



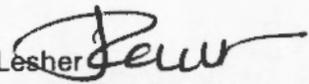
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# MEMORANDUM

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Date: March 30, 2022

To: The Honorable Chair and Members  
Pima County Board of Supervisors

From: Jan Leshner   
Acting County Administrator

Re: **Water Resources Status and Management Options**

With climate change exacerbating pressures on both water demand and supplies, it is timely for the Board to receive an update on options at its disposal to manage water resources.

The attached report, led by Water Policy Manager Kathy Chavez, outlines the current County water resources environment and provides a general overview of regulatory, advisory and project context and options. This will be followed up with additional communications outlining more targeted strategies for the Board's consideration.

Please let me know if you have any questions.

#### Attachment

c: Carmine DeBonis, Jr., Deputy County Administrator for Public Works  
Francisco García, MD, MPH, Deputy County Administrator & Chief Medical Officer,  
Health and Community Services  
Yves Khawam, PhD, Assistant County Administrator for Public Works  
Linda Mayro, Director, Office of Sustainability and Conservation  
Suzanne Shields, Director, Regional Flood Control District  
Jackson Jenkins, Director, Regional Wastewater Reclamation  
Carla Blackwell, Director, Development Services  
Kathy Chavez, Water Policy Manager, Office of Sustainability and Conservation



## Water Resource Options for Pima County April 2022

Pima County and Arizona, in general, is characteristic of the arid West where warm temperatures and low precipitation are the norm. Vegetation, wildlife and to some extent, civilization has adapted to these arid conditions.

In the last fifty years, especially the last two decades, Pima County has experienced extreme weather events, record warm temperature, below average precipitation, wildfires and persistent drought conditions. Increasing global fossil fuel emissions are projected to cause warmer temperatures, seasonal shifts in precipitation and decreased streamflow in eastern Pima County.<sup>1</sup> In spite of this, long term water planning, investment in water resource infrastructure, and the Arizona Department of Water Resources' periodic review of municipal water providers' assured water supply designations have enabled Pima County to continue to grow, while maintaining reliable water service.

This paper presents potential strategies to help Pima County adapt to changing climate conditions and water scarcity. Four areas where Pima County has authority to implement changes include regulatory strategies, incentives, leading by example, and infrastructure investment. The goals of these strategies are to adapt to decreased rainfall and sustained drought, mitigate effects of climate change, narrow the hydrologic gap between where water is stored and where it is recovered, reduce the need for imported water, and augment supplies with reclaimed water.

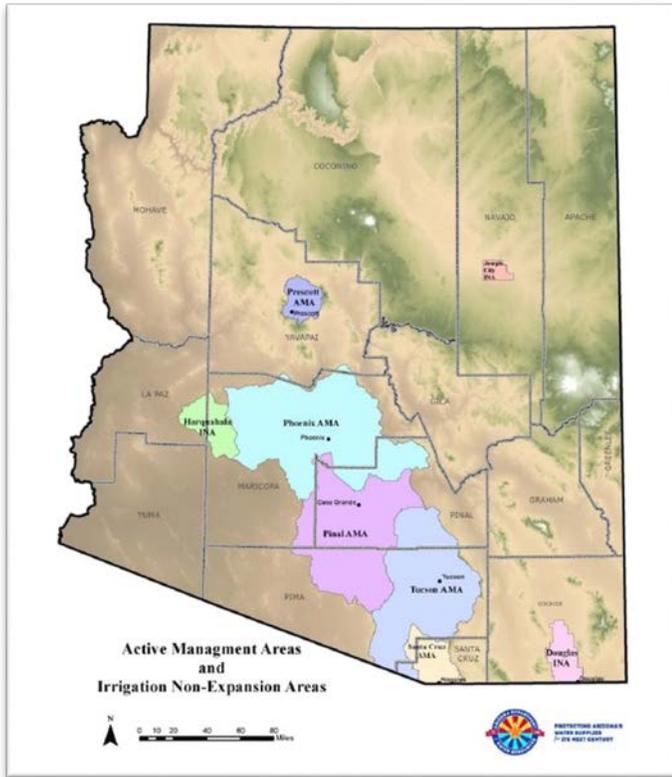
1. [Regulatory Strategies](#)
2. [Incentives and Rebate Strategies](#)
3. [Leading by Example](#)
4. [Water Infrastructure Investment](#)
5. [Advantages and Limitations](#)
6. [Initial Options for Consideration](#)

### Introduction

As a subdivision of the state, Pima County statutory authorization is described in Arizona Revised Statutes, Title 11. As a result, adaptation strategies must be within the bounds of the county's statutory authority or require legislative amendments. The Pima County Regional Wastewater Reclamation Department has statutory authority, the only county in the state, to operate a regional wastewater system under ARS 11-264. The Regional Flood Control District has statutory authority to construct, operate and maintain artificial groundwater recharge facilities having flood control benefits under ARS 48-3603.C.17. Pima County also has land use authority under ARS 11, Chapter 6.

