, there is the potential for even deeper reductions in the District's allocation depending upon further actions by the BOR to stabilize the water levels in Lake Mead and Lake Powell. Such reductions could become permanent as part of the 2026 re-consultation for the future operations of both reservoirs. A final factor affecting LTSC accrual are LSCR Basin Study's climate model projections of deep shortages in CAP supplies in the late 2030s and 2050s.

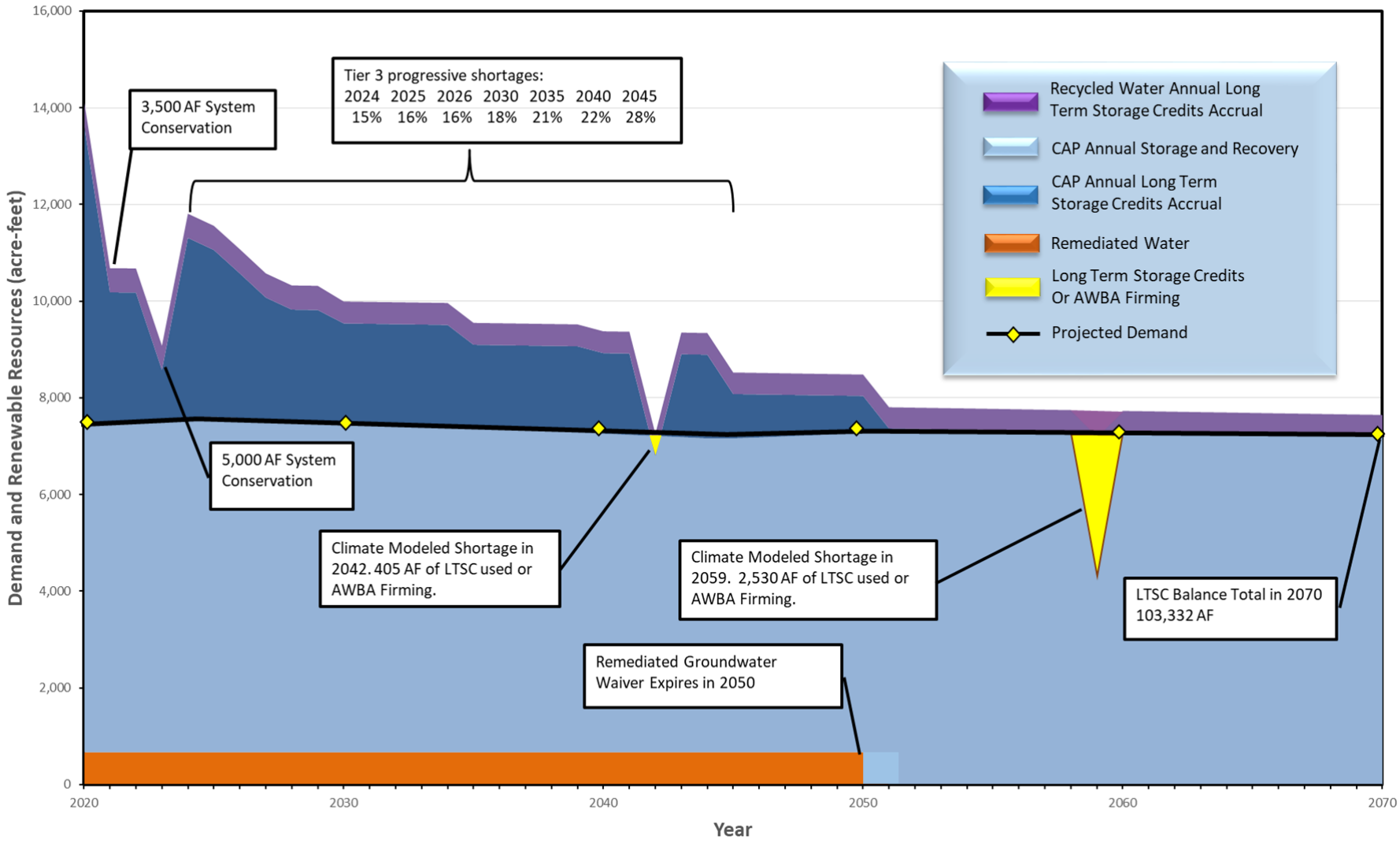

Figure 1. Metro Main (less Diablo Village and Metro West) Projected Demand and Future Renewable Water Resources (Tier 3 Reductions in CAP Availability)

Figure 2 shows the aggregated accrual of LTSCs for the District through 2070. At the end of the planning period, there will be a total of: 103,332 AF of CAP, 26,248 AF of effluent, and 136,164 AF of allowable groundwater credits available for the District's use. That would meet about 20 years of the District's projected demand.

