# Economic Impacts to Central Arizona of Reductions in CAP Deliveries

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# Executive Summary

Counsel for the Central Arizona Project (CAP) retained WestWater Research to estimate the economic impacts of reductions in deliveries of Colorado River water to Central Arizona. CAP holds long term contracts for over 1.4 million acre-feet (MAF) of Colorado River water. CAP delivers this water through a 336-mile aqueduct to municipal, tribal, agricultural and industrial customers in Maricopa, Pinal, and Pima counties. CAP delivers Arizona's largest renewable supply to Maricopa, Pinal and Pima counties where more than 80% of Arizona's population resides.[1] This report describes in detail that **the expected economic consequences of cuts to CAP deliveries are significant, the most severe reductions modeled through the year 2060 cause a reduction of over 2.7 trillion dollars in total economic impact and a loss of nearly 7 million job-years[2], among other impacts.**

Agreements governing the operations of the Colorado River expire in 2026. In January 2026, as part of the NEPA process required to implement future operating conditions on the River, Reclamation released a Draft Environmental Impact Statement (DEIS) evaluating five alternatives for Post-2026 Colorado River operations; some alternatives distribute shortages proportionally among all users (pro rata), while others enforce a strict priority system where CAP deliveries are cut before other Colorado River users.[3] Decisions made in the coming months will determine the long-term availability of Colorado River water to CAP and other river users. This study examines the potential economic consequences of significantly reduced CAP deliveries to inform Post-2026 negotiations and illustrate what is at stake for Arizona's economy.

This report evaluates how severe, long-term reductions in CAP deliveries could affect water supplies, water market prices, and economic outcomes in Maricopa, Pinal, and Pima counties. The impacts of reduced CAP deliveries are estimated by evaluating the difference in water supply and economic outcomes under three scenarios.

The **Baseline Scenario** assumes Arizona receives 900,000 acre-feet of CAP water annually, consistent with recent deliveries and approximately 70% of CAP's maximum entitlement. Contractors in the Priority Indian and Priority M&I pools continue to receive the majority of their allocations. Under CAP's internal priority system, Non-Indian Agricultural (NIA) pool deliveries remain zero.

The **Basic Coordination Scenario** assumes a maximum policy shortage that would reduce the total deliverable supply of water through the CAP to 236,900 acre-feet based on the USBR Shortage Allocation modeling and use assumptions used in the DEIS for the Basic Coordination alternative with strict priority enforcement, assuming Lake Mead levels just below 1,110 feet consistent with current conditions.

The **Extreme Shortage Scenario** represents conditions where, under a strict priority system, Lake Mead elevations decline to levels where CAP deliveries are eliminated entirely, as has been proposed in the DEIS under dead pool scenarios and under Maximum Operational Flexibility Alternative where Arizona's third and Fourth Priority water entitlements are eliminated.[4] Indian Priority and M&I Priority pool allocations fall to zero. This scenario illustrates the economic risks Arizona faces should Colorado River conditions

[1] CAP website.

[2] The report employs IMPLAN economic modeling where a "job-year" represents one job (full-time, part-time, or seasonal) supported for one year, often used to sum employment impacts across multi-year analyses.

[3] In the DEIS, the pro-rata alternatives are Enhanced Coordination and Supply Driven Alternative (LB Pro Rata); the strict priority alternatives are No Action, Basic Coordination, Maximum Operational Flexibility (LB Priority) and Supply Driven Alternative (LB Priority).

[4] The total CAP annual deliverable supply is reduced to approximately 21,400 AF under the maximum policy shortage for the Maximum Operational Flexibility Alternative which is treated as a *de minimis* negligible volume for purposes of this report.

deteriorate beyond current projections.

Impacts under each scenario impacts were evaluated in four parts:

1. **Water Supply Impacts:** The model incorporates the complete water supply portfolio for 40 municipal and five tribal CAP contractors—including groundwater, effluent, long-term storage credits (LTSCs), and alternative surface water sources—and projects how demand and supply would evolve through 2060.
2. **Water Market Prices:** An econometric model of water market transactions was developed to forecast wholesale water prices as a function of CAP deliveries.
3. **Direct Economic Impacts:** The direct economic impacts of water supply reductions were evaluated for six categories: consumer welfare losses, business interruptions, foregone development, lost water provider revenues, depleted water resources, and tribal water resources.
4. **Indirect and Induced Impacts:** IMPLAN, a regional economic impact model, was used to estimate broader economic effects and employment.

The analysis finds that water supply impacts to the CAP service area begin immediately as providers draw down groundwater and long-term storage credits (LTSCs) to replace CAP supplies. Scarcity drives up wholesale water prices, making it harder for providers to acquire alternative water supplies, LTSCs or groundwater to replace CAP supplies. Tribes have less surplus water available to bank as LTSCs or sell to municipal buyers and lose revenue they previously earned from leasing their supplies or creating LTSCs to be marketed. New housing development ceases where there is no longer an assured water supply. For some providers, insufficient supplies to meet demand for existing customers begin as early as 2030 and expand over time as backup supplies are exhausted. Consumers and existing businesses face significant supply interruptions, leading to household welfare losses and reduced business activity. Water providers face substantial revenue shortfalls resulting from reduced water sales.

This report quantifies the direct and indirect economic impacts of reduced CAP deliveries but does not evaluate the interrelated economic and ecological effects of increased groundwater pumping, including aquifer depletion, land subsidence, ecosystem degradation, increased energy costs from greater pumping depths, and the investments in infrastructure required to switch from surface water to groundwater. As a result, the economic impacts presented here are conservative and do not capture all likely impacts of reduced CAP deliveries in Central Arizona.

This analysis also does not capture the risks associated with the potential loss or deferral of large, advanced manufacturing investments in Central Arizona, such as the $165 billion semiconductor fabrication and packaging facilities recently announced by TSMC. The long-term viability of this and other advanced manufacturing projects depends on corporate assessments of sustainability, environmental impacts, and regulatory certainty, even where near-term physical water availability is adequate. Scaling published economic impact assessments suggest that the loss of this facility could reduce total economic output by approximately $84 billion, household income by roughly $24 billion, and state and local tax revenues by about $3.6 billion—highlighting economic risks not captured in the modeled CAP shortage impacts.

The impacts of reduced CAP deliveries are quantified in Table 1, which summarizes the incremental impacts of water supply reductions under the Basic Coordination and Extreme Shortage Scenarios relative to the Baseline Scenario.

**Table 1: Summary of Economic Impacts under Maximum Policy Shortages and Use Assumptions**

| Impact Category | Basic Coordination Scenario | Extreme Shortage Scenario |
|---|---|---|
| **1. Water Supply Impacts** | | |
| First Year of Shortages Modeled If Maximum Policy Shortage Implemented | 2032 | 2030 |
| Subsequent Shortages in 2060 (% demand) | 26% | 34% |
| Depletion of groundwater and LTSCs (through 2060) | 8.0 MAF | 8.7 MAF |
| **2. Water Market Prices (beginning in 2027)** | | |
| Wholesale water price ($/AF) | $1,550 | $12,840 |
| Percentage Increase from Current Price | 210% | 2468% |
| **3. Direct Economic Impacts ($ Billions, through 2060)** | | |
| Depleted groundwater and LTSCs | $12 | $108 |
| Lost tribal water supply | $7 | $60 |
| Consumer welfare losses | $38 | $64 |
| Business interruptions | $308 | $462 |
| Foregone housing development | $467 | $550 |
| Lost provider revenues | $18 | $27 |
| **4. Indirect and Induced Impacts ($ Billions, through 2060)** | | |
| Employment losses (%) | 3.3% | 4.4% |
| Employment losses (job years) | 5,272,838 | 6,980,079 |
| **Total economic impact (multiplier)** | **$2,221 (2.81×)** | **$2,780 (2.68×)** |

# 1. Introduction

Counsel for the Central Arizona Project (CAP) retained WestWater Research to estimate the economic impacts of reductions in deliveries of Colorado River water to Central Arizona.

The interim agreements governing the management of the Colorado River expire in 2026.[5] Decisions made in the coming months will determine the long-term availability of Colorado River water to CAP and other river users. This study examines the potential economic consequences of significantly reduced CAP deliveries to inform Post-2026 negotiations and illustrate what is at stake for Arizona's economy.

## 1.1. The Central Arizona Project

The CAP is an extensive water diversion system in Arizona designed to transport water from the Colorado River to the state's central region of Maricopa, Pinal, and Pima counties, where most of the population resides, and to mitigate groundwater depletion by shifting to surface water. It spans 336 miles and is Arizona's largest renewable water supply, delivering up to approximately 1.5 million acre-feet annually to support agriculture, municipalities, industries, and Indian communities in Maricopa, Pinal, and Pima counties.

When fed with a full supply of water, the CAP irrigates nearly one million acres of Indian and non-Indian irrigated agricultural land and provides drinking water to about 80% of Arizona's population. Since its completion in the early 1990s, CAP has been instrumental in enabling Arizona's population to nearly double.

The Colorado River Basin Project Act of 1968 authorized the US Bureau of Reclamation (USBR) to build the CAP, ensuring that Central Arizona's 2.8 million acre-feet share of Colorado River water would reach its population centers rather than staying in the more rural northern and western part of the state. In 1971, the Central Arizona Water Conservation District (CAWCD) was established to manage CAP operations, repay construction costs, and oversee the system. Construction of the CAP began in 1973 and was considered substantially complete in 1993. CAP's contractors and subcontractors include Tribes, long-term municipal and industrial (M&I) users, and agricultural users. Additional benefits include hydropower, flood control, wildlife habitat protection and enhancement, and recreational opportunities.