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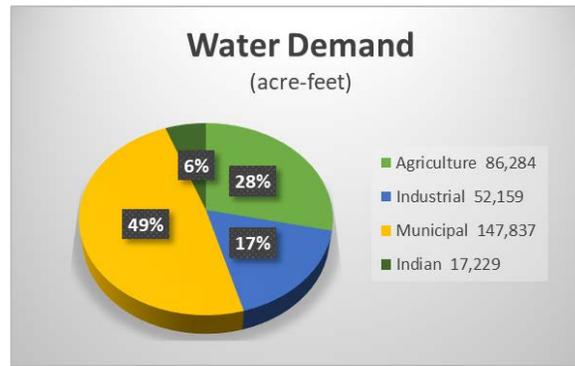
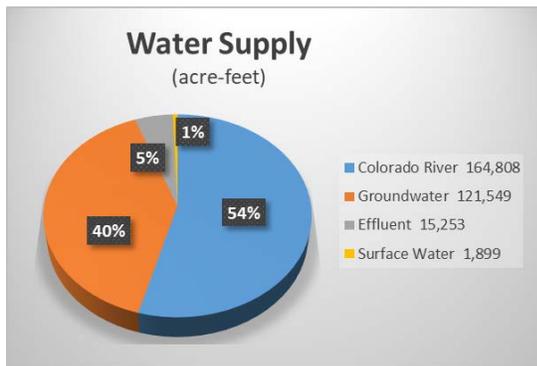
<sup>1</sup> *Hydroclimate Analysis Lower Santa Cruz River Basin Study*, Technical Memorandum No ENV-2020-056, Lindsay Bearup, PhD, PE, US Bureau of Reclamation, February 2021



Much of Pima County’s population and water use is concentrated in eastern Pima County. When Arizona’s Groundwater Management Act<sup>2</sup> was adopted in 1980, it established active management areas, heavily reliant on groundwater. These areas are subject to groundwater pumping regulation and reporting requirements to the Arizona Department of Water Resources (ADWR). The Tucson Active Management Area (TAMA) includes eastern Pima County and portions of Pinal and Santa Cruz counties (see Figure 1). The goal for the Tucson Active Management Area is to achieve safe yield by 2025. Safe yield is achieved when no more groundwater is withdrawn as is replenished annually. TAMA has achieved safe yield intermittently since 2010 and strives to remain in safe yield.

ADWR maintains data on water supply and demand for each of the active management areas.<sup>3</sup> Water supply in the TAMA is provided by Colorado River water (54%), groundwater (40%),

effluent or recycled water (15%) and surface water (1%). Water demand is 49% for municipal uses, 28% for agriculture, 17% for industrial purposes and 6% for Indian uses.



Although the TAMA does not mirror Pima County precisely, it can be agreed that about half of the water demand in Pima County can be attributed to the municipal sector and reductions in municipal water demand can improve the county’s resiliency in the face of water scarcity from drought and a warming climate. Pima County maintains no water regulatory authority on agriculture. Furthermore, development trends project some agricultural lands will convert to municipal uses in the future. Thus, this paper’s focus is on regulatory strategies to reduce municipal water demand.

<sup>2</sup> Ariz. Rev. Stat. Ann. SS 45-401 et seq

<sup>3</sup> Arizona Department of Water Resources [AMA Annual Supply and Demand Dashboard](#), data for 2019.

## 1. Regulatory Strategies

Comprehensive Plan Policies. Pima County's land use authority to develop and implement comprehensive plan policies, zoning codes, and issue building permits extends to unincorporated areas of the county. The Development Services Department enforces the zoning code and manages processes affecting how Pima County will grow. By statute, county comprehensive plans include a water resource element. Concurrent plan amendment and rezoning requests on property greater than one acre requires site analysis that addresses water supply. Comprehensive plan policies within [Pima Prospers](#) that support improved water management include:

- 3.2 Focused Development Investment Area Element policies amended to prioritize and incentivize reuse of land and infill, urban forms that help provide efficient use of water resources.
- 3.4 Environmental element requires conservation of lands depending on the CLS category and guidelines that apply to that location. This chapter focuses on the preservation and conservation of habitat. The element also requires water harvesting and drought management policies.
- 3.5 Housing element requiring water harvesting and water efficient Green Building techniques.
- 4.2 Water Resources element (statutorily mandated) provides an analysis of water use, and has specific goals that promote responsible water management. Goals include promotion of the use of effluent, continue the practice of preliminary integrated water management plans, explore new water supplies, recognize that water suppliers are key to water availability.

These policies are only applicable when a zoning change is requested by a developer. Lands developed under existing zoning are not subject to these policies.

Zoning Code. Pima County's zoning requirements, embodied in Title 18 of the county code, contain several water conservation requirements for new development, including drought tolerant landscaping, prohibition on new golf courses dependent on groundwater, preparation of preliminary integrated water management plans for significant rezoning cases and conservation of lands to protect priority biological resources. Water management within the zoning code applies to new development whereas a greater emphasis on improving water conservation in existing housing would have a larger impact on current water use. According to Tucson Water, 30% of the residential water demand is for outdoor use.

Amendments to the zoning code strengthening water use efficiencies would require monitoring and staff resources to confirm compliance. Compliance is enforced through staff with Department of Environmental Quality. Amendments applicable only to new development could include:

- Prohibit decorative turf landscaping on public and private property, currently prohibited if a landscape plan has been submitted. Regulatory compliance and enforcement would be needed
- Permit turf only on schools and parks
- Require more shade trees irrigated with harvested rainwater from paved parking areas from commercial and industrial uses
- Require solar covered parking for new commercial development
- Require more shade in general and trees to cool down the environment
- Restrict swimming pool size on apartment and resort properties. Depending on wind and outside temperature, a pool can evaporate as much as 8.5 feet of water annually<sup>4</sup>
- A net blue ordinance that would require new development to offset increased water demand by funding and installing water conservation fixtures, such as low flow toilets, in existing housing. This would require staff to monitor, inspect and confirm compliance.

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<sup>4</sup> [Arizona Monthly Average Pan Evaporation Rate.png \(patagoniaalliance.org\)](#)

The Regional Flood Control District is working on an ordinance that requires rainwater harvesting for new residential and commercial development including rainwater captured at first flush water. Offering rebates for existing development could incentivize retroactive installation of water conservation strategies.