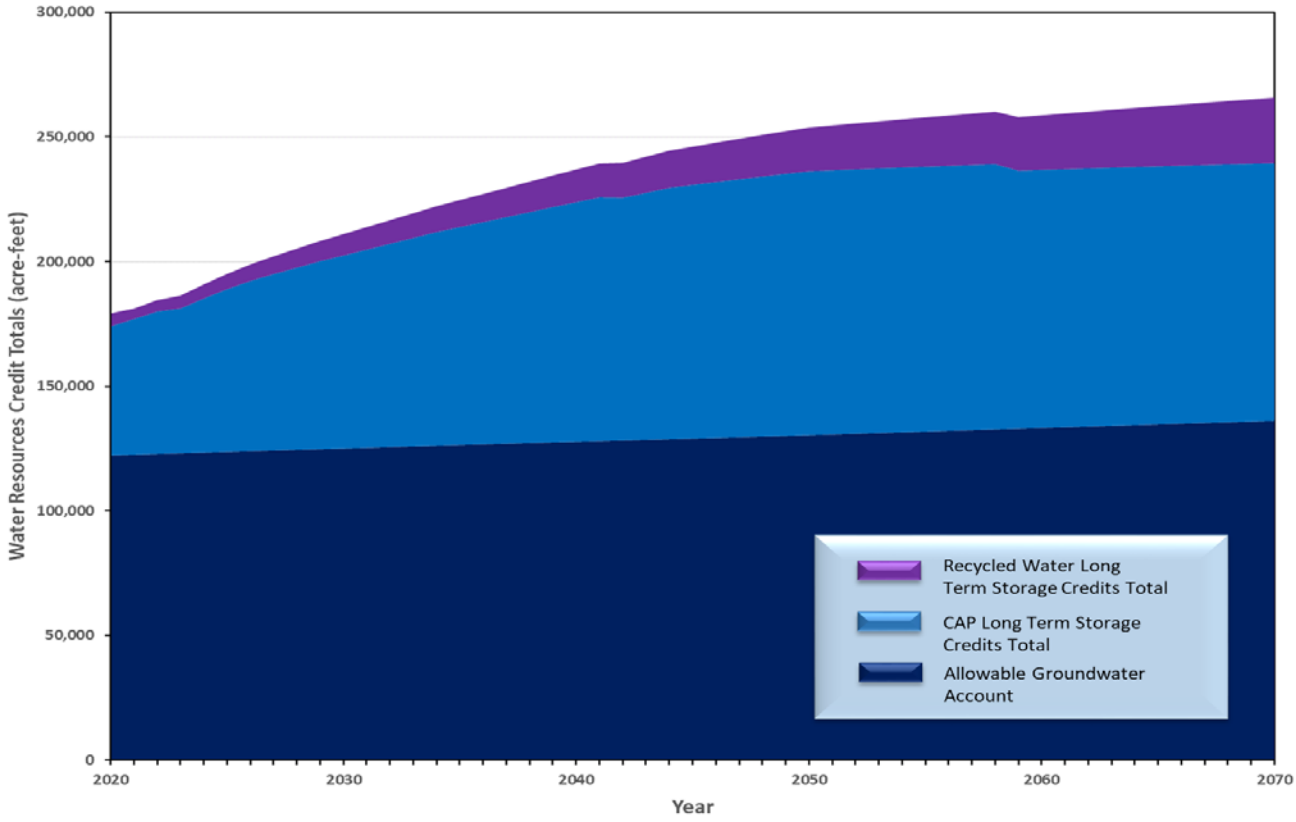

Figure 2. Metro Main (less Diablo Village and Metro West) Aggregated Accrual of Allowable Groundwater and Long Term Renewable Storage Credits (Tier 3 Reductions in CAP Availability).

Groundwater

Groundwater is a physical supply for the Metro Main service area. Depth to groundwater in the alluvial basin ranges from 160 to 460 feet below land surface (ft bls). The aquifer is more than 1,000 feet thick beneath the majority of the service area except next to the Catalina Mountains. Water level trends show decreasing groundwater elevation 1 to 1.5 feet per year. A Hydrology Study completed for Metro Main's assured water supply done in 2020 used a total demand of 8,175 AF and modeled water levels over a 100 year period. The model predicted a depth to groundwater of 300 ft bls after 100 years in the southwest portion of the service area and 650 ft bls in the northwest part of the service area.

The Metro Main service area has twenty-six wells. Twenty-one wells are Pre-Code wells so each well has no annual volume cap. The other five wells have an annual volume cap of 6,988 AF per year. Additionally, Metro Main has a remediated water waiver for 1,048 AF per year from its South Shannon well; however, the remediated water waiver expires in 2050. Projected annual groundwater pumpage in calendar year 2070 is 7,270 AF. At present, the service area wells can meet this buildout demand. Some of these wells will require rehabilitation or replacement as they age beyond their useful asset life.

Renewable Water

- *CAP M&I Water Credits*

The Metro Main service area has an M&I CAP water allocation of 13,460 AF per year. To meet ADWR's groundwater replenishment requirement for Metro Main's DAWS, the service area stores CAP water at AVRP and at three GSFs. These credits are recovered on an annual basis by Metro Main's wells, which are permitted as recovery wells. Any credits earned beyond the replenishment needs become LTSCs. These credits can be banked for future use by the District. From 2015 to the writing of this plan, Metro Main has stored more CAP water than its projected groundwater replenishment needs.

CAP water credit recovery by wells greater than one mile from where the credits were stored is allowable under ADWR rules provided any groundwater level decline occurring in the service area is not greater than four feet per year in the last five years. As mentioned before, the annual groundwater decline in Metro Main is 1 to 1.5 feet per year. Therefore, the recovery of LSTCs stored at AVRP and GSF projects by the Metro Main wells will continue until the service area can construct NWRRDS.

- *Recycled Water Credits*

Effluent credits are projected to be earned as LSTCs through 2070 since CAP water credits will meet Metro Main's groundwater replenishment needs. All of the effluent LTSCs will be earned from storage in the LSCR Managed Effluent Recharge Project. There is the possibility of storing some of the effluent at the Cortaro-Marana Irrigation District (CMID) GSF, however, the uncertainties related to needed infrastructure costs do not make the project feasible at this time.

- *Remediated Water*

The South Shannon Groundwater Treatment System is projected to produce 668 AF out of its permitted capacity of 1,048 AF. Remediated water is exempt from needing groundwater replenishment. The exemption for remediated water will expire in 2050. The volume of water will be replaced with additional CAP annual storage and recovery.

Metro Hub

The Metro Hub service area only has allowable groundwater resources to meet demands. Table 4 summarizes the water supplies available and the projected customer demand in 10-year increments.

TABLE 4. Metro Hub Supply and Demand Projection

Year	2020	2030	2040	2050	2060	2070
Projected Demand (AF)[1]	862	862	865	865	865	865
Supplies (AF)						
Groundwater	862	862	865	865	865	865
Recycled Water Credits[2]	0	0	0	0	0	0
CAP M&I Credits[3]	0	0	0	0	0	0
Available Supplies (AF)	862	862	865	865	865	865

[1] Demand is assumed to stabilize between 2040 and 2070.

[2] Recycled Water deliveries assumed uneconomical since Metro Hub has only 7% of its demand as irrigation use.