## 1.2. Economic Growth in Central Arizona

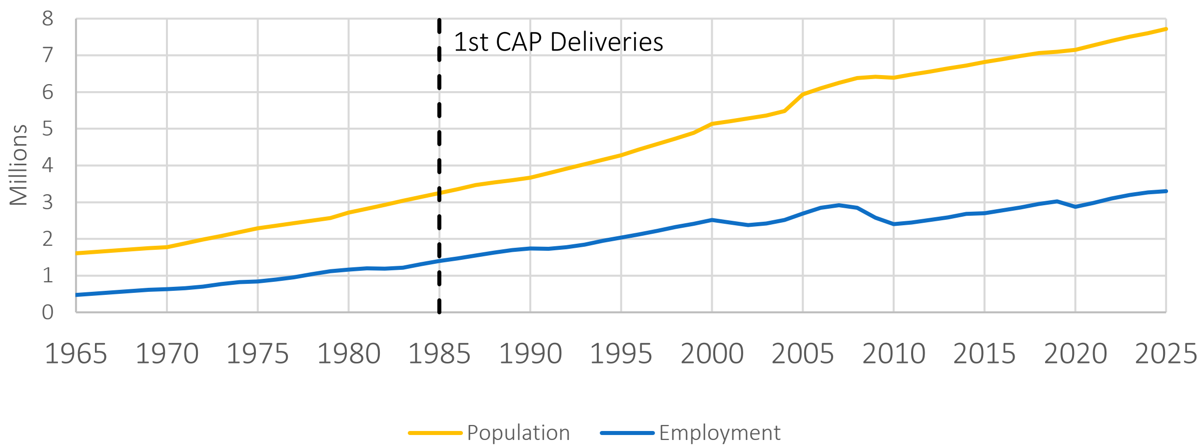
Central Arizona's economic expansion over the past four decades was built on reliable water supply, particularly Colorado River water delivered through the CAP. This infrastructure enabled the region to transition from depleting groundwater reserves to a more sustainable mix of surface water sources. Sustaining continued growth requires availability of both CAP water and groundwater to meet long-term urban, agricultural, and industrial needs.

The three-county region served by CAP (Maricopa, Pima, and Pinal counties) grew from 2.5 million residents in 1985, when CAP deliveries began, to 6.3 million in 2024, a 148% increase (U.S. Census Bureau; Arizona OEO). As shown in Figure 1, population growth has been accompanied by corresponding employment growth, with the region now supporting approximately 2.7 million jobs concentrated in healthcare, technology, professional services, and manufacturing (BLS).[6].

[5] Record of Decision: Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead (2007); Agreement Concerning Colorado River Drought Contingency Management and Operations (2019); 2024 Supplement to the Interim Guidelines (2024); Minute 323 Including the Bi-National Water Scarcity Contingency Plan.

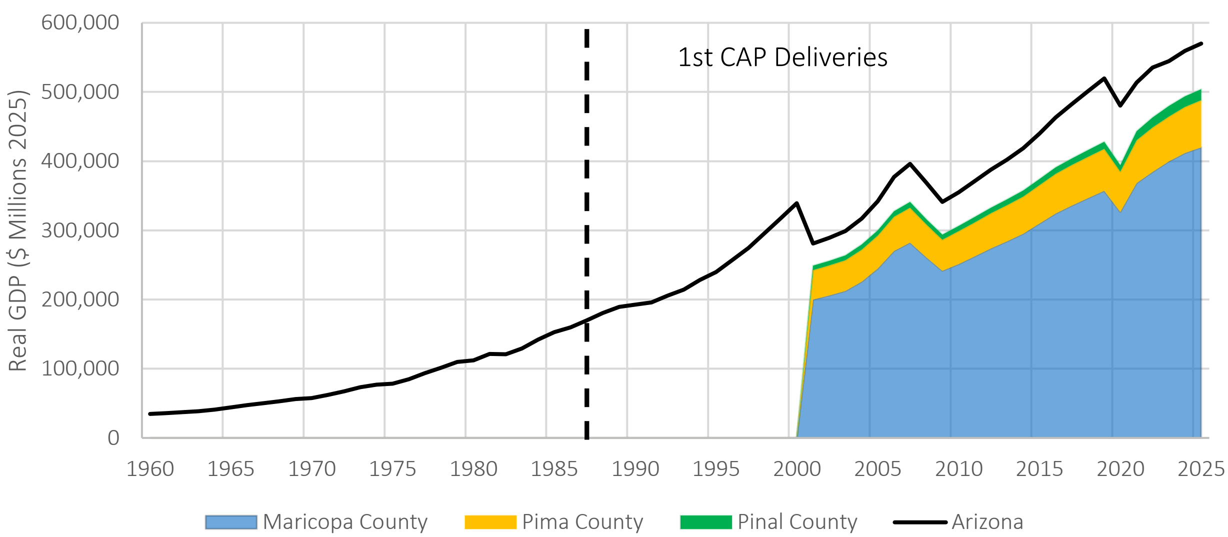
[6] FRED/U.S. Census Bureau

**Figure 1: Historical Employment and Population Growth in Arizona**




In 2023, CAP's service area combined GDP reached $460 billion, representing 88% of Arizona's statewide total (BEA via FRED). Figure 2 illustrates the trajectory of real GDP growth in Arizona over recent decades, highlighting the economic expansion that reliable water supplies have helped enable.

**Figure 2: Historical Real GDP Growth in Arizona ($ 2025 Millions)**




### 1.3. Groundwater Management in Central Arizona

Prior to CAP completion, Central Arizona was heavily dependent on groundwater pumping. By 1980, decades of unregulated pumping had created severe overdraft, causing declining water tables and land subsidence (ADWR). The federal government made CAP funding contingent on Arizona addressing this crisis, leading to the 1980 Groundwater Management Act.

The 1980 Act created the Arizona Department of Water Resources and established Active Management Areas covering 80% of the state's population (ADWR). CAP water was central to breaking Arizona's dependence on groundwater: it provided the renewable surface water supply needed to reduce pumping and work toward safe-yield—balancing groundwater withdrawals with recharge. The Act's cornerstone Assured Water Supply Program requires developers to demonstrate 100-year water availability for new subdivisions, with CAP water essential to most designations.

CAP deliveries also enabled Arizona's underground storage program. The 1994 Underground Water Storage, Savings, and Replenishment Act established a system for recharging excess CAP water into aquifers, earning Long-Term Storage Credits equal to 95% of the volume stored (A.R.S. § 45-852.01). The Arizona Water Banking Authority (AWBA), established in 1996, has accrued 4.4 million acre-feet of LTSCs through 2024. These credits, built largely from historical CAP deliveries, support sustainable new housing development across Central Arizona—developers rely on LTSCs to satisfy Assured Water Supply requirements where direct renewable supplies are unavailable.

Reductions in CAP deliveries threaten this framework. With less CAP water available for storage, the accumulation of new LTSCs has slowed dramatically, constraining future development capacity and risking renewed dependence on unsustainable groundwater overdrafting.

### 1.4. Colorado River Water Allocation in Central Arizona

Within Arizona, there are water entitlement priorities to Colorado River water that determine who receives water and the order in which entitlement holders receive water, including who will face cuts first under shortage. First priority entitlement holders are the last to receive cuts and Fourth Priority holders are the first to receive cuts under shortage. CAP is entitled to up to approximately 1.5 million acre-feet of Colorado River water per year under a Fourth Priority, plus a small amount of Third Priority water. The CAP delivers water through an internal system of priorities, with Third Priority being highest priority, followed by roughly co-equal Indian and M&I priority water followed by lower priority Non-Indian Agricultural (NIA) water. Additional lower CAP priorities are the Agricultural Settlement Pool and Other Excess Water, which comprise “Excess Water”. Excess Water is created when water is not taken by Indian, M&I, or NIA. Other Excess Water is the first pool to receive reductions in water deliveries under a shortage condition, followed by Agricultural Settlement Pool.

The state of Arizona is a party to the 2007 Colorado River Basin Interim Guidelines and Lower Basin Drought Contingency Plan (DCP) Agreement of 2019, which require reductions in Arizona’s Colorado River diversions at various Lake Mead levels, or “tiers”, to reduce the risk of reaching critically low Lake Mead levels through 2026. The DCP was implemented when the 2007 Colorado River Interim Guidelines for Lower Basin Shortage and Coordinated Operations for Lake Powell and Lake Mead (2007 Interim Guidelines) were found to be insufficient to reduce the risks of Lake Powell and Lake Mead declining to critically low elevations. The tiers of shortage are established each year based on the August report from the previous year projecting Lake Mead water levels. The DCP Tiers range from Tier 0 (1,090 feet elevation) to Tier 3 (1,025 feet elevation). If Lake Mead elevation drops below 1,025 feet, the CAP Indian and M&I Priority supply decreases from full supply to approximately 90% of supply Table 2 summarizes the DCP Tiers.

**Table 2: Drought Contingency Plan Tiers**

| DCP Tier | Lake Mead Elevation | Arizona Reduction Volume (AF) | Shortage Year(s) |
|---|---|---|---|
| Tier 0 | 1075’-1090’ | 192,000 | 2020-2021 |
| Tier 1 | 1050’-1075’ | 512,000 | 2022, 2024-2026 |
| Tier 2a | 1045’-1050’ | 592,000 | 2023 |
| Tier 2b | 1025’-1045’ | 640,000 | n/a |
| Tier 3 | <1025’ | 720,000 | n/a |

An NIA CAP Priority mitigation agreement was completed in 2019 as one element of the DCP process and describes the use of mitigation resources totaling 450,000 acre-feet[7] to fully and/or partially offset CAP NIA water subcontracts through 2025. The mitigation agreement provided that wet water CAP deliveries would be used to fully or partially offset reductions across each Shortage Tier, except Tier 3. From 2020-2022, mitigation resources would fully satisfy water delivery schedules for CAP NIA Priority water. From 2023-2025, mitigation resources would fully or partially satisfy the CAP NIA Priority pool deliveries as described below.