Economic Development Incentives. Pima County believes companies want to grow in communities that have excellent quality of life and that make investments in critical infrastructure that are the foundation for commerce as reflected in Pima County’s 2019 [Economic Development Plan](#). One emerging practice is a non-residential determination of water use to guide economic development. Several Phoenix-area cities have established tiers of water usage to guide economic development targets. The objective is to attract industry and commerce that balances water use with jobs, capital investment and community tradeoffs. Although Pima County cannot establish water budgets for new commercial/industrial development, it can set parameters for the types of industry and commerce it wants to encourage. These guidelines could be incorporated into Pima County’s Economic Development Plan, integrated into the Comprehensive Plan and/or codified by ordinance. Conceptual examples of tiered water use guidelines could be:

- Tier One: Establish a baseline water use acceptable without conditions. It could be an estimated water demand or water demand calculated using square foot of building
- Tier Two: For companies exceeding the Tier One baseline, assess:
  - the amount of water returned to the sanitary sewer or amount of water recycled
  - number of jobs and capital impact to the county, in addition to estimated water demand
  - compatibility with existing infrastructure in the area, infrastructure upgrades needed or service delivery with lower income areas
  - calculation of long term prospects and usage to determine service capacity over a period of time
- Tier Three: Companies not qualifying for Tier Two would not receive development incentives, charged a higher rates or receive no discounts. Most companies would avoid this tier.

Coordination with private water providers and other jurisdictions in Pima County would be needed.

Permit Restrictions and Limitations on Growth. State statutes require developers to demonstrate an assured water supply before subdivision plats in active management areas are recorded<sup>5</sup>. The water provider serving the development must apply for and receive a designation of assured water supply from Arizona Department of Water Resources (ADWR) by meeting seven criteria: physical water availability, continuous water availability, legal water availability, water quality, financial capability, consistency with the management plan, and consistency with the management goal for the active management area.<sup>6</sup> ADWR reviews the designation every ten years or when a significant change is made to the water service area. If a water provider is unable to meet one of these criteria, for example compromised physical availability of groundwater or critical shortages of Colorado River water deliveries to the water provider, ADWR can revoke the designation and Pima County must withhold plat approvals. Alternately, a subdivision can apply to ADWR for a certificate of assured water supply using the seven criteria described above. ADWR can revoke the certificate if the criteria can no longer be met.

State statutes also set standards for counties on land development moratoriums due to a lack of essential public facilities.<sup>7</sup> Water resources provided by a county or water utility fits the definition public facilities,

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<sup>5</sup> ARS 11-822.A

<sup>6</sup> AAC R12-15 Article 7

<sup>7</sup> ARS 11-833

but excludes private wells. The standards include justification, public notification and a public hearing and the justification must meet several criteria under the statute:

- For the TAMA, must prove no assured water supply can be provided. As stated above, new subdivision plats cannot be approved without an assured water supply
- The moratorium must be limited only to the shortage area and on property with no development approvals
- Demonstration that the housing and economic development needs of the area have been accommodated

A moratorium can only be in effect for 120 days without additional public hearings and progress on resolving the lack of public facilities. Under current state statute, a growth moratorium due to water shortages, would be legally challenging to implement.

Building and Plumbing Code. Pima County's building and plumbing code, also implemented by the Development Services Department, safeguards public health, safety and general welfare. The International Plumbing Code is adopted into Pima County's code by reference and requires water efficient fixtures, including waterless urinals in new construction since 2010.

More challenging, however, is retrofit of existing homes. There are an estimated 140,000 residential housing units in unincorporated Pima County. Upgrading to water efficient plumbing fixtures in older homes is typically included in renovations, but identifying and mandating existing homes with outdated water fixtures is difficult and there is no regulatory framework to require upgrades. Installing water efficient plumbing has more frequently been encouraged using voluntary rebates and incentives.

Rainwater Harvesting and Graywater. Monitoring and compliance is one of the greatest challenges in ensuring regulatory strategies are effective. In 2010, the City of Tucson implemented a commercial rainwater harvesting ordinance. Reports commissioned by the city in 2018 and 2020 found many sites did not match the approved harvesting plan. To assess ordinance compliance for outdoor/landscape water usage, irrigation meters (either private or city-owned) were required, but not necessarily tracked. Annual reporting required by the ordinance was also lacking.<sup>8</sup> City staff made a number of recommendations for increased ordinance monitoring and notification.

Pre-plumbed gray water systems have also had mixed results. Gray water systems capture water from hand washing sinks, showers, bathtubs and clothes washing machines for use in outdoor landscape irrigation. In 2010 the City of Tucson instituted a gray water ordinance requiring new housing to include a gray water stub out. A 2021 survey found few residents were using the gray water feature and were unfamiliar on how to use it. The City of Tucson also offers a rebate of up to \$1,000 to offset qualifying costs, but has had low participation. Large-scale graywater systems could have an impact on sewer operations and would require evaluation from the Regional Wastewater Reclamation Department.

Drought Response Plan and Water Wasting Ordinance. Pima County implemented a drought management and water wasting ordinance in 2007, updated in 2014. Enforcement and restrictions were determined with input from a stakeholder committee process. Currently declared at Drought Stage 1, conservation is voluntary. The Local Drought Impact Group, established under Pima County Code 8.70, can recommend

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<sup>8</sup> City of Tucson Mayor & Council Memorandum, *Commercial Rainwater Harvesting Ordinance Review*, November 9, 2021

to the County Administrator and with the Board of Supervisors' approval, an increase to the drought stage severity. Additional possible actions under an increased drought stages include:

- Declaration of Drought Stage 2, which consists of restricted irrigation hours, prohibitions on outdoor misters, public fountains and water features, car washing (except with bucket and shut-off nozzle), charity car washes (except at commercial car washes that recycle water), prohibition on turf over seeding (unless irrigation by rainwater), and restaurants to provide water only on request.
- Declaration of Drought Stage 3 including the above measures, plus no filling newly constructed residential pools, no car washing unless equipped with water recirculation system, pools topped off only to maintain water level
- Declaration of Drought Stage 4 consisting of the previous measures, plus landscape irrigation of only shrubs and trees, no filling pools, car washing only if water used is captured by a rainwater harvesting system, no water used to clean parking lots or streets and no potable water in construction.
- Increased enforcement of the water wasting provisions requiring additional enforcement staff
- Increased messaging and public education to encourage residents to conserve water, suggest water-saving tips, and promote desert-type xeriscape landscaping or water-efficient gardening.