[3] Groundwater levels have been rising, so Metro Hub does not need a CAP Wheeling Agreement with the City of Tucson.

Groundwater

Groundwater is the physical supply for the Metro Hub service area located in northeastern Tucson Valley. Depth to groundwater in the alluvial basin ranges from 22 to 95 feet below land surface (ft bls). The aquifer is a little more than 2,500 feet thick, however, recent trends show increasing groundwater elevation or increasing aquifer thickness of one foot per year as the average annual change between 2011 and 2021. Over the period of 2018 to 2021 average annual water level rise was over four feet per year.

The Metro Hub service area has five wells. Three of the wells are Pre-Code wells, so they have no annual volume cap. Hub wells #1A and #5A have an annual volume cap of 564.55 and 220 AF per year, respectively. Projected annual groundwater pumpage in calendar year 2070 is 865 AF. The Metro Hub wells would need to supply 865 AF to meet that demand, which is well within their current production capacity. Some of these wells will require rehabilitation or replacement as they age beyond their useful asset life.

Renewable Water

Presently, the Metro Hub service area does not have a DAWS because groundwater levels are stable or rising and the service area is at buildout. Groundwater pumped from the Hub wells within

the service area does not need to meet ADWR's requirement for the creation of a DAWS. Therefore, the District's CAP M&I subcontract does not need to be utilized for the Metro Hub service area to wheel water by the City of Tucson to the Metro Hub service area or used in some other way. Neither is there enough demand (only 7%) from large turf customers to deliver recycled water from the Tucson Water Reclaimed Water System to be economical for Metro Hub.

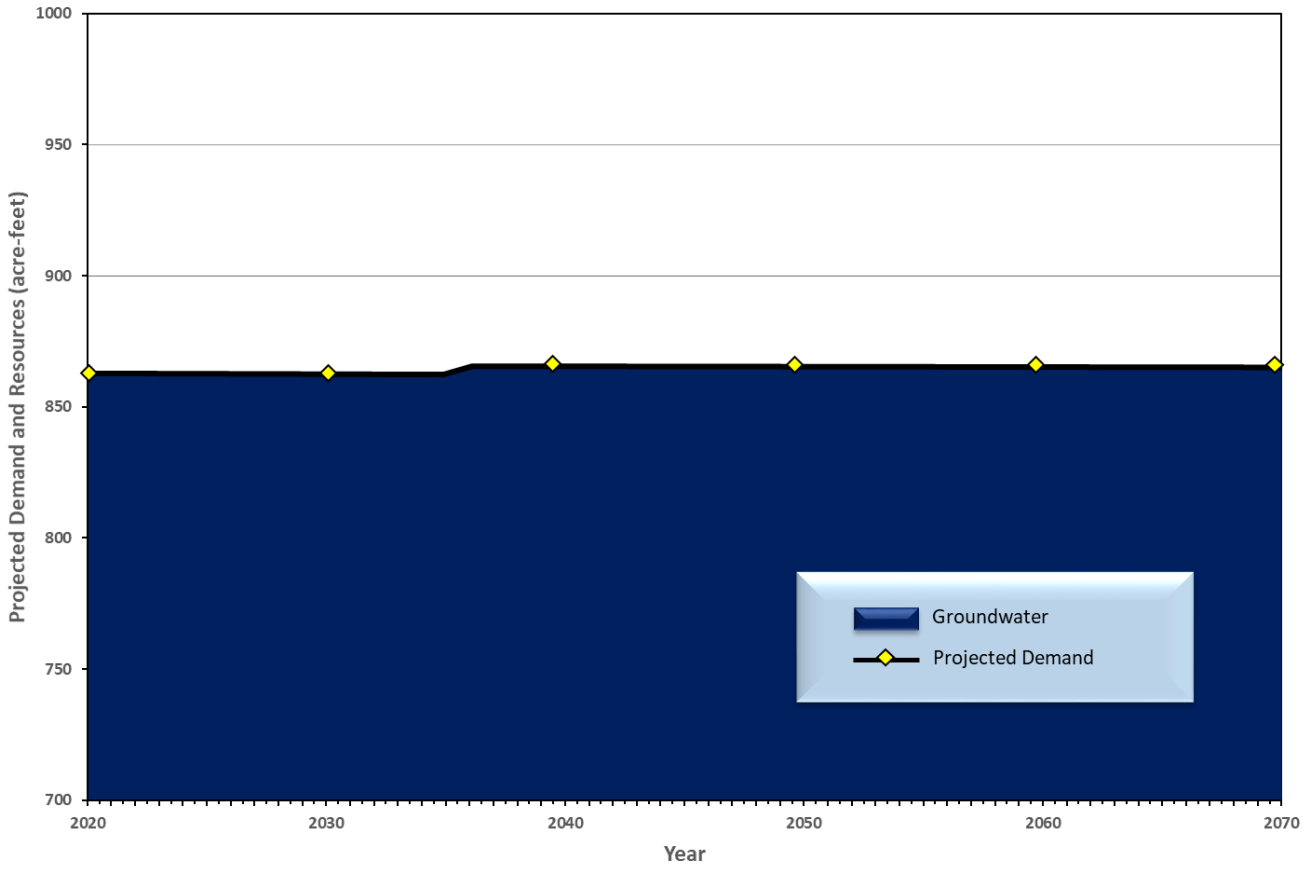

Figure 3. Metro Hub Projected Demand and Groundwater Resources Utilization.

Metro Southwest – Diablo Village

The Metro Southwest – Diablo Village service area has a portfolio of water resources to meet customer demands that includes: CAP recovered credits and a small amount of allowable groundwater credits. For this Plan, only renewable supplies are used to supply resources used to meet projected demands. Table 5 summarizes the renewable water supplies available and the projected customer demand in 10-year increments.