- Lake Mead <1090′ = Arizona Tier 0 Reduction of 192,000 acre-feet
    - Mitigation 2023-2025: 100% mitigation
- Lake Mead <1075′ = Arizona Tier 1 Reduction of 512,000 acre-feet
    - Mitigation 2023-2025: M&I and Indian Priorities fully mitigated; NIA 75% mitigation
- Lake Mead <1050′ = Arizona Tier 2a Reduction of 592,000 acre-feet
    - Mitigation 2023-2025: M&I and Indian Priorities fully mitigated first; NIA 75% mitigation
- Lake Mead <1040′ = Arizona Tier 2b Reduction of 640,000 acre-feet
    - Mitigation 2023-2025: M&I and Indian Priorities fully mitigated first; NIA 50% mitigation
- Lake Mead <1025′ = Arizona Tier 3 Reduction of 720,000 acre-feet
    - No mitigation for any water user in Tier 3 or 2026, whichever occurs first

Also in 2019, the AWBA adopted a policy regarding the distribution of LTSCs for firming CAP M&I subcontractors. Through 2026, the AWBA will distribute LTSCs pursuant to A.R.S. § 45-2457(B)(7) to meet all reductions to scheduled CAP M&I Priority water due to a shortage condition or required DCP contributions.

With the expiration of the 2007 Interim Guidelines, 2019 DCP, and related agreements, USBR lacks the operational authority to adequately respond to projected extreme drought conditions. The Colorado River Post-2026 Operations guidelines development process was a multi-year NEPA process that identified a range of alternatives and determined water management actions and operations for Lake Mead and Lake Powell for decades into the future. Post-2026, shortage conditions include impacts to the availability of M&I and Indian Priority.

USBR’s Draft Environmental Impact Statement (DEIS) for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead (January 2026) focuses on potential operations post-2026 and included shortage allocation models. Each model was created to demonstrate how shortages may be allocated under action alternatives. Each model simulates shortages based on entitlement and its own unique assumptions. Modeling provides an indication of potential cuts to Arizona’s Colorado River users, including the CAP, at declining levels of water deliveries.

The DEIS Priority Shortage Allocation Model represents the effect of the priority systems among and within the Lower Basin States. The DEIS makes assumptions about how shortages might be shared but

[7] Mitigation resources consist of 400,000 acre-feet of Intentionally Created Surplus (ICS) held by CAWCD, dedicated by resolution of the CAWCD Board of Directors for mitigation purposes as outlined in the DCP Agreement, and 50,000 acre-feet of CAP operational supplies.

generally does not make assumptions about potential actions taken by entitlement holders in response to shortage. A range of available CAP supply available to Indian, M&I, and NIA from zero to 1,251,317 acre-feet, in rounded 10,000 acre-feet increments except at pivotal quantities, is included showing all discrete levels of supply modeled. No NIA water is available below 990,000 acre-feet of total CAP supply.

# 2. Study Approach

The purpose of economic analysis is to understand, quantify, monetize, and evaluate tradeoffs between action alternatives and identify an alternative that maximizes sustainable economic development. Economic analysis also provides a way to identify the action alternative that is acceptable, effective, efficient, and complete, and that contributes to defined goals and objectives. This economic analysis identifies a Baseline Scenario that represents continued current conditions, a Basic Coordination Scenario that represents USBR's potential actions under a "no deal" scenario where the Basin States do not produce a negotiated consensus alternative, and an Extreme Shortage Scenario that represents an elimination of CAP deliveries that could result from the Post-2026 process under dead pool scenarios and under Maximum Operational Flexibility Alternative where Arizona's Third and Fourth Priority water entitlements are eliminated. Total economic impacts include direct effects (initial, immediate changes in economic activity resulting from an action alterative), indirect effects (changes in expenditures within the region in industries supplying goods and services), and induced effects (changes in expenditures of household income).

## 2.1. Scenario Definitions

The impacts of reduced CAP deliveries are estimated by evaluating the difference in water supply and economic outcomes in Arizona's three largest counties (Maricopa, Pima and Pinal) under three scenarios.

### 2.1.1. Baseline Scenario (900,000 acre-feet)

The Baseline Scenario assumes 900,000 acre-feet of CAP water is available annually, consistent with recent deliveries under Tier 1 shortage conditions. This represents approximately 70 percent of CAP's full entitlement. Under this scenario, Tribal and M&I Priority contractors continue to receive the majority of their allocations, while NIA pool deliveries remain at zero.

A Tier 1 shortage constitutes about a 30 percent reduction from CAP's normal supply, primarily impacting agricultural users. Most Tribal, municipal, and industrial users are expected to continue meeting water demands in the near-term due to decades of planning, investment in infrastructure, and diversified water management strategies, though some are projected to have supply deficits in coming decades under persistent Tier 1 conditions.

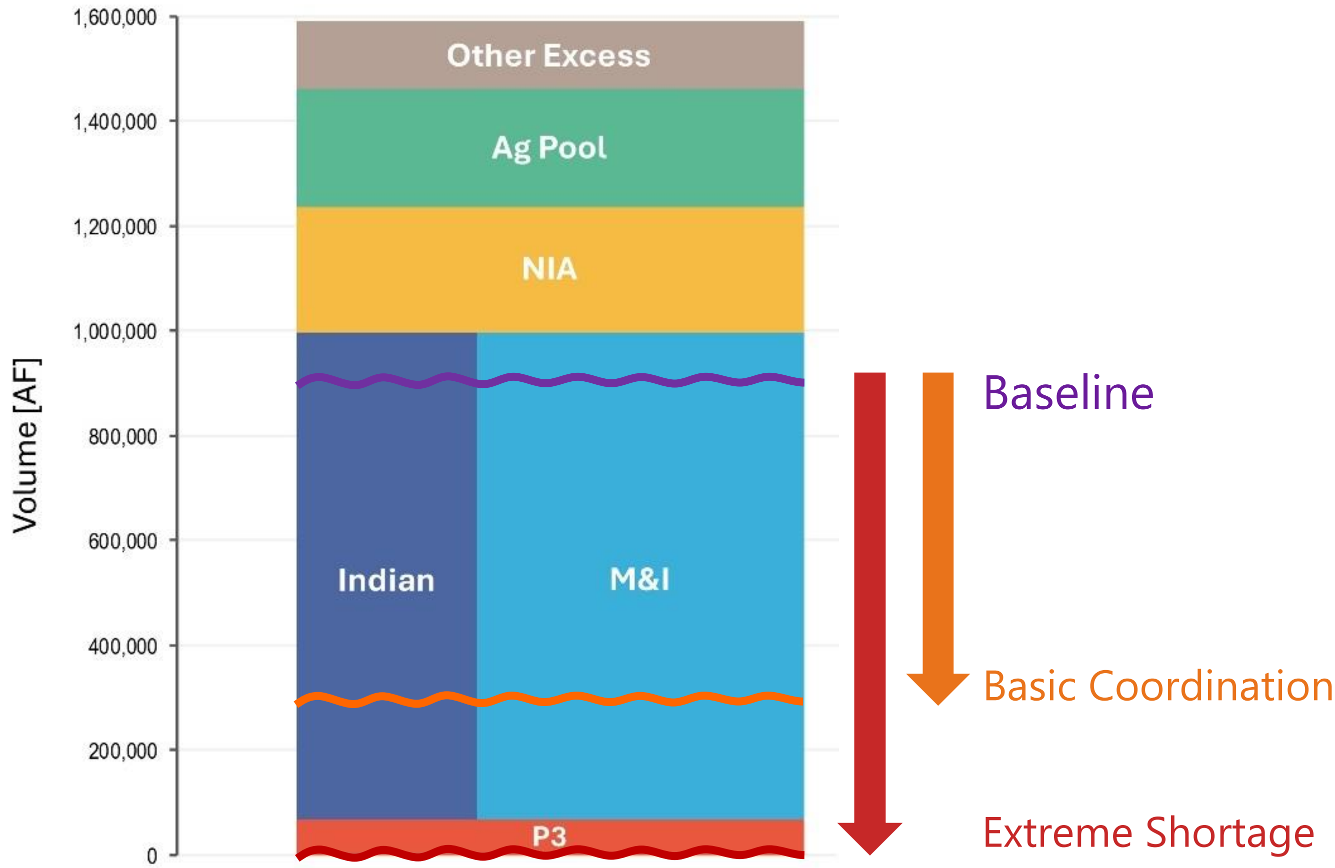
### 2.1.2. Basic Coordination Scenario (236,900 acre-feet)

The Basic Coordination Scenario assumes CAP diversions from the Colorado River are reduced to 236,900 acre-feet per year as described under the DEIS Basic Coordination ("no deal") alternative's maximum policy shortages and use assumptions. This volume provides severely limited deliveries to CAP contractors and subcontractors.

### 2.1.3. Extreme Shortage Scenario (0 acre-feet)

The Extreme Shortage Scenario represents a severe reduction in water supplies to zero as proposed by Reclamation under dead pool scenarios and Maximum Operational Flexibility Alternative where Arizona's Third and Fourth Priority water entitlements are eliminated. This scenario would strongly affect CAP water users' ability to meet demands, causing long-term water supply reliability concerns. This scenario facilitates quantification of the full economic impact of CAP.

**Figure 3 CAP Priority Deliveries in Baseline (900 TAF), Basic Coordination (237 TAF), and Extreme Shortage (0 TAF) Overlayed on CAP's Priority Block Chart for Illustrative Purposes**




### 2.2. Analysis Framework

The period of analysis is 2027 through 2060. This period was selected based on the availability of population projections, which are used to forecast future water demands. Economic impacts are clearly demonstrated to occur within this timeframe.