Pima County's drought ordinance includes water wasting enforcement provisions and penalties and is enforced by the Health Department. Increased drought restrictions would require additional compliance monitoring and enforcement, including staffing resources. Drought response actions were developed using stakeholder input and approved by the Board of Supervisors. Drought restrictions have typically consisted of short-term water reduction actions as a solution to a short-term water supply reduction to meet current water municipal water demand but may need to be revisited due to the long-term effects associated with climate change.

Although a shortage was declared for the Colorado River in 2022, the reduction will primarily affect agricultural users in Pinal County. No municipal water supplies will be reduced during the Tier One shortage. Further, many residents in Pima County do not receive Central Arizona Project water from Colorado River through their water provider. In spite of this, further Colorado River reductions could impact water providers in the future under a Tier Three shortage. Ongoing drought conditions can also affect groundwater recharge and groundwater levels. These are valid reasons to conserve water. Permanent water conservation measures are appropriate for prolonged drought.

Some water providers in Pima County have access to CAP water while others rely on groundwater. Each are affected by drought differently. Water providers retain the flexibility to move to more restrictive drought stages based on how drought affects them and their water supply decisions. Pima County's drought response plan establishes code enforcement for water providers in unincorporated Pima County.

## **2. Incentives and Rebate Strategies**

Because we live in the desert, water scarcity, low rainfall and warm temperatures have been factors in the area's water conservation ethic. Most residents are motivated to conserve water. Several programs create incentives to conserve water.

Rebates. Many water providers offer residential rebates for installation of water conservation measures. The City of Tucson offers rebates for high efficiency toilets (\$75), clothes washers (\$200), gray water (\$1,000) rainwater harvesting (up to \$2,000) as well as grants and toilet replacement for low income water customers and emergency plumbing repairs for qualified low income customers. Tucson water's rebate

program is funded with conservation fee funds providing about \$1.5 million annually to qualified water customers. These programs are available to Tucson Water customers in unincorporated Pima County, as well as customers within the city.

Area water providers, including Metro Water, Town of Oro Valley and others also offer rebates, landscape watering guidelines, water audits, low water use plant guidance and programs encouraging water use efficiency.

Pricing. One of the most effective water conservation measures is pricing. Most water providers have an increasing block rate structure, meaning higher water users pay a higher rate per unit of water and a higher water bill. Since Pima County is not a water provider, this strategy is best implemented by local water providers. Wastewater sewer user fees utilize winter water use in calculating sewer bills.

Turf Irrigation. In 1984, the City of Tucson's construction of the reclaimed system began a trend of golf courses irrigation with reclaimed water. Eighteen golf courses in Pima County use reclaimed water for irrigation. Three golf courses report using CAP water for irrigation. The remaining courses throughout Pima County hold type 2 grandfathered groundwater irrigation rights, including two in the City of Tucson. Of the twelve courses using groundwater, six are in the Green Valley area. Connection to Tucson Water's reclaimed system is possible when the reclaimed system is in close proximity and the golf course finds an economic incentive to convert to reclaimed water. Initially, golf courses receiving water service from Tucson Water were required to convert to reclaimed water. Reclaimed water rates, currently are \$2.13 per hundred cubic feet, while the potable, residential water rate charged by Tucson is \$2.07 per hundred cubic feet. With a groundwater right, irrigation costs are much cheaper, limited to the power cost to pump groundwater. For existing golf courses with a groundwater right, there is little incentive and no regulatory mandate to convert to reclaimed water. New golf courses in unincorporated Pima County, however, are required under the county's zoning code to use renewable water, either reclaimed water or CAP water. The Arizona Department of Water Resources calculates the golf courses in Arizona make up only two percent of the state's water demand.

Consistent with Pima County's Sustainable Action Plan for County Operations (SAPCO) FY 2018-25, many of Pima County's recreational turf facilities are connected to the reclaimed system. These include Brandi Fenton Memorial Park, Rillito Regional Park, George Mehl Foothills Park and Kino Sports Complex and other smaller, local parks. Crooked Tree Golf Course, owned by Pima County, is also irrigated with reclaimed water. Mike Jacobs Sports Park receives reclaimed water directly from the Tres Rios Wastewater Reclamation Facility. Parks that use groundwater, do so because reclaimed water is not available and the distance to renewable water makes it cost prohibitive.

High Water Use Customers. Residents and businesses that are motivated to improve water efficiency can conduct a water audit to identify opportunities for water savings. Under the City of Tucson's drought response plan, Tucson Water is planning to develop water use guidelines, provide water audit assistance and ultimately water restrictions for customers within their water service area that are failing to decrease water use during more severe CAP shortages. Since Pima County is not a water provider, it cannot regulate water service conditions. It can, however, provide funding for water audits, assistance for landscape retrofitting and financial assistance to replace high water use plumbing fixtures.