TABLE 5. Metro Southwest – Diablo Village Supply and Demand Projection

Year	2020	2030	2040	2050	2060	2070
Projected Demand (AF)[1]	465	2,165	2,242	2,319	2,396	2,473
Supplies (AF)						
Recycled Water Credits[2]	0	0	0	0	0	0
CAP M&I Credits[3]	465	2,165	2,242	2,319	2,396	2,473
Projected Supply (AF)	465	2,165	2,242	2,319	2,396	2,473

[1] Assumes annual demand increases by 120 single-family units by 3.3158 persons per unit (2010 Census) by 91.7 gallons per capita per day (GPCD) from 2015 to 2024; 150 units per year from 2025 to 2040; and 200 units per year thereafter.

[2] Assumes zero; however, the District is working to obtain an effluent IGA with Pima County

[3] Assumes the CAP LTSC are transferred from Metro Main annually. Credits will be recovered with Diablo Village service area wells.

Groundwater

Groundwater is the physical supply for the Diablo Village service area located in southeastern Avra Valley. Depth to groundwater in the alluvial basin ranges from 407 to 457 feet below land surface (ft bls). The aquifer is a little more than 1,000 feet thick; however, recent trends show increasing groundwater elevation with an increasing aquifer thickness of six feet per year as seen in the average annual change between 2011 and 2021. If recharge of CAP water is curtailed or stops at the SAVSARP facility, the water level in Diablo Village would be expected to decline. A groundwater supply analysis performed for the DAWS assumed a worst case scenario with an annual groundwater decline of 2.1 feet. These assumptions predicted a depth to groundwater of 750 ft bls after 100 years.

The Diablo Village service area has two wells. DV-1 well is a Pre-Code well so it has no annual volume cap. DV-2 well has an annual volume cap of 686 AF per year. Over the next five years there is anticipated to be significant development in the service area. Demand is expected to jump

from 450 AF per year to 2,000 AF per year by 2028. Projected annual groundwater pumpage in calendar year 2070 is 2,473 AF. Developer financed infrastructure will be required to meet the growth in demand. Two production wells and the associated storage, booster capacity, and transmission pipelines are planned in the near future to support planned growth in the service area.

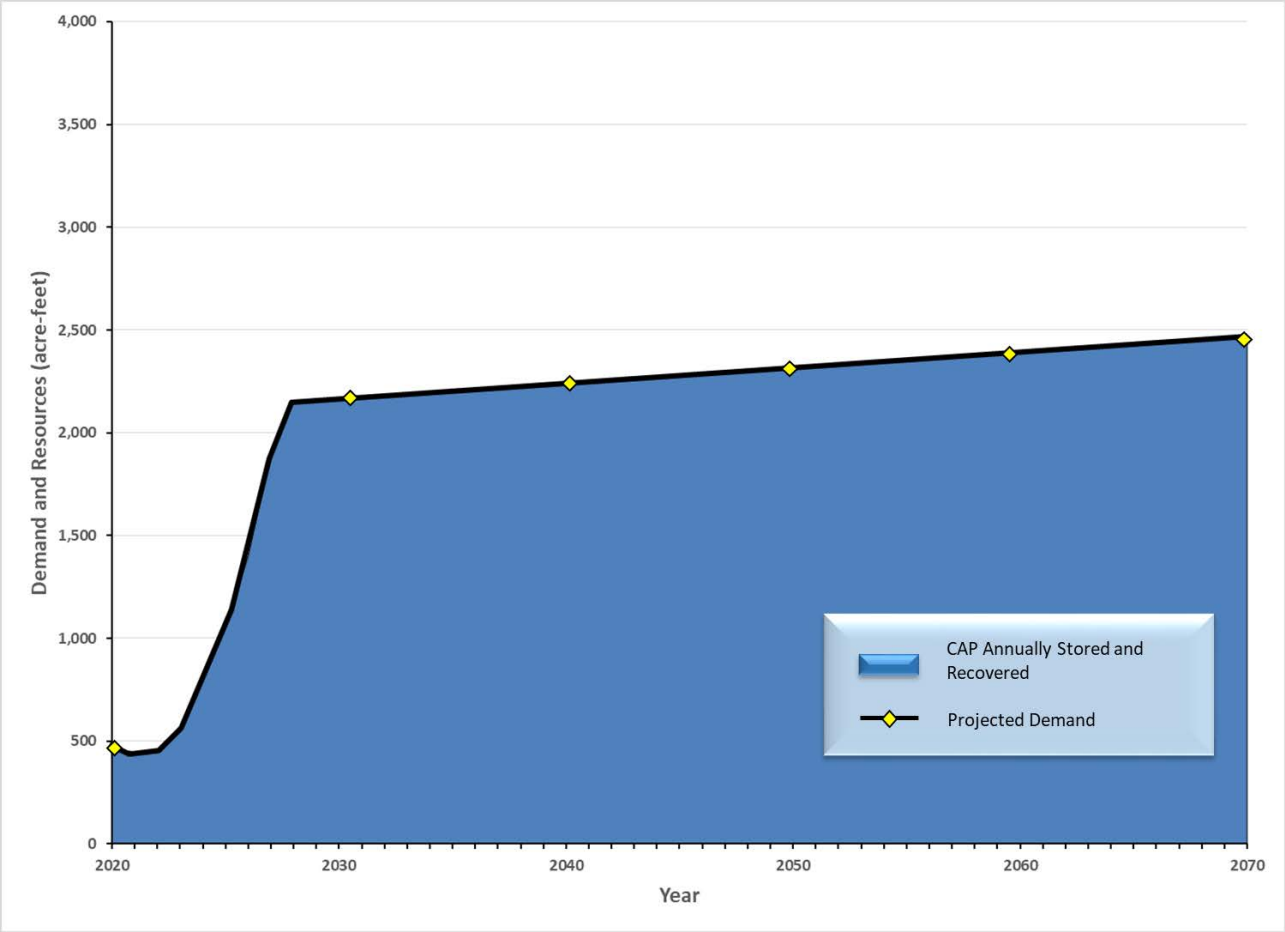

Figure 4. Metro Southwest – Diablo Village Projected Demand and Renewable Water Resources Utilization

Renewable Water

- *CAP Credit Purchase from Metro Main*

Presently, the Diablo Village service area does not have an M&I CAP Water allocation. To meet ADWR's groundwater replenishment requirement for Diablo Village's DAWS, the service area purchases CAP credits annually from Metro Main. These credits are stored at GSFs and recovered in the same year by recovery wells in the Diablo Village service area.