Impacts under each scenario were evaluated in four parts:

**Water Supply Impacts:** A provider-specific water supply model was developed for 40 municipal and five tribal CAP contractors. The model incorporates each provider's complete water supply portfolio—including groundwater, effluent, LTSCs, and alternative surface water sources—and projects how demand and supply would evolve through 2060.

**Water Market Prices:** An econometric model of water market transactions (including LTSCs) was developed to forecast wholesale water prices as a function of CAP deliveries.

**Direct Economic Impacts:** The direct economic impacts of water supply reductions were evaluated for five different groups: tribes, existing residential customers, existing commercial and industrial customers, water providers, and foregone residential and commercial development.

**Indirect and Induced Impacts:** IMPLAN, a regional economic impact model, was used to estimate broader economic effects and employment.

# 3. Water Supply Impacts

The water supply model employs a standard supply-and-demand framework widely used by engineers and economists for water supply reliability planning. This approach—projecting future demands against available supplies to identify potential shortfalls—is the foundation of integrated resource planning as described in the American Water Works Association's *Manual of Water Supply Practices M50: Water Resources Planning*.[8] The methodology is also consistent with ADWR's Assured Water Supply program, which evaluates 100-year water supply availability by comparing projected demands against physically and legally available supplies.[9] California's Urban Water Management Plan requirements follow a similar framework, requiring urban water suppliers to assess supply reliability over a 20-year planning horizon by comparing projected supplies and demands under normal and drought conditions.[10]

The model tracks each provider's complete water portfolio and projects how supply and demand evolve over time. For each year in the analysis period, the model compares available supplies against projected demand to determine whether a provider can meet its obligations or will experience a shortage.

The model operates according to existing regulatory frameworks governing water use in the Active Management Areas. This means the shortages we estimate are *regulatory shortages*—they reflect the legal and institutional rules that constrain how water providers can access and use different supply sources, rather than assumptions about physical aquifer depletion. Providers are assumed to experience shortages when they cannot meet demand within their authorized groundwater allowances and available storage credits, even if additional physical groundwater might theoretically exist.

## 3.1. Supply Sources Modeled

For each provider, the model tracks:

- CAP allocations by priority class (M&I, Indian, NIA, Priority 3)
- Other surface water supplies (Salt River Project, reclaimed water, other contracts)
- Effluent (projected to grow with population served)
- Imported groundwater (for providers with Harquahala contracts)
- Groundwater allowances and physical availability under Assured Water Supply designations
- LTSC account balances
- Central Arizona Groundwater Replenishment District (CAGRD) replenishment obligations

## 3.2. Water Use Priority

Providers are assumed to use water supplies in a defined sequence, reflecting both economic incentives and regulatory requirements:

1. Surface water (including SRP and future interconnect projects)
2. Imported groundwater from Harquahala Irrigation Non-Expansion Area (INA), where

[8] American Water Works Association. *Water Resources Planning: Manual of Water Supply Practices M50*. 3rd ed. Denver, CO: AWWA, 2017

[9] Arizona Department of Water Resources. "Assured and Adequate Water Supply Programs." The programs evaluate "the availability of a 100-year water supply considering current and committed demand, as well as growth projections

[10] California Department of Water Resources. "Urban Water Management Plans." Cal. Water Code §10610-10656.

contracted

3. Effluent
4. CAP water
5. Groundwater (within allowance limits)
6. Long-term storage credits
7. CAGRD replenishment

Groundwater and LTSCs function as supplies of last resort. A provider experiences a shortage only after exhausting all preceding supply sources and depleting available groundwater allowances and storage credits.

## 3.3. CAP Allocations

When total CAP supplies decline, water is allocated among contractors according to the priority system established in federal contracts and Arizona law. The model considers the shortage allocation methodology from USBR's DEIS Shortage Allocation Model, which distributes available CAP water as follows:

### 3.3.1. Priority Structure

CAP diversions are allocated first to a small amount of Third Priority water, followed by Indian and M&I contractors (generally co-equal), then to NIA contractors. When available CAP supply equals or exceeds approximately 982,000 acre-feet, Indian and M&I priorities receive their full allocations. Below this threshold, NIA allocations are reduced first and no NIA water is available.

Within each priority class, available water is distributed pro-rata based on contract volumes. The model does not assume movement of water within or between CAP priorities, and excess water contracts are not modeled.

### 3.3.2. Tribal Allocations

Tribes holding Third Priority water and Indian Priority CAP contracts receive allocations according to federal settlement agreements. Third Priority is the highest priority within the CAP. Tribes with Present Perfected Rights are not affected by CAP shortage. Tribes holding Indian Priority CAP contracts experience progressive reductions as total system supplies decline, consistent with shortage provisions of the applicable settlement agreement and water delivery contract.

## 3.4. Demand Projections

Supply and demand were projected separately for M&I and Tribal subcontractors.

### 3.4.1. M&I Subcontractor Demand

Baseline demand for each M&I provider reflects the most recent (2023) ADWR annual report data. Demand is projected using population growth rates from the Arizona State Demographer, with preference for sub-county projections from the Maricopa Association of Governments (MAG) or Pima Association of Governments (PAG) where available. For providers not included in MAG or PAG projections, growth rates from similar providers or county-level rates were applied. Similar providers were selected based on location and growth expectations as indicated in water master plans.

To incorporate potential efficiency gains from low-flow fixtures and conservation programs, per-capita demand is reduced by 5 gallons per capita per day (GPCD) each decade[11]. Baseline GPCD data was obtained from annual reports, water master plans, water impact fee assessments, and Assured Water Supply designations.

### 3.4.2. Tribal Demand

Tribal municipal demand is estimated by multiplying on-Reservation population by 146 gallons per capita per day.[12] Commercial and industrial (C&I) demand is estimated by multiplying total C&I acreage by 2.4 AF per acre.[13] For large facilities such as hotels and casinos, structure footprints are multiplied by five to account for surrounding irrigated areas. Population and acreage estimates are sourced from tribal reports, news articles, and related documentation.

Agricultural water demands are estimated using irrigation application rates from University of Arizona Cooperative Extension enterprise budgets and crop acreage from USDA CropScape data. For each Tribe, acreage is categorized by crop type and multiplied by crop-specific application rates to estimate total agricultural water demand.

The analysis holds tribal population, C&I acreage, crop mix, and irrigation efficiency constant over the analysis period, because projections on how these factors may change over time are unavailable, and limited changes have been observed in recent years

## 3.5. AWBA Mitigation

The AWBA holds approximately 2.3 million acre-feet of long-term storage credits allocated to CAP M&I firming. These reserves were accumulated specifically to buffer M&I contractors against future CAP shortages. In addition, AWBA and USBR have federal obligations to firm certain reallocated NIA priority CAP water for Arizona tribes under the Arizona Water Settlements Act. AWBA's obligations primarily involve firming up to 15,000 acre-feet for Gila River Indian Community (GRIC), 3,750 acre-feet for White Mountain Apache Tribe (intended to be leased by cities in the Phoenix AMA), and 557.5 acre-feet to the Hualapai Tribe. The AWBA has dedicated 160,633 acre-feet of LTSCs pursuant to its firming agreements with GRIC. In addition, USBR is required to firm up to 28,200 acre-feet of Tohono O'odham Nation's (TON) NIA water.

The model assumes AWBA provides M&I mitigation equal to 10% of CAP M&I reductions throughout the analysis period. Actual mitigation could be higher depending on AWBA policy decisions and the pace at which reserves are deployed. The model also assumes GRIC firming is met using existing AWBA LTSCs dedicated for this purpose (160,633 acre-feet).

## 3.6. Groundwater and LTSC Depletion

Before shortages reach customers, providers draw down their reserve supplies. The model simulates this process: as CAP deliveries decline, providers substitute groundwater pumping and withdraw long-term storage credits to meet demand. Only after these reserves are exhausted do customers experience shortages.

The water supply model simulates how each provider responds to reductions in CAP deliveries by substituting alternative supplies, primarily groundwater pumping and withdrawals of LTSCs. Many providers have substantial reserves of groundwater and LTSCs that they can rely on for continued water

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[11] 2019 Phoenix Water Conservation Ad Hoc Committee created a "water metric" to reduce total GPCD from 169 in 2019 to 155 by 2030 (~5 GPCD in a decade). City of Phoenix Water Resource Plan, 2021 Update.

[12] Estimated Use of Water in the United States in 2015. USGS. 2018.

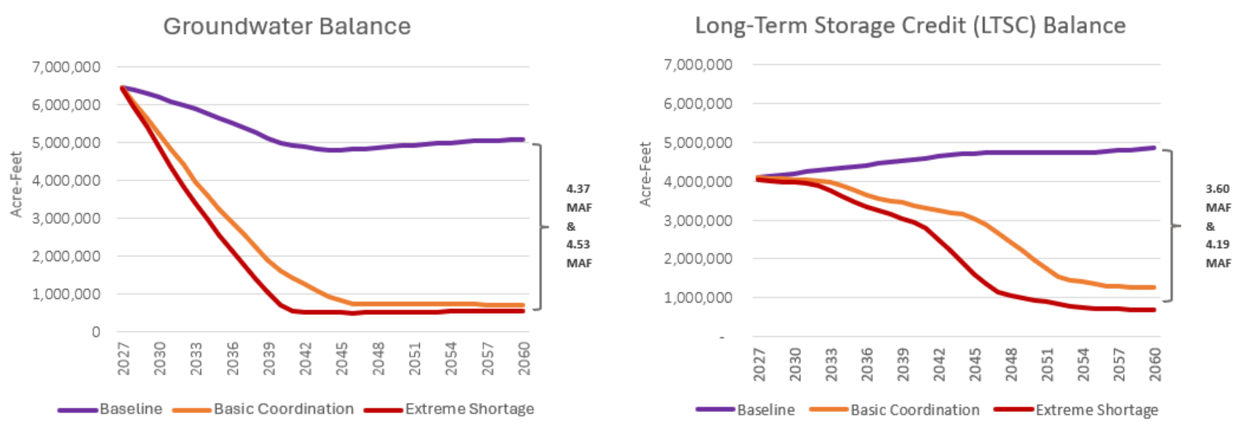
[13] Arizona Water Demand Analysis by Land Use Category. WestWater Research. October 9, 2024.

supply in the near term. However, groundwater pumping is limited by regulatory constraints under Arizona's Active Management Area framework. The model limits groundwater pumping based on regulation and does not account for physical limits on groundwater availability.