Long term storage credit bank Since 2003 Pima County has been storing effluent at underground storage facilities and has accrued over 26,000 acre-feet of long term storage credits. Credits can be sold and used anywhere in the Tucson Active Management Area. A potential use could be to retire the credits as a

contribution to aquifer health, sell credits where groundwater levels would not be adversely impacted or hold them until the market is more favorable and as a long term backup supply, in Tier 3 shortage or worse. County policy for how its credits are used is not fully addressed in Board Policy 54.9. They represent stored water added to the aquifer and not considered groundwater. Where this stored water is recovered should consider aquifer levels and groundwater quality. Recovery sites that withdraw Pima County's stored effluent could be prohibited in areas of declining groundwater levels and subsidence-prone areas and to improve hydrologic connectivity.

Public Education and Awareness. The Arizona Department of Water Resources requires large water providers in the Tucson Active Management Area to implement municipal water conservation programs and best management practices. Accordingly, Tucson Water, with over 280,000 customers throughout Pima County, has a comprehensive water conservation program. Other water providers also implement water conservation programs with assistance of the Water Conservation Alliance of Southern Arizona, WaterCASA.

Pima County could augment public education and awareness through a coordinated, regional strategy with water providers to keep residents educated on water issues and conservation efforts. Additional partnerships with water experts, such as the University of Arizona's Water Resources Research Center, Pima County Cooperative Extension, Sonoran Institute, Kyl Center for Water Policy and others help to inform and educate our citizens on water issues.

Engaged public officials also support water and energy conservation efforts. Water issues can be complex, but affect all our citizens. Water policy leadership, approval for water infrastructure funding, and adequate operating budgets support water resource and infrastructure investment to protect our environment, improve resiliency, and sustain economic vitality.

### **3. Leading by Example**

One area where Pima County has potential to make a positive impact is in the efficient operation of its facilities and county operations. As described in the Pima County Sustainable Action Plan for County Operation FY 2018-25 (SAPCO), targets and goals are established for five areas; carbon, water, landscapes, materials, and workforce.

County Water Consumption. SAPCO's target for water is to reduce potable water use across all county facilities by 15 percent each year. In the baseline year, FY2018-19 county facilities were using 99 gallons of potable water per square-foot of office space. In FY2020-21, however, water use increased to 144 gallons per square-foot. SAPCO's goal is to use 64 gallons per square-foot by 2025, so there are many opportunities to improve Pima County's potable and irrigation water consumption:

- Conduct water audits of county facilities to identify where the largest water demand is occurring and where investment of water efficient improvements will result in the most water and cost savings;
- Install water sub meters on county facilities to differentiate between indoor consumption and outdoor irrigation use and target where efficient water savings efforts are needed. This will help determine where to invest in improvements;
- Replace HVAC systems with energy and water efficient HVAC. Cooling towers for county office buildings use large quantities of water and improving efficiency would reduce water use;
- Secure funding to install water efficient plumbing retrofits;
  - Replace 1.6 gallon toilets with 0.8 gallon toilets
  - Add water conservation aerator filters on faucets

- Install motion sensor faucets
- Install waterless urinals
- Construct stormwater planters to eliminate irrigation;
- Secure funding to upgrade and improve irrigation efficiency on county parks.

County Energy Consumption. The water/energy nexus refers to the interdependence of water and energy. Production of energy requires water and development and delivery of water requires energy. Thus, saving water saves energy and saving energy saves water. Accordingly, there is an imbedded water savings in reducing energy consumption.

SAPCO’s target to reduce carbon emissions is linked to energy use because most of our energy is produced by carbon-emitting fossil fuel power plants. Ninety-one percent of Pima County’s carbon emissions are produced by two sources; wastewater treatment operations (45%) and building and facilities (46%). SAPCO’s 2025 mandated target is to reduce its emissions to 78,832 MTCO<sub>2</sub>e, while its aspirational target is to reduce carbon emissions by 50% by 2025, or to decrease from 94,041 MT CO<sub>2</sub>e<sup>9</sup> in the base year FY2018-19 to 46,978 MTCO<sub>2</sub>e by 2025. Last year the Regional Wastewater Reclamation Department began delivering 552,000 cubic feet of biogas, a byproduct of the wastewater treatment process, to Southwest Gas for delivery to its customers as a renewable fuel source

As described in the December 21,2022 memorandum to the Board of Supervisors, staff is preparing a report identifying challenges and necessary changes to fulfill SAPCO’s goals.

Landscape and Turf Management. Pima County’s outdoor facilities add a vital dimension through its many recreational amenities enriching our outdoor lifestyle. Landscape and sports fields support healthy lifestyles for everyone. Improvements to irrigated areas can improve water efficiency, whether irrigated by potable water or reclaimed water.

Pima County’s Natural Resources, Parks and Recreation Department, the Stadium District and Tourism and Attractions operate and maintain over 50 parks, many with turf for recreation and sports. Some are large regional parks, urban parks and others are smaller local parks serving rural areas.

Best practices for ballfield maintenance. Maintenance strategies employed by staff include:

- Soil sampling every two years to identify amendment needs to improve the organic substrate and eradicate the non-desired invasive weeds and grasses, thereby, reducing water consumption, improving percolation, strengthening the root system, and promote a healthy color;
- Dethatching to remove the barrier (primarily clippings of grass stems, stolons and surfaced rhizomes) that deprive the root system of air, water/percolation and nutrients. This layer promotes insect infestations and diseases when an abundance of thatch material is present;
- Application of growth regulators on turf to reduce the need for water consumption;
- Aeration to add air/oxygen to the root base and soften compacted playing surface;
- Periods of rest to promote restoration and prevent turf degradation and/or structural damage;
- Artificial turf, where appropriate. There are currently no fields using artificial turf in the county parks system. Artificial turf is currently used as an aesthetic feature, for example at the Brandi Fenton Memorial Park clubhouse and Pima County Historic Courthouse

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<sup>9</sup> Metric tons of carbon dioxide emission

Best practices for maintenance and repair. Parks staff also implement irrigation best practices for maintaining and repairing existing systems. These include:

- Replace sprinkler heads, address spacing, split valves to increase pressure/coverage, repair leaks, conduct backflow testing, upgrade systems and materials when needed.
- Maintain a standard operating procedure for irrigation/clock schedule per season to prevent overwatering
- Aging infrastructure methodically addressed as budgetary and personnel resources are available
- Reclaim water is used where available

Pima County's parks provide recreational, green spaces for the public to enjoy, improving our quality of life and supporting healthy activities. The best practices described above are a public-facing example of how Pima County leads by example.