Recovery well permits for DV-1 and DV-2 wells were granted by ADWR in 2014 for use as groundwater supply wells and/or recovery wells (CAP water credits). Recovery of CAP credits are reported each year to the ADWR as "annually stored and recovered CAP" by the two Diablo Village wells to offset the groundwater withdrawn by these wells. Recovery of CAP credits is allowable by the Diablo Village wells provided any groundwater level decline occurring in the service area is not greater than four feet per year in the last five years. Planned wells to meet future demands will be permitted as recovery wells and production will be reported to ADWR the same as the existing wells.

- *Tucson CAP Wheeling Agreement*

The District maintains a CAP wheeling agreement with the City of Tucson. The wheeling agreement allows Tucson Water to wheel a portion of the District's CAP water stored at SAVSARP through Tucson Water infrastructure as a redundancy supply should well capacity be impacted by maintenance or an emergency outage.

- *Effluent IGA with Pima County*

The District cannot currently demonstrate to ADWR that Diablo Village has rights to its recycled water. The District recommended that Pima County's Comprehensive Land Use Plan Update include a policy for adoption that water providers receive an effluent entitlement when the water provider has a DAWS and contributes wastewater to a County non-Metropolitan water reclamation facility. To date, there is no IGA between the District and Pima County for accrual of effluent storage credits at the Avra Valley Water Reclamation Facility.

Metro Southwest – E&T

The Metro Southwest – E&T service area only has allowable groundwater resources to meet demands. Table 6 summarizes the water supplies available and the projected customer demand in 10-year increments. Figure 5 illustrates the demand and the water supply used to meet the demand.

TABLE 6. Metro Southwest – E&T Supply and Demand Projection

Year	2020	2030	2040	2050	2070
Projected Demand (AF)[1]	103	103	102	102	101
Supplies (AF)					
Groundwater	103	103	102	102	101
Recycled Water Credits[2]	0	0	0	0	0
CAP M&I Credits[3]	0	0	0	0	0
Total Supplies (AF)	103	103	102	102	101

[1] Service area is fully built out. Demand assumed to be stable between 2020 and 2070.

[2] No recycled water because E&T has no irrigation use and the service area is not connect to a public sewer system.

[3] Assumes groundwater levels are stable, so E&T does not need a CAP Wheeling Agreement with the City of Tucson

Groundwater

Groundwater is the physical supply for the E&T service area located in south central Tucson Valley. Depth to groundwater in the alluvial basin ranges from 78 to 81 feet below land surface (ft bls). The aquifer is more than 2,500 feet thick; however, recent trends show groundwater elevations are declining by 2 to 3 feet per year. This decline can most likely be attributed to increased production by Tucson Water south of the service area; however, significant reductions in groundwater pumpage by the Farmers Investment Co (FICO) pecan orchards could reverse the water level declines in future years. The service area is built out and the highest historic water demand is 116 AF per year in 2012. Projected demand in 2070 is 102 AF.

The E&T service area has two wells. One well is a Pre-Code well, so it has no annual volume cap. The other well has an annual volume cap of 79 AF per year. Projected annual groundwater pumpage in calendar year 2021 was 99 AF. Demand is projected to be stable through 2070. The E&T wells, and a planned replacement well for E&T22, will need to supply 102 AF to meet that demand, which is within their production capacity.