As shown in Figure 4, substitution toward groundwater and LTSCs results in:

- **Basic Coordination:** an additional cumulative drawdown of 8.0 million acre-feet relative to the Baseline scenario, including 4.4 million acre-feet of native groundwater and 3.6 million acre-feet of banked storage credits.
- **Extreme Shortage:** an additional cumulative drawdown of 8.7 million acre-feet relative to the Baseline scenario, including 4.5 million acre-feet of native groundwater and 4.2 million acre-feet of banked storage credits.

**Figure 4: Native Groundwater and LTSC Balances**



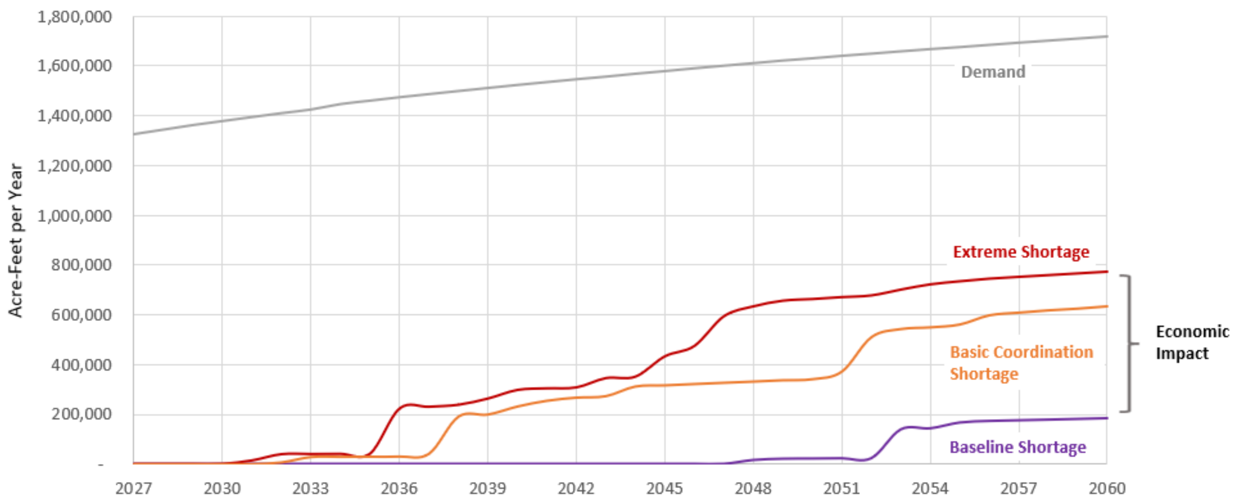

## 1. *Projected Shortages*

Even after accounting for available groundwater and LTSCs, many providers would lack sufficient water to meet demand in the Basic Coordination and Extreme Shortage scenarios. Under the Baseline Scenario, available groundwater supplies and LTSCs are sufficient to meet projected municipal demand through approximately 2048, after which some providers begin to experience water shortages.

Under the DEIS Basic Coordination Scenario maximum policy shortage and use assumptions, shortages emerge in 2032. Under the Extreme Shortage Scenario, shortages emerge much earlier. Even after accounting for available groundwater and LTSCs, the model forecasts that some providers begin experiencing shortages as early as 2030, with shortfalls expanding over time as backup supplies are exhausted.

The estimated economic impact is defined as the difference in water availability—and resulting shortages—between the Baseline and Basic Coordination/Extreme Shortage Scenarios. This differential generally grows over time as shortages emerge earlier and expands more rapidly under the Extreme Shortage Scenario, but it narrows in 2048 as shortages also begin to materialize under the Baseline Scenario. By 2060, the Basic Coordination Scenario results in an additional shortage of 446,400 acre-feet per year and the Extreme Shortage Scenario results in an additional shortage of 588,200 acre-feet per year compared to the Baseline, equal to 26% to 34% of total regional municipal water demand (Figure 5).

**Figure 5: Demand and Water Supply Shortages under Baseline, Basic Coordination, and Extreme Shortage Scenarios**




Tribal shortages are represented primarily by the reduced volume of marketable CAP water. Any surplus CAP water available after all on-reservation municipal, C&I, or agricultural demands are met is assumed to be recharged to create LTSCs which can then be sold in following years. In the Baseline Scenario, Tribes consistently have surplus water that they have recharged and/or marketed to buyers in Central Arizona. As water market purchases continue to become more important for water providers and governmental entities to meet demands and regulatory obligations, the value of surplus Indian Priority CAP water will continue to grow. Under the Basic Coordination Scenario, only San Carlos Apache Tribe (SCAT) will have surplus CAP water for marketing, and the amount of marketable water is significantly reduced. Under the Extreme Shortage Scenario, no Tribes will have surplus CAP water for marketing.

Under Basic Coordination, Tribes are expected to have a shortage in marketable supplies from approximately 40,000 acre-feet under Baseline to 150 acre-feet. With zero CAP water under Extreme Shortage, Tribes are expected to have a shortage in marketable supplies of down to zero.

### 3.7. Allocation of Shortages Among Customers

Shortages are allocated among new and existing customers, and between residential and commercial and industrial (C&I) users, to estimate economic impacts by sector. For each provider, any additional shortage under the Basic Coordination and Extreme Shortage scenarios relative to the Baseline is allocated first to new demand based on projected growth, and then to existing demand/customers. This effectively assumes curtailment of residential and commercial construction and growth before shortages to existing residents and businesses. Shortages are assumed to be shared equally between C&I and residential users. Figure 6 and Figure 7 show how shortages are allocated between these different groups. Note that the decline in “additional shortages” beginning after 2052 reflects increasing shortages under Baseline relative to Extreme Shortage, as available groundwater and long-term supply contract (LTSC) stocks are depleted under the Baseline.