Drought tolerant turf. Many recreational turf and golf facilities in Southern Arizona use Bermuda grass because it tolerates high temperatures well. When the weather cools in the fall, Bermuda becomes dormant appearing dry and yellow. To maintain green turf during winter months, many facilities reseed with a winter rye variety. This practice requires high water use to keep the germinating seed moist, typically during late September and October. The Karsten Turfgrass Research Facility at the University of Arizona conducts research on turf grass science. Research on turf varieties that tolerate heat as well as cooler temperatures could eliminate over seeding and high water use in the fall. Drought tolerant grasses such as TifTuf™ Bermuda grass on future park projects should also be considered. It uses less water, stays green longer and tolerates drought.

Turf Replacement. Indoor water use is commonly discharged to a regional wastewater reclamation facility where it can be treated for reuse or groundwater replenishment. Irrigation for turf, however, is a consumptive use where water is removed from the recycling system.

Strategies that reduce turf irrigation, such as prohibition of ornamental turf, allow limited water supplies to be used elsewhere. Several sport fields in Tucson have replaced irrigated turf with artificial turf that requires no irrigation. A few examples are Tucson High School, Salpointe Catholic High School and the University of Arizona's football field. Artificial turf requires minimal maintenance, no pesticides or fertilizer, requires no water, reduces injuries and is durable. Disadvantages are it contains hazardous chemicals which may cause toxic runoff (although natural turf uses chemical fertilizers and pesticides). Failure to clean artificial turf can promote harmful bacteria. Some artificial turf products can contain lead and zinc. Artificial turf has heat-absorbing properties, making it unusable during warm weather when not shaded. Large shade canopies, however, could be used to keep turf cool and capture rainwater for landscape shrubs and artificial turf rinsing.

#### **4. Water Infrastructure Investment**

Local government is a key provider of domestic water resource management through its ability to develop and construct regional water and wastewater infrastructure. In Pima County, municipal utilities develop, transport and deliver water to over one million residents. Pima County collects, treats and reuses over 60 million gallons of sewage every day. When long term planning determines a water supply/demand deficit, one strategy is to employ demand management, such as conservation, to close the supply/demand deficit. Recognizing that conservation may not meet all the projected water supply/demand shortfall, another strategy is water augmentation that imports new supplies. Because of the long lead time to assess, design, fund and construct, water augmentation strategies are planned years, or decades, before they are needed.

Desalination. Many areas have augmented their water supply using ocean desalination. 177 countries worldwide operate over 16,000 desalination plants for drinking water, agriculture, industry, manufacturing, and tourism.<sup>10</sup>

Israel, located in the arid Middle East, relies on reclaimed water and desalination for over half of its water supply. First pioneered in 2007, today Israel operates five desalination plants treating approximately 405,000 acre-feet (500 million m<sup>3</sup>) per year using reverse osmosis.

Australia, one of the world's driest continents, classifies 70% of its land as arid or semi-arid. Following a 12-year drought that began in 1997, Australia began building seawater desalination treatment plants. Today, there are over 30 reverse osmosis water treatment plants in Australia. Many are using wind or solar power to reduce energy costs.

In 2015, the City of San Diego commenced operation of the Carlsbad Desalination Project treating 56,000 acre-feet annually of ocean seawater at the Pacific Ocean at a construction cost of \$922 million. San Diego is using desalination to augment its water supply and improve drought resiliency. With the Bureau of Reclamation's shortage declaration on the Colorado River effective 2022 and water levels at both Lake Mead and Lake Powell continuing to decline, consideration for augmenting water supplies in Arizona has accelerated.

The Governor's Water Augmentation, Innovation and Conservation Council, created in 2019, was established to advise the Governor on sustainable water supplies for Arizona's future comprised of four committees, including desalination and long term water augmentation. The desalination committee has examined treating brackish water from within the state and ocean desalination that would increase delivery or exchange of Colorado River water. The long term water augmentation committee has discussed potential strategies including forest management and weather modification. The Governor has proposed creation of an Arizona Water Authority to develop new water supplies, construct infrastructure and finance water augmentation, conservation and reuse project. The proposed authority requires legislative approval.

In 2020, the International Water and Boundary Commission authorized a binational desalination study<sup>11</sup>, developing conceptual estimates to treat and deliver ocean water to Los Morelos Dam through a 285-mile pipeline. The treated water would be delivered at the border to Mexico in exchange for an equal amount of Colorado River delivered to Arizona. The report concludes desalination of ocean seawater of 50,000 to 200,000 acre-feet can provide a significant part of an overall water supply solution improving resiliency in the Colorado River Basin.

Using these design concepts, Pima County, in 2021, evaluated a planning scenario to treat 100,000 acre-feet of ocean water at Puerto Libertad in Mexico, for direct delivery to Pima County through a 196-mile pipeline.<sup>12</sup> Treated water would augment municipal water supplies in lieu of pumped groundwater and reductions in Colorado River water deliveries. Pima County's concept delivers wet water to the region in

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<sup>10</sup> *The state of desalination and brine production.* Jones, Edward, et.al. Science of the Total Environment. 2013

<sup>11</sup> *Binational Study of Water Desalination Opportunities in the Sea of Cortez* TM1: Water Supply Availability and Demand Analysis, Minute 323 Desalination Work Group, Black & Veatch, Libra, April 2020

<sup>12</sup> [Memorandum to Board of Supervisors, Water Resources Management of the Lower Santa Cruz River Basin and Augmenting Pima County Water Supply from the Sea of Cortez, July 27, 2021.](#)

lieu of Colorado River water, which remains vulnerable to shortages due to climate change and reduced downstream flows that could impact aquatic habitat in the Colorado River.