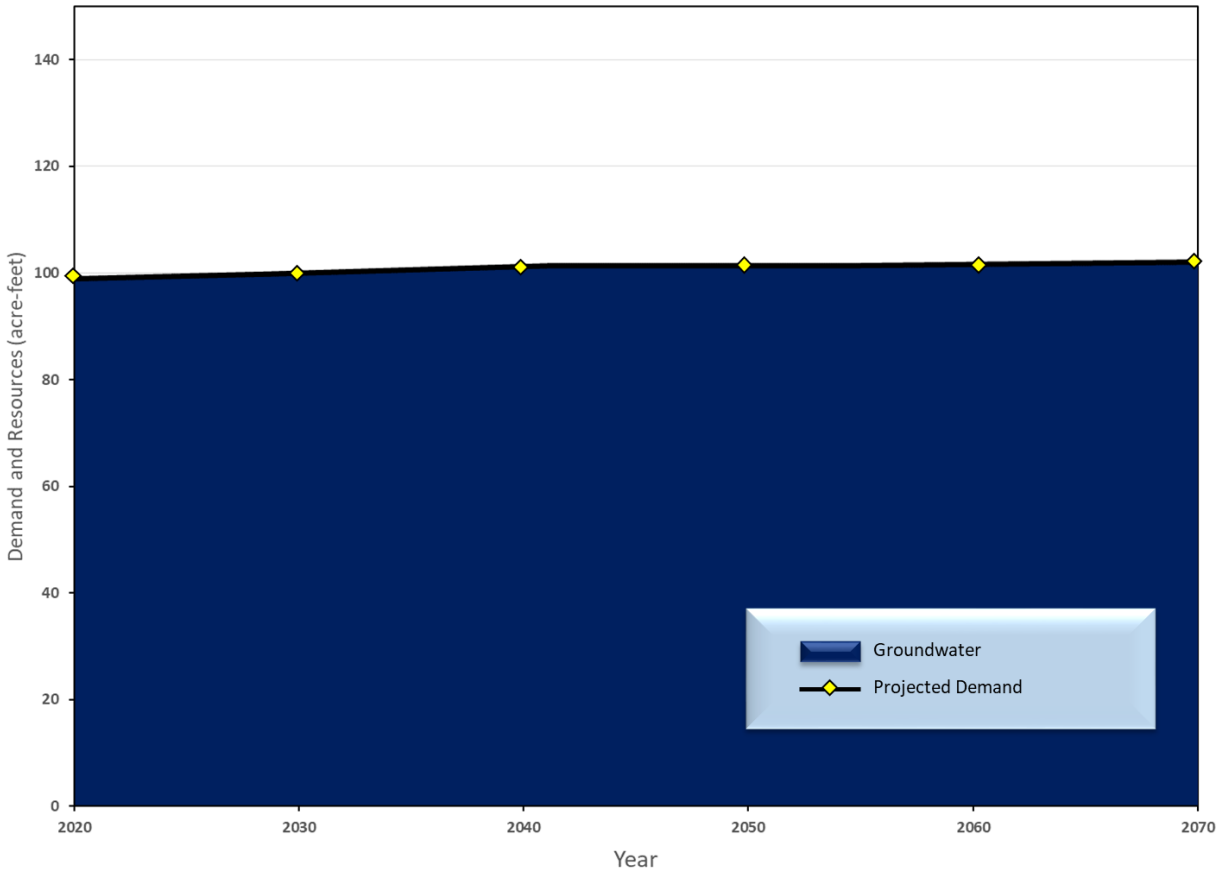

Figure 5. Metro Southwest – E&T Projected Demand and Renewable Water Resources Utilization.

Renewable Water

The Metro Southwest – E&T service area does not have a DAWS because groundwater levels have been relatively stable and the service area is fully built out. Groundwater pumped from the E&T wells within the service area does not need to meet ADWR's requirement for the creation of a DAWS. Therefore, the District's CAP M&I subcontract does not need to be utilized for the E&T service area by being wheeled by the City of Tucson to this service area or in some other form. Additionally, the service area does not have a recycled water supply because the properties are on septic tanks and not connected to a public sewer system.

Metro Southwest – Lazy B

The Metro Southwest – Lazy B service area has a limited portfolio of water resources used to meet customer demands that includes: CAP recovered credits and allowable groundwater that has to be treated to remove arsenic. Table 7 and Figure 6 summarize the water supplies available and the projected customer demand in 10-year increments.

TABLE 7. Metro Southwest – Lazy B Supply and Demand Projection

Year	2020	2030	2040	2050	2060	2070
Projected Demand (AF)[1]	8	8	8	8	8	8
Supplies (AF)						
Groundwater[2]	1.5	1.5	1.5	1.5	1.5	1.5
Recycled Water Credits[3]	0	0	0	0		0
CAP M&I Credits[4]	6.5	6.5	6.5	6.5	6.5	6.5
Total Supplies (AF)	8	8	8	8	8	8

[1] Service area is fully built out, and demand is assumed to remain steady through 2070.
[2] Groundwater is assumed to be only backup supply if CAP Wheeling is unavailable.
[3] Service area is not connected to public sewer system, so effluent use is not feasible.
[4] Assumes Metro Southwest – Lazy B purchases CAP M&I credits from Metro Main recovered through the CAP Wheeling Agreement with City of Tucson.

Groundwater

Groundwater is currently the backup supply for the Lazy B service area located in south Avra Valley. Depth to groundwater in the service area is about 364 feet below land surface (ft bls). The aquifer is about 600 feet thick and water levels have risen since the start of recharge operations in Avra Valley. Water levels in the service area well have risen between 11 and 14 feet per year in the past five years. The service area is fully built out and the highest historic water demand is 8 AF per year.

The Lazy B service area has only one well. The well is an exempt well, so it has production cap of 35 gallons per minute. The well is capable of meeting the full water demand of 8 AF; however, the well has an arsenic removal treatment system that in necessary for meeting drinking water standards.

Renewable Water

- *Credit Purchase from Metro Main*

With only one water source that requires an arsenic removal treatment system, the District also uses water wheeled by Tucson Water. The Lazy B service area purchases CAP credits from Metro

Main that are stored at SAVSARP with Metro Main's M&I CAP Water allocation. Approximately 7 AF of credits are purchased each year and has the recovered CAP water is wheeled through Tucson Water's system. Metro Main will ensure there are sufficient CAP credits stored at SAVSARP to be recovered and wheeled to the service area.