**Figure 6: Allocation of Additional Water Shortages across Sectors (Basic Coordination)**

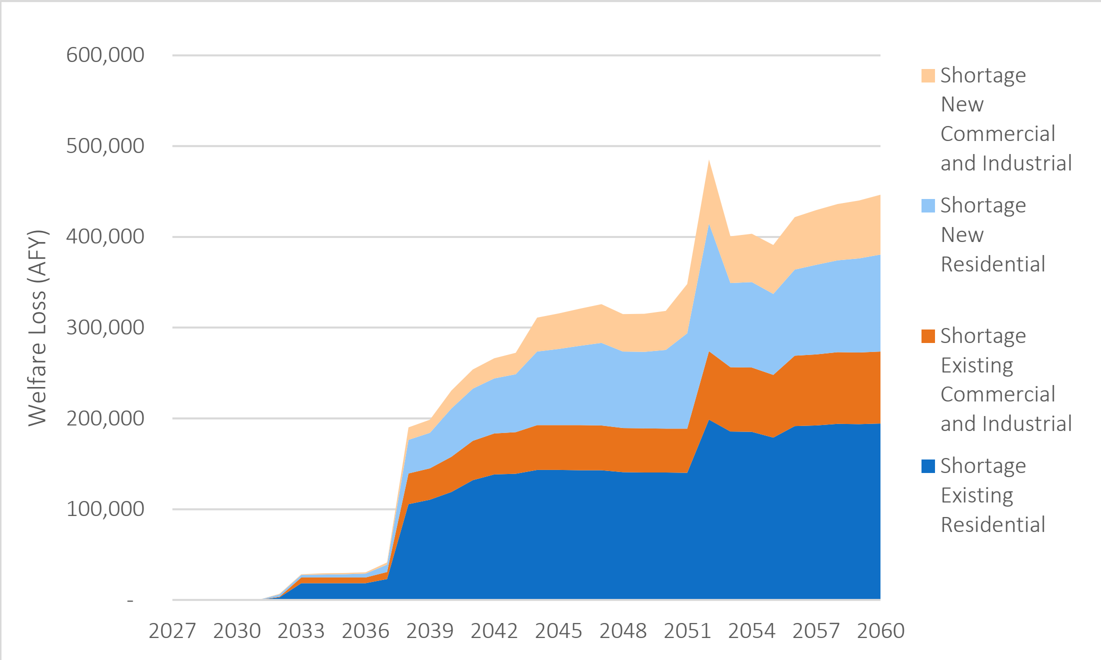



**Figure 7: Allocation of Additional Water Shortages across Sectors (Extreme Shortage)**

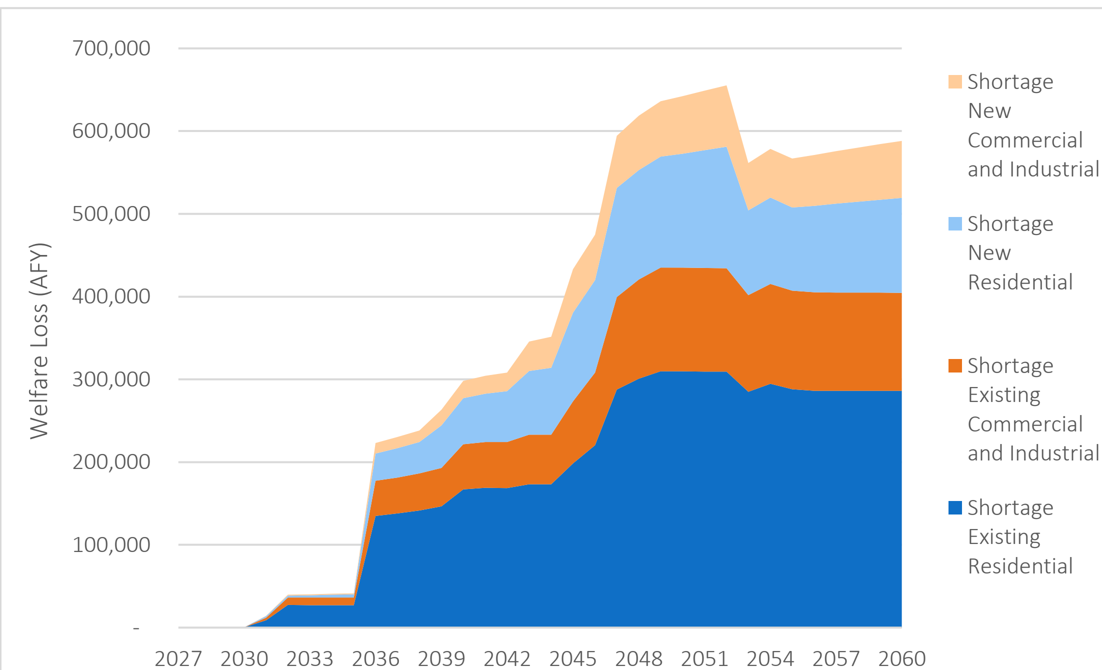
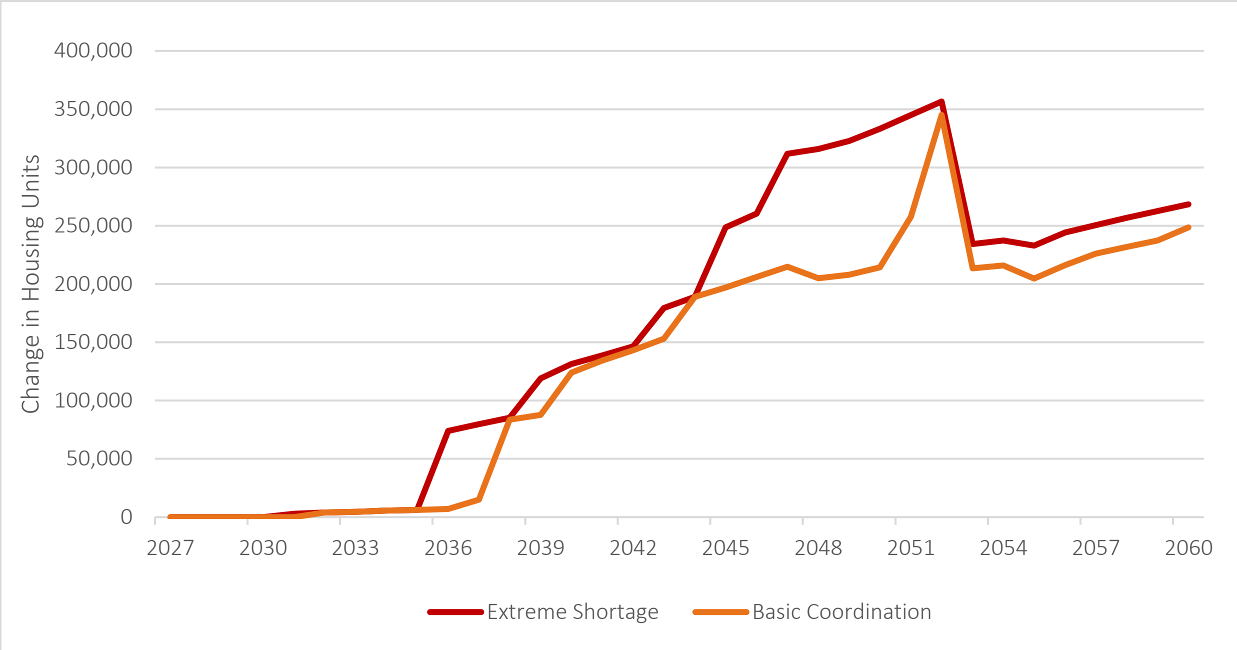



Figure 8 shows the annual number of housing units foregone due to insufficient water supply for new development. For each provider, the number of foregone units is calculated by taking the shortage volume allocated to new development, multiplying by the residential share of demand in each service area, and dividing by estimated per-household water consumption. Per-household consumption is derived from each provider's GPCD multiplied by average household occupancy rates from Census data.

**Figure 8: Forgone Housing Development**




# 4. Water Market Impacts

Arizona has an actively traded water market. LTSCs are the most commonly purchased asset among municipalities, developers, and government agencies, and CAP water is the primary source of these credits. This section describes the water market and presents an econometric model used to forecast how wholesale water prices respond to reduced CAP deliveries.

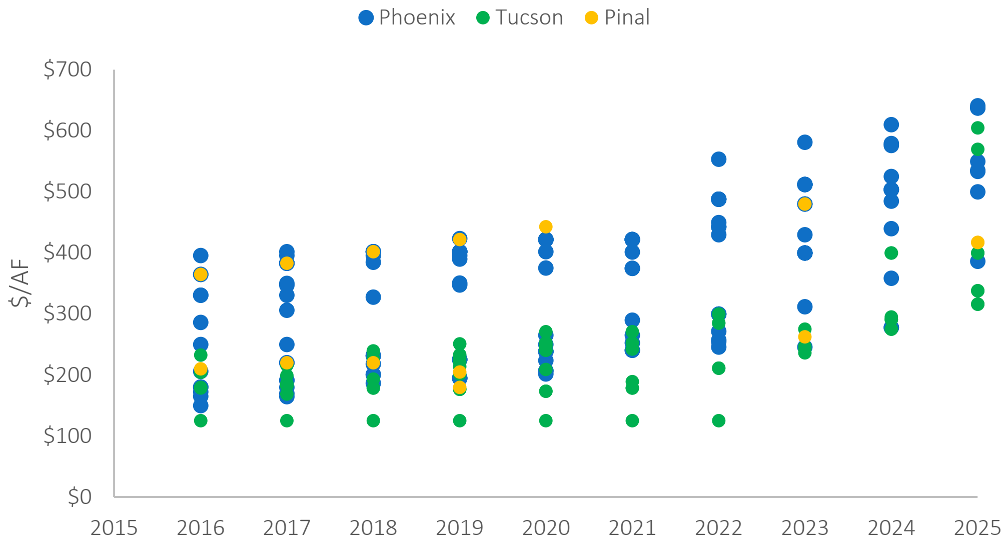
## 4.1. Overview of Arizona Water Market

LTSCs are created when entities store eligible renewable surface water supplies—typically CAP water or effluent—underground at permitted recharge facilities in the Active Management Areas (AMAs). Water stored underground and not recovered by December 31 of that calendar year may be recognized by the Arizona Department of Water Resources as an LTSC. Each credit authorizes one-time recovery and use of one acre-foot of stored water. LTSCs are transferable within the AMA where the water was stored through a streamlined administrative process.

CAP M&I subcontractors rely on the LTSC market to augment existing supplies and avoid shortages. The CAGRD and AWBA acquire LTSCs to meet statutory replenishment and firming obligations. CAP Tribal contractors are the largest storers and sellers of LTSCs, making their surplus CAP supplies available to other water users. Many providers consider LTSCs a reserve supply to draw upon when CAP water is unavailable.

Prices have been steadily increasing due to Colorado River shortage conditions, which have reduced the supply of new credits, increased CAP delivery costs, reduced the number of willing sellers, and expanded the pool of buyers. In the Phoenix AMA, average prices have increased at a compound annual growth rate of 13% since 2020; in the Tucson AMA, the growth rate is 14%. Despite rising prices, LTSCs remain a highly sought-after alternative to CAP deliveries because of their transactional ease and flexibility in recovery and use.

**Figure 9: Water Market Prices by Active Management Area**




### *4.2. Water Market Pricing Model*

To forecast how water prices respond to reduced CAP deliveries, we developed an econometric model using water market data from Arizona. The model draws on 968 water market transactions from 2013 through 2025 in the Phoenix, Pinal, and Tucson AMAs, including sales of LTSCs, CAP water, mainstem Colorado River water, effluent, extinguishment credits, imported groundwater, and Type 2 Non-Irrigation Grandfathered Groundwater Rights.

The regression model estimates annual unit prices as a function of water supply type, transaction type, seller and buyer characteristics, CAP water supply availability, transaction size, and geographic location. The model achieves an R-squared of 0.68, indicating that these factors explain approximately 68% of the variation in observed prices.

The key finding is that CAP water supply availability is a statistically significant driver of water market prices**.** The coefficient on CAP supply volume is negative and highly significant (t-statistic of -17.56), confirming that reductions in CAP deliveries cause systematic increases in water prices across all supply types. This relationship is nonlinear: as CAP deliveries decline, the market price of water increases at an accelerating rate.

Full regression results and coefficient interpretations are provided in Appendix C.