Another desalination augmentation strategy involves treating brackish, or high-salinity groundwater. Brackish groundwater areas exist in Arizona. Salinity concentrations are typically lower than ocean water and require less delivery infrastructure. Brackish groundwater areas with desalination potential include the West Salt River Valley, Gila Bend Basin, Lower Santa Cruz, Little Colorado River, and Willcox Basin.<sup>13</sup>

Direct Potable Reuse. Once considered a water supply of last resort, direct potable reuse is gaining favorable public acceptance as a viable water augmentation supply. Direct potable reuse involves advanced treatment and distribution of recycled water without underground storage to augment potable water supply. Under the relevant environmental and water resource regulatory structure, potable reuse could be used to augment water supply.

Over 64,000 acre-feet of recycled water is produced annually in the regional and expected to increase in proportion to population. About 20,000 acre-feet is applied to direct reuse for landscape and turf irrigation. Of the remaining 44,000 acre-feet about 14,000 acre-feet leaves the region as measured at Trico Road and the Santa Cruz River. Up to 44,000 acre-feet per year could potentially be available for direct potable reuse.

Indirect potable reuse has been within the existing regulatory framework for some time. The Arizona Department of Water Resources permits effluent recharge facilities to store recycled water underground and recover it at a later date anywhere in the Tucson active management area. Local entities have stored about 1.8 million acre-feet of water (CAP and effluent) in the Tucson Active Management Area that can be recovered (pumped from the ground) consistent with state rules.

Regional Stormwater Harvesting. Pima County and its Regional Flood Control District recognize the value of using stormwater to improve drought resilience and reduce potable water demand.<sup>14</sup> The Regional Flood Control District has implemented policies and green infrastructure through:

- Existing urban areas
- Prioritizing watersheds
- Locating basins
- Retrofitting existing infrastructure
- Decentralizing retention
- Implementing regulations within Pima Prospers in growth areas and new development
- Coordinating master planning in economic development areas to maximize beneficial use of stormwater
- Improve recharge along our regional watercourses

Other potential water augmentation strategies could include constructing recharge facilities to store excess water in locations where water will be needed. Water recovery must be within hydrologic area of impact. Water used for energy production could also be reduced by replacing fossil fuels and nuclear

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<sup>13</sup> *Brackish Groundwater: Perspectives on Potential Favorable Development Areas and Deep Brine Injection*, Presentation to GWAC Montgomery & Associates, May 15, 2017

<sup>14</sup> *Regional Flood Control District Program Development to Increase Water Availability through Enhanced Groundwater Recharge of Stormwater and Reuse of Same*, Memorandum to the Board of Supervisor from C.H Huckelberry, September 2021.

energy with solar and other non-water related energy through incentives. This would reduce industrial water demand used for electricity generation.

Wastewater Reclamation Planning. With the need to bridge hydrologic disconnects between where water is withdrawn and recharged or reused, the RWRD is in the process of re-evaluating whether it is more cost and water effective to plan new facilities in a centralized or decentralized manner. It is expected that this analysis will be completed and communicated to the Board later this calendar year.

## **5. Advantages and Limitations of Water Resource Strategy Options**

Several methods or strategies to address water scarcity have been described above. Each varies in effectiveness and ability to implement. Some are strategies that motivate voluntary conservation practices; others are mandates requiring compliance and enforcement.

Regulatory mandates can be effective, but are also perceived as heavy-handed. Mandates, such as ordinances, must include staff to monitor compliance, enforce ordinances and impose fines or penalties for non-compliance. Conservation effectiveness and meaningful reductions in water consumption must also be measurable using water consumption data which the county does not have access. Mandates can be costly and time consuming to implement and unpopular with the public if perceived as unfair or punitive.

The City of Tucson has had a mandatory rainwater harvesting ordinance in place for commercial development since 2010. The ordinance requires new commercial development to meet 50% of their landscape irrigation using rainwater harvesting. In a review reported to Mayor and Council, 40 of the approximately 300 properties subject to the ordinance had installed irrigation sub meters.<sup>15</sup> Irrigation meters are necessary to determine compliance with the 50% rainwater harvesting requirement for landscape irrigation. Most properties failed to submit the required annual report to Tucson Water. The review also found properties were not irrigating based on seasonal weather conditions, rainwater basins had been filled in and maintenance was lacking. Ongoing education, inspection, enforcement and adequate staffing is needed if the program will succeed.

In 2010 the City of Tucson also approved a gray water ordinance requiring new single family and duplex units to install a “stub out” on clothes washing machine to supplement outdoor irrigation. The city also offers a rebate of up to \$1,000 for gray water installation to supplement outdoor watering. A survey sent to 6,925 homes built after 2010 was sent to determine if gray water was being used.<sup>16</sup> The survey had a seven percent response rate. Of the respondents, most were unaware their home had gray water capabilities, were unsure how to use the gray water system and there was general lack of knowledge among homeowners on how to use graywater

To be successful, existing or new statutory authority for regulatory mandates must be in place. Prior to enactment, public input can indicate the public’s willingness to accept increased regulation. The public can also offer input to modify proposals in ways that are effective, yet acceptable to the public. In successful adoption of increased regulation stakeholders and constituents understand that increased regulation is necessary for the public good and not overly burdensome. Overregulation will result in adverse public reaction and lack of support.