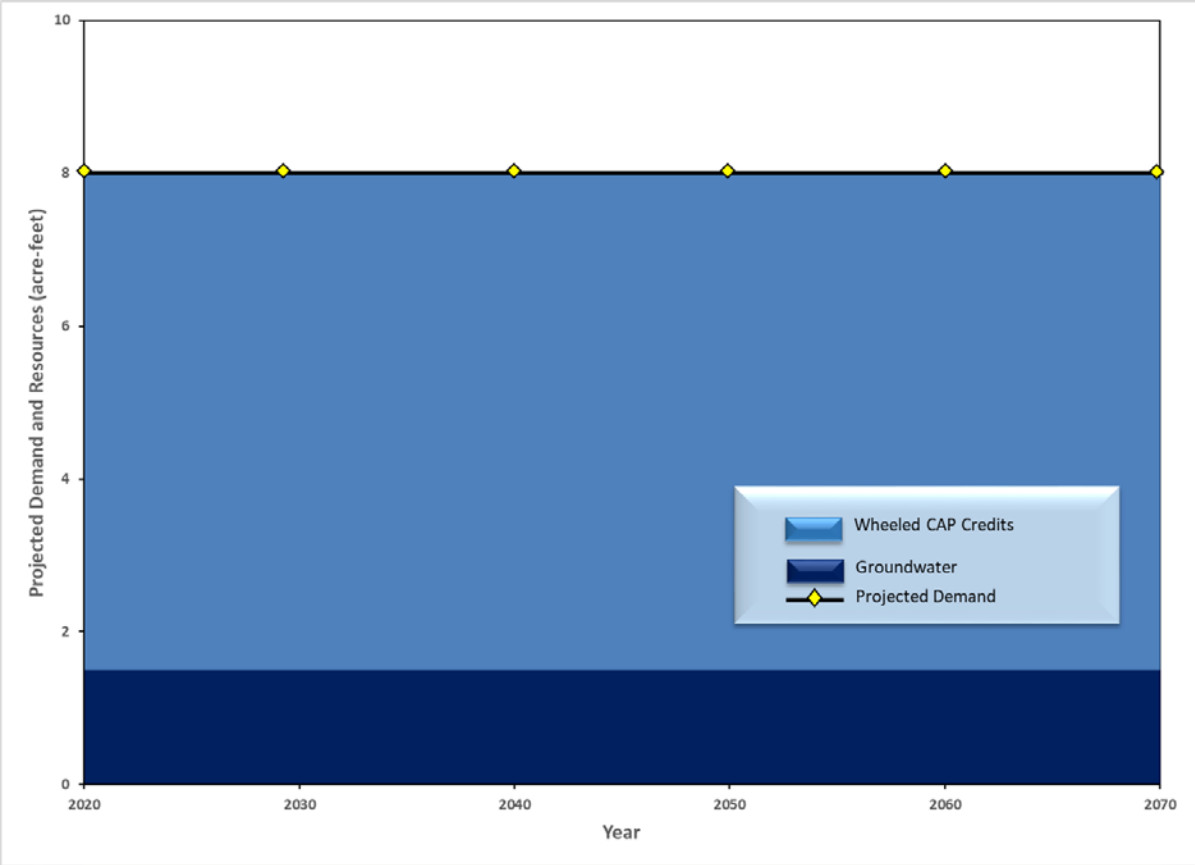

Figure 6. Metro Southwest – Lazy B Projected Demand and Water Resources Utilization.

Metro West

Metro West has a DAWS and will rely on recycled water resources to meet demands when development begins. Table 8 and Figure 7 illustrate the projected demand and the water resources used to meet them.

TABLE 8. Metro West Supply and Demand Projection

Year	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Projected Demand (AF)[1]	0	47	51	60	66	75
Supplies (AF)						
Recycled Water Credits[2]	0	47	51	60	66	75
CAP M&I Credits[3]	0	0	0	0	0	0
Available Supplies (AF)	0	47	51	60	66	75

[1] Service area construction estimated to begin in 2030.

[2] Assumes effluent IGA executed with Town of Marana consistent with Pima Association of Governments (PAG) 208 Plan and supply is 50% of demand, remaining demand met through effluent credits earned by Metro Main at LSCR Managed Effluent Recharge Project.

[3] Assumes District M&I CAP Water subcontract of 13,460 AF sufficient to meet both Metro Main and Metro West demands, if effluent credits not available.

Groundwater

Groundwater is the physical supply for the Metro West service area located in northern Avra Valley. Metro West has a DAWS and therefore groundwater used each year must be replenished with a renewable water resource. Depth to groundwater in the service area is about 210 feet below land surface (ft bls). The aquifer is greater than 2,000 feet thick. The service area is undeveloped and is not expected to develop in the near term.

The Metro West service area has no active wells, and future development will be responsible for financing the construction of all necessary infrastructure to meet water demands.

Renewable Water

- *M&I CAP Water Allocation*

Development is assumed to not occur in until 2030. If development did occur, Metro West can meet its ADWR's groundwater replenishment requirement for its DAWS through renewable water credits from storage of the District's M&I CAP Water. The supply is projected to be sufficient to meet the renewable water credit needs of both Metro Main and Metro West if recycled water credits are not sufficient.

- *Recycled Water*

An executed effluent agreement with the Town of Marana could provide some of the renewable supply needed to meet demand when the service area begins development. Stored recycled water at the Marana WRF Recharge Project could be used on an annual storage and recovery basis. For now, recycled water stored in the LSCR Managed Effluent Recharge Project by Metro Main will be used to meet the replenished groundwater demands.