### *4.3. Projected Prices Under Scenarios*

Using the regression model, LTSC prices are projected across a range of CAP delivery volumes, after an estimated 25,000 acre-feet of losses from the CAP canal due to evaporation and seepage[14], from 900,000 acre-feet (Baseline Scenario) to 0 acre-foot (Extreme Shortage Scenario). Projections assume average market conditions: a Tribal seller and a buyer mix reflecting observed market shares (approximately 50% government (CAGRD, AWBA, and USBR), 18% municipal (primarily cities), 7% industrial, 25% developer),

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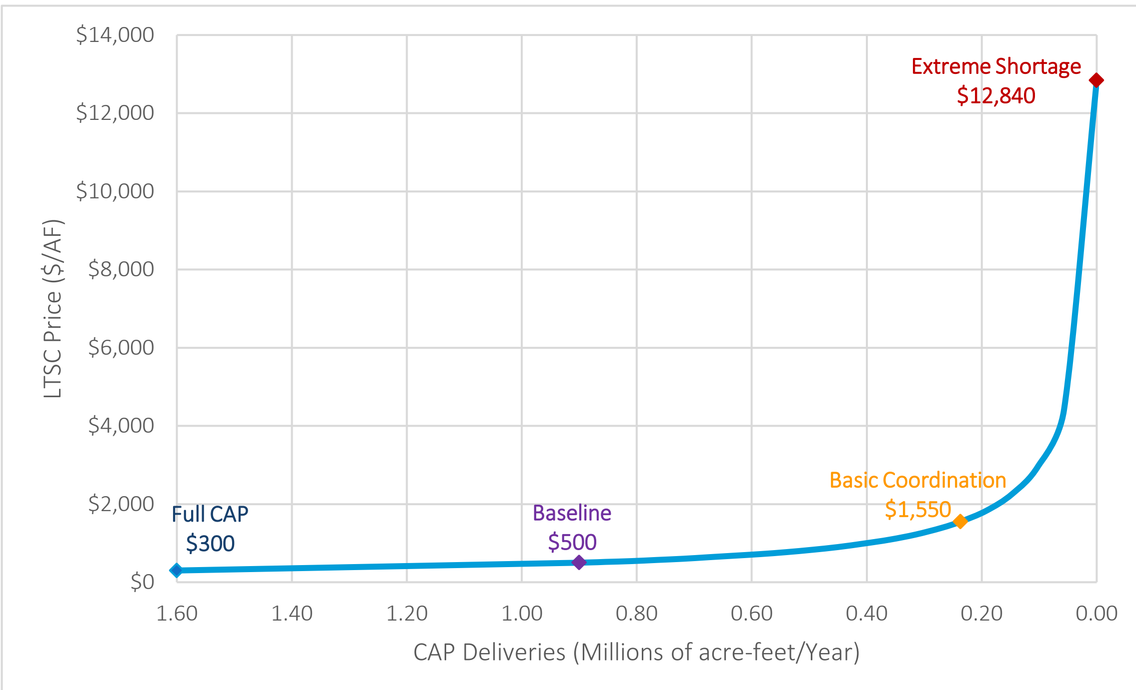
1. [14] CAP System Loss: Seepage & Evaporation = ~1.5% (or ~25,000 acre-feet) system loss from CAP canal. CAP website: **3 facts of CAP efficiency: seepage and evaporation.**

with 70% volume traded in the Phoenix AMA.

Under the Baseline Scenario, with 900,000 acre-feet of CAP deliveries, the market price for LTSCs is estimated at $500 per acre-foot—consistent with currently observed prices. Under the Basic Coordination Scenario, with CAP supplies reduced to 236,900 acre-feet, the price of water is projected to rise to $1,550 per acre-foot. The Extreme Shortage Scenario results in the price of LTSCs increasing to $12,840 per acre-foot with zero CAP water delivered.

Figure 10 illustrates the nonlinear relationship between CAP supply and LTSC prices. The accelerating price response reflects the increasing scarcity value of water as CAP supplies decline. For example, a reduction of 90,000 acre-feet from 925,000 to 835,000 acre-feet corresponds to an 8% price increase. The same 90,000 acre-foot reduction from 115,000 to 25,001 acre-feet corresponds to a 295% price increase.

**Figure 10: Estimated Econometric Relationship between CAP Allocation and LTSC Prices**




These projected prices are used in subsequent sections to value depleted water resources and estimate the economic impacts of reduced CAP deliveries.

### 4.4. Replacement Cost Approach to Pricing Water

An alternative approach to valuing water—rather than examining existing market transactions—is to consider the replacement cost of developing new supplies. Developing alternative water supplies to replace lost CAP deliveries would require substantial investment at costs significantly exceeding current water prices. Recent studies by the Arizona Department of Water Resources and consulting engineers have identified three primary augmentation options for Central Arizona: brackish groundwater desalination ($1,100–$2,200 per acre-foot), seawater desalination from the Gulf of California ($2,400–

$2,700 per acre-foot at the plant), and imported groundwater from basins west of Phoenix.[15] Local reuse programs, while valuable, cannot generate supplies at the scale required to offset a near-total reduction in CAP deliveries, and our analysis already accounts for contracted Harquahala groundwater imports.

Real-world experience in Southern California illustrates the true cost of seawater desalination. The San Diego County Water Authority's Carlsbad Desalination Plant—the largest in the Western Hemisphere—currently costs approximately $3,050 per acre-foot, with costs projected to reach $3,650 per acre-foot by 2026 following required environmental upgrades.[16] The Montecito Water District's 50-year contract with Santa Barbara for desalinated water has a base price of $2,700 per acre-foot (nominal), but effective costs are considerably higher; the district's initial annual payments of $4.6 million for 1,430 acre-feet—approximately $3,200 per acre-foot—reflect additional contributions toward capital recovery, interest, and operational expenses.[17] Critically, these costs do not include the conveyance or exchange arrangements that would be required to deliver water to Central Arizona from coastal facilities. When conveyance costs are considered, delivered costs for seawater desalination or other imported water would likely range from $3,500 to $5,000 per acre-foot—consistent with our finding that water market prices would rise to approximately $3,360 per acre-foot under severe CAP shortage conditions.

# 5. Direct Economic Impacts

This section describes the methodology for estimating direct economic impacts of water supply reductions under the Counterfactual Scenario. Direct impacts are organized into five categories, each measuring a distinct type of economic loss. Results including the total dollar values for each category are presented in Section 7.

## 5.1. Depleted Groundwater Resources

As described in Section 4, providers respond to reduced CAP deliveries by drawing down groundwater allowances and long-term storage credits before shortages reach customers. The depletion of these reserves represents a loss of storage—water assets accumulated over decades that will no longer be available for future use.

Depleted water resources are valued using the water market pricing model described in Section 5. The calculation multiplies the change in groundwater and LTSC balances between the Baseline and Basic Coordination/Extreme scenarios by the market price of water under reduced water supply conditions.

We assume groundwater and LTSCs are valued at the same price. This reflects the regulatory environment in Arizona's Active Management Areas, where groundwater allowances and storage credits are functionally interchangeable for meeting Assured Water Supply requirements. A provider that depletes its groundwater allowance faster must acquire additional LTSCs to maintain its designation — making the

[15] Arizona Department of Water Resources, *Long-Term Water Augmentation Options for Arizona* (Phoenix: ADWR, 2022), *Binational Study of Water Desalination Opportunities in the Sea of Cortez* (2020);. Nominal costs: $1,000–$2,000/AF for brackish desalination, $2,200–$2,500/AF for seawater desalination. Adjusted to 2025 dollars using CPI-U.

[16] Deborah Sullivan Brennan, "San Diegans Poised to Pay Skyrocketing Price for Poseidon's Desalinated Water," *San Diego Union-Tribune*, December 15, 2022. Nominal costs: $2,815/AF (2022), projected $3,736/AF (2026). Excludes.

[17] Montecito Water District and City of Santa Barbara, *Water Supply Agreement*, September 2020. Base contract price $2,700/AF nominal; effective cost ~$3,200/AF including Montecito's $33 million contribution toward capital and O&M. See Joshua Molina, "Santa Barbara Seals 50-Year Deal to Sell Water to Montecito," *Santa Barbara Independent*, July 2, 2020.

two resources economically fungible.

Because the water market pricing model does not include time-varying components, we apply a constant real price throughout the study period. This price reflects market conditions under Basic Coordination and Extreme Shortage. In the Basic Coordination Scenario, CAP supplies are reduced to 236,900 acre-feet, and in the Extreme Shortage Scenario, CAP supplies are reduced to zero.

This analysis considers the depletion of groundwater and LTSCs by M&I providers and Tribes.

### 5.2. Tribal Water Resources

The water supply analysis in Section 4 concludes that Tribal nations are unlikely to face direct significant shortages to their municipal, commercial/industrial, or agricultural uses during the study period. Most Tribes hold sufficient alternative surface water and groundwater supplies to meet current on-reservation demands even under Extreme Shortage.

However, the reduction in CAP deliveries eliminates Tribes' ability to accumulate and market surplus water. Under current conditions, Tribal contractors regularly store excess CAP water as LTSCs and sell credits to municipal providers, CAGRD, and other buyers. This water marketing activity provides a critical supply source for M&I customers throughout the region.

Tribal water resource losses are valued using the same water market pricing model applied to depleted M&I resources. The calculation compares the volume of surplus CAP water available for LTSC creation under the Baseline Scenario against the Basic Coordination and Extreme Shortage scenarios, then applies projected market prices.

It is assumed that Tribal contractors store any CAP water available above their on-reservation municipal, C&I, and irrigation demands to generate LTSCs for sale the following year. This assumption reflects observed tribal water management practices.

### 5.3. Consumer Welfare Losses

Consumer welfare losses measure the reduction in economic well-being experienced by existing residential customers who receive less water than they would prefer to consume. This is distinct from the financial cost of water—it captures the full value that households place on foregone water uses.