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<sup>15</sup> City of Tucson Mayor & Council Memorandum, *Commercial Rainwater Harvesting Ordinance Review as directed by Mayor & Council*, November 9, 2021.

<sup>16</sup> Presentation to Citizens’ Advisory Committee Conservation and Education Subcommittee, February 14, 2022

Incentives or rewards for water conservation are voluntary. In contrast to regulatory mandates, rebates reward conservation actions such as replacing high water use plumbing fixtures and devices, removing decorative turf or installing gray water systems. In order to have a significant impact on water consumption, wide public participation is essential. Effectiveness and success must be measurable, meaningful and permanent and requires data analysis to determine if the incentives are effective at reducing water demand.

Funding for rebates needs to be budgeted. Because participation is voluntary, it can be difficult to determine how much funding is needed. In one California city, turf removal rebates were so popular, more funding had to be allocated. Several water providers have rebate programs. Pima County might want to supplement these programs, rather than creating a separate, competing program.

Public education programs are an opportunity to create water awareness and a water-wise culture to improve voluntary water and energy conservation efforts. A well-crafted public message launched on appropriate platforms can reach target audiences effectively. Education about how and why water scarcity should concern citizens can bring about behavior change. Voluntary change is preferable to government mandates.

Identifying target audience, messaging and delivery can provide an opportunity to create a water-wise culture and improve voluntary participation in conservation. Messaging must be credible and unbiased. Public education can also serve to clarify perceptions about vulnerability to water scarcity and shortages.

Public education success at achieving behavioral changes in water conservation can be difficult to measure, however. Changes in water use can be attributed to many factors; weather extremes, regional drought, policy changes or catastrophic events.

Leading by example is Pima County's commitment to achieve sustainability in water conservation, carbon emissions reductions and other key focus areas described in the Sustainability Action Plan for County Operations (SAPCO). The plan sets goals to be achieved by 2025. Annual reports document progress toward achieving these goals. Setting goals that result in measurable reductions lends credibility to the county's efforts. Tools and metrics to measure success is also necessary. These include metering data of water and energy consumption, utility software and reporting protocols. Assessment and analysis of progress needs to occur at the department level where operational improvements can be made. Annual reporting to the Board, as is done with SAPCO, confirms progress or identifies needed improvements. It is also necessary to adjust goals when they are met or when data shows them to be unrealistic.

Infrastructure that benefits large segments of the community is where local government has a unique opportunity to improve quality of life, water resiliency and sustainability. Large infrastructure investment, however, requires much planning, community support, collaboration across many public and private sectors and funding before implementation can begin. Consequently, a large lead time is needed to bring infrastructure to fruition.

While Pima County is not a water provider, it has many opportunities to contribute to water infrastructure. The Regional Wastewater Reclamation Department operates the regional system generating over 60,000 acre-feet of recycled water that can be used to offset groundwater pumping and augment water supply through direct or indirect potable use. The Regional Flood Control District has

authority to build large-scale stormwater detention basins and can build recharge facilities to replenish groundwater and augment water supply.

## **6. Initial Options for Consideration**

The following are potential strategies that could be considered by the Board for further review or implementation. Regulatory amendments to planning policies and the zoning code to improve water management could include the following strategies:

- Prohibition on ornamental turf
- Allow turf only on schools and parks
- Require rainwater harvesting on new residential and commercial development
- For commercial and industrial development, require more shade trees irrigated with harvested rainwater collected from paved areas
- Require more shade trees in general
- Restrict swimming pool surface area sizing for apartments and resorts
- For commercial and industrial development, require solar covered parking
- Increase staffing for monitoring, compliance and enforcement and designate a responsible department
- Develop water use guidelines for attracting new commercial and industrial projects to sites in Pima County that would balance water use with jobs, capital investment and community tradeoffs.

Improved drought management and response would consist of review of drought stages and response actions that result in long term water reduction for sustained drought conditions and short term water conservation for flash drought conditions. The drought response plan triggers and restrictions were determined with input from a large and diverse stakeholder group. Major changes to the drought response ordinance should include a similar inclusive process.

Incentives provide positive reinforcement for water and energy conservation efforts taken by the public voluntarily. Rebates provided by water providers differ among providers and are not consistently applied throughout Pima County. Potential considerations are:

- Establish a funding budget and provide rebate funding to water providers serving Pima County
- Based on the City of Tucson's recent experience with rainwater harvesting and gray water rebates, these strategies are not recommended at this time

Lead by Example builds on the Pima County Sustainable Action Plan for County Operations by improving water and energy efficiency. Additionally, creating a water and energy conservation ethic among the county's workforce who may extend it to their families at home will improve sustainability in our community.

Additional water conservation elements for consideration:

- Establish a water use implementation plan for county facilities to achieve water reduction goals established in SAPCO
- Conduct water audits of county facilities to identify where the largest water demand is occurring and where investment of water efficient improvements will result in the most water and cost savings

- Install water sub meters on county facilities to differentiate between indoor consumption and outdoor irrigation use and target where efficient water savings efforts are needed. This will help determine where to invest in improvements
- Replace HVAC systems with energy and water efficient HVAC. Cooling towers for county office buildings use large quantities of water and improving efficiency would reduce water use
- Install water efficient plumbing retrofits
- Replace 1.6 gallon toilets with 0.8 gallon toilets
- Add water conservation aerator filters on faucets
- Install motion sensor faucets
- Construct stormwater planters to eliminate irrigation
- Estimate the costs of these strategies and budget for the ones that maximize water savings, and
- Reduce energy demand and increase non-water intensive renewable energy supply

#### Conclusion

Water in the arid West has always been scarce. With alarming carbon emission increases, climate warming and changes to precipitation patterns are already being observed. Living with water scarcity in the Sonoran Desert will require many adaptive changes to maintain our quality of life.

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