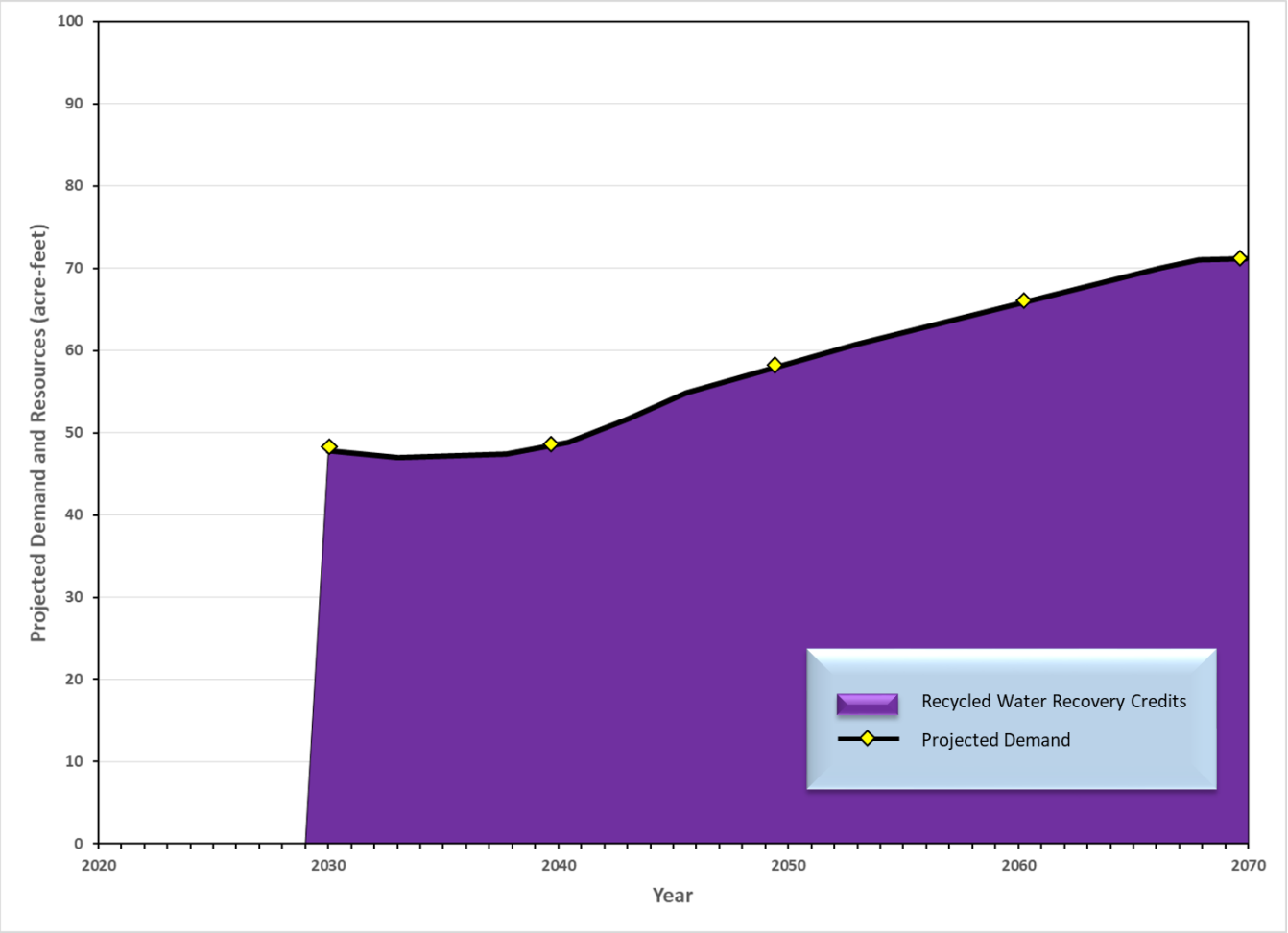

Figure 6. Metro West Projected Demand and Renewable Resources Utilization.

Drought Preparedness and Response Plan

Arizona is in the midst of a prolonged drought that has various impacts on our environment, specifically regarding water supplies in Southern Arizona. The drought does not immediately equate to water shortage; however, the District has been steadily working toward the use of renewable supplies rather than relying solely on our groundwater.

During the last ten years, the District has seen the decline in water levels at its Metro Main service area wells with an average of 1.2 feet per year. Even though there has been a marked decrease in per capita daily water use, the reduction in natural recharge occurring due to lack of precipitation has contributed to continued water level declines.

The ADWR requires that all water providers are to have a Drought Preparedness Plan. Due to drought conditions in the Colorado River Basin, there is a possibility that the District's CAP allocation could be reduced in the near future. No one knows how long the current drought might last. Climate change research is predicting a 20- to 30-year drought cycle. The continuing effects of climate change may even extend the length of current and future droughts; therefore, the District has updated its Drought Preparedness and Response Plan in order to respond to a reduction of our available water supply due to the current and future droughts.

The District's Drought Preparedness and Response Plan includes measures initiated based on the severity of the drought. Since the District is not a municipality with enforcement capabilities, it must rely on customers to voluntarily comply with requests for water reduction. The District can also implement a drought surcharge to its rates, and in the most severe drought response stage, not approve water service agreements for new construction beyond what can be supported by the District's current portfolio of water resources. The main focus of The District's Drought Preparedness and Response Plan is to continue the overall objective of sound water management. The District's Drought Preparedness and Response Plan includes four stages in response to the impacts of a drought on the District's available water supplies, which include Colorado River water delivered by the CAP canal, remediated groundwater, groundwater and effluent. The stage then determines which measures are initiated. The stages are determined on the combination of shortage levels and the annual decline of the overall groundwater levels in the District service areas.

Drought Response Stages and Response Measures

A **Stage 1 (Alert)** drought response will be declared by the District's Board of Directors, on the advice of the General Manager, when a Tier 1 shortage is declared in Lake Mead, which is when water levels are below 1,075 feet above sea level, AND the District wide average groundwater level declines are over 1.0 feet annually. Select response measures for this stage include:

- Increasing customer awareness about the drought and water resources through education.
- Working with Pima County to put ordinances in place that strengthen Southern Arizona's conservation ethic.

- Working with its neighboring water providers to look at cooperative efforts that include providing emergency interconnects and joint conservation efforts.
- Finally, the District continuing its overall water management efforts to use renewable water supplies.

A **Stage 2 (Warning)** drought response also will be declared by the District's Board of Directors, on the advice of the General Manager, when a Tier 2a shortage is declared in Lake Mead, which is when water levels fall below 1,050 feet above sea level, AND the District wide average groundwater level declines are over 2.0 feet annually. Select response measures for this stage include:

- A continuation of all Stage 1 actions.
- Requesting that customers limit landscape irrigation to between 8:00 p.m. and 8:00 a.m. as well as avoid other outdoor water uses; for example, hosing down walkways and washing vehicles without a bucket and hose with a positive cutoff nozzle.
- Asking Hotels and restaurants to initiate industry green measures for conserving water, such as providing water only on request and washing sheets and towels only if requested.

A **Stage 3 (Emergency)** drought response will be declared by the District's Board of Directors, upon the recommendation of the General Manager, when a Tier 2b shortage is declared in Lake Mead, which is when water levels fall below 1,045 feet above sea level, AND the District wide average groundwater level declines are over 3.0 feet annually. Select response measures for this stage include:

- A continuation of all previous actions under Stages 1 and 2.
- The District's Board of Directors considering instituting a drought surcharge to Tier 4 of the rate structure.
- Asking customers to not to empty or fill their pools and to avoid outdoor water uses.

A **Stage 4 (Crisis)** drought response will be declared by the District's Board of Directors, upon the recommendation of the General Manager, when a Tier 3 shortage is declared in Lake Mead, which is when water levels fall below 1,025 feet above sea level, or the volume of water delivered by the Central Arizona Project to the District is less than annual potable demand, AND the District wide average groundwater level declines are over 4.0 feet annually. Select response measures for this stage include:

- A continuation of Stages 1, 2, and 3 response actions.
- The District's Board of Directors considering instituting a drought surcharge to Tier 3 of the rate structure in addition to the surcharge for Tier 4.
- Requesting that Customers limit landscape irrigation ONLY to trees and shrubs between 8:00 p.m. and 8:00 a.m. and no irrigation of turf or ground covers.