The residential welfare loss calculation is grounded in standard microeconomic consumer surplus theory. Consumer surplus represents the difference between what consumers are willing to pay for a good and what they actually pay. When a water shortage forces customers to consume less than their preferred quantity, they lose consumer surplus—this welfare loss measures the economic harm from the shortage.

The methodology follows the framework developed by Brozović, Sunding, and Zilberman (2007) and refined by Buck, Auffhammer, Hamilton, and Sunding (2016), both published in peer-reviewed economics journals.[18] This approach has been applied to estimate water shortage costs for major utilities throughout California, including the Metropolitan Water District of Southern California, East Bay Municipal Utility

[18] Buck, Steven, Maximilian Auffhammer, Stephen Hamilton, and David Sunding. 2016. "Measuring Welfare Losses from Urban Water Supply Disruptions." *Journal of the Association of Environmental and Resource Economists* 3 (3): 743–778. https://doi.org/10.1086/686018;
Brozović, Nicholas, David L. Sunding, and David Zilberman. "Estimating Business and Residential Water Demand Functions." *Water Resources Research* 43, no. 12 (2007): W12411. https://doi.org/10.1029/2006WR005388.

District, San Francisco Public Utilities Commission, and the Municipal Water District of Orange County.

Baseline water prices are drawn from 2025 rate schedules for each provider. Future prices are assumed to grow at 2.5% annually in real terms, consistent with historical rate trends observed in the region. Provider-specific demand data are drawn from ADWR annual reports.

The analysis employs an iso-elastic (constant elasticity) demand function, which is standard in water economics because it provides a parsimonious representation of demand requiring only three parameters: observed quantity, observed price, and an elasticity estimate. We apply a price elasticity of -0.3 throughout the analysis. This value falls within the range of published estimates for urban residential customers in arid regions of the western United States, where conservation programs have already captured many low-cost savings opportunities, making remaining demand relatively price-inelastic.[19]

## 5.4. Business Interruptions

Business interruption costs represent economic losses experienced by commercial and industrial water users who cannot obtain their desired quantity of water. Unlike residential customers—whose losses are measured through consumer surplus—businesses experience losses through reduced production. The appropriate measure is the reduction in value-added (output minus intermediate input costs) attributable to water shortages.

The relationship between water curtailment and output loss is industry-specific and cannot be derived from first principles. We apply output-elasticity estimates from a 2022 survey of businesses in Orange County, California, conducted for the Municipal Water District of Orange County.[20] The survey asked businesses across eight industry sectors how a hypothetical water shortage would affect their operations, providing empirically grounded estimates of the output response to water curtailment.

These survey-based estimates represent the best available data on business responses to water shortages. While the survey was conducted in Southern California, the industry-specific output elasticities are transferable to Central Arizona because they reflect fundamental relationships between water inputs and production processes that do not vary geographically. We account for differences in regional industry composition and scale by applying Arizona-specific output data.

The output-elasticity of shortage measures the percentage change in output resulting from a one percent shortage in water supply. Table 3 presents elasticities by industry sector.

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[19] The iso-elastic demand function takes the form $Q = A \cdot P^{\varepsilon}$, where Q is quantity demanded, P is price, ε is the price elasticity of demand, and A is a scaling parameter. Following Buck et al. (2016), the average welfare loss per unit of curtailed water is: $\frac{L}{Q \cdot r} = \frac{\varepsilon}{1+\varepsilon} \cdot P \cdot \frac{1-(1-r)^{\frac{1+\varepsilon}{\varepsilon}}}{r} - c$, where L is total welfare loss, Q is baseline consumption, r is the proportional reduction in supply, P is baseline price, and c is marginal cost. This formula captures several economically meaningful properties: welfare losses increase more than proportionally with shortage severity (reflecting that households first curtail low-value uses like lawn irrigation, then must forgo increasingly valuable uses as shortages deepen), and welfare losses exceed simple revenue calculations because they capture full willingness to pay.

[20] Boarnet, Marlon, Wallace Walrod, David L. Sunding, and Oliver R. Browne. 2022. *The Economic Impacts of Water Shortages in Orange County*. San Francisco: The Brattle Group. Prepared for Municipal Water District of Orange County.

**Table 3: Value Added and Shortage Elasticity**

| Sector | Value Added (2025) | Elasticity of Shortage |
|---|---|---|
| 11 - Agriculture, Forestry, Fishing and Hunting | $1,115,797,527 | 0.106 |
| 21 - Mining, Quarrying, and Oil and Gas Extraction | $2,655,584,919 | 0.053 |
| 22 - Utilities | $6,710,496,107 | 0.053 |
| 23 - Construction | $31,716,861,861 | 0.053 |
| 31-33 - Manufacturing | $37,045,326,959 | 0.187 |
| 42 - Wholesale Trade | $25,767,185,477 | 0.100 |
| 44-45 - Retail Trade | $30,203,242,489 | 0.103 |
| 48-49 - Transportation and Warehousing | $16,280,769,016 | 0.100 |
| 51 - Information | $16,052,926,729 | 0.097 |
| 52 - Finance and Insurance | $33,650,551,011 | 0.097 |
| 53 - Real Estate and Rental and Leasing | $76,695,879,219 | 0.097 |
| 54 - Professional, Scientific, and Technical Services | $35,463,376,106 | 0.067 |
| 55 - Management of Companies and Enterprises | $7,489,451,110 | 0.067 |
| 56 - Administrative, Support, Waste and Remediation | $22,316,888,773 | 0.067 |
| 61 - Educational Services | $4,526,202,616 | 0.045 |
| 62 - Health Care and Social Assistance | $39,882,023,633 | 0.045 |
| 71 - Arts, Entertainment, and Recreation | $4,213,155,855 | 0.197 |
| 72 - Accommodation and Food Services | $17,872,547,892 | 0.197 |
| 81 - Other Services (except Public Administration) | $13,026,879,414 | 0.103 |
| 9A - Government Enterprises | $8,382,037,149 | 0.106 |
| 93 - Non-NAICS | $0 | 0.106 |
| 9B - Administrative Government | $35,897,694,817 | 0.106 |
| **Total** | **$466,964,878,681** | **0.097** |

The average output-elasticity of 0.097 indicates that a 10% shortage in water supply leads to approximately a 1% reduction in output.

## 5.5. Foregone Development

Foregone development measures the value of residential and commercial construction that cannot occur due to water supply constraints. Under Arizona's Assured Water Supply framework, new subdivisions cannot be approved unless developers demonstrate a 100-year assured supply. When providers lack sufficient water to serve new customers, development that would otherwise occur is precluded.

Foregone development is valued using property values, which capitalizes the expected future stream of economic benefits from development. This approach is appropriate because property values reflect not just construction costs but the full economic value that residents and businesses derive from occupying developed land—including access to employment, amenities, and economic opportunities.

For residential foregone development, we estimate the number of housing units that cannot be built due to water constraints. The calculation divides the shortage volume allocated to new residential demand by provider-specific estimates of per-household water consumption. Per-household consumption is derived from GPCD estimates in Assured Water Supply designations multiplied by average household occupancy rates from Census data.

Housing values are based on 2025 data from Zillow for each provider's service area. Future values are assumed to appreciate at 4% annually in real terms, consistent with historical home price growth rates observed in the Zillow data for the region.

For commercial and industrial foregone development, we estimate the acreage that cannot be developed due to water constraints. The calculation divides the shortage volume allocated to new C&I demand by the assumed water demand rate of 2.4 acre-feet per acre (consistent with the demand methodology in Section 3.7. Commercial and industrial land values are based on 2025 data from Zillow. The same 4% real appreciation rate is applied.

The share of demand attributable to residential versus commercial/industrial uses is held constant for each provider throughout the analysis period, based on current demand composition from Assured Water Supply documentation. For providers where this breakdown is unavailable, regional averages are applied.

### 5.6. Lost Provider Revenues

Water providers experience direct financial losses when they cannot deliver water to customers. Lost provider revenues measure the foregone retail water sales that would have occurred under the Baseline Scenario but do not occur under Basic Coordination and Extreme Shortage.

Lost revenues are calculated by multiplying the volume of undelivered water by the applicable retail water rate. The calculation uses each provider's forecasted future current volumetric rate.

Baseline rates are drawn from 2025 rate schedules for each provider. Future rates are assumed to grow at 2.5% annually in real terms, consistent with historical rate trends observed across the region and the same assumption applied in the consumer welfare analysis.[21]

## 6. Indirect and Induced Impacts

In addition to direct benefits/impacts, this analysis also considers regional economic impacts, which are the effects of changes in the economy of a region. The size of regional economic impacts is determined by the linkages within the local/regional economy, and the leakages from this economy to the larger economy. Economic linkages are the relationships between industries, businesses, factors of production (labor and capital), and government created by trade and other exchange, such as taxes, within and among regions. Economic linkages create multiplier effects in a regional economy as money is circulated. The magnitude of impacts from economic linkages are limited by the amount of leakage in a regional economy. Economic leakages are a measure of the income shares spent outside of the region. The more the economic leakage, the less the multiplier effect. Generally, the smaller the regional economy, the higher the economic leakage.

### 6.1. IMPLAN Methodology

Regional economic analysis modeling can be achieved with IMPLAN, the most widely used input-output (I-O) impact model system in the United States. IMPLAN is an I-O database and modeling software used to estimate economic impacts of changes in demand or spending associated with project alternatives, using annual, regional data. An I-O analysis summarizes and analyzes the relationship among industries, the ripple effect of a given economic activity, and the contribution of some existing activity within a specific region.

Any given industry typically purchases goods and services from and sells goods and services to another industry within a given region, which in turn sells to or buys from other industries or supplies final

[21] Consumer welfare losses and lost provider revenues both measure economic harm from water shortages to residential customers, but they serve different purposes in the analysis. Consumer welfare losses capture the full value that households place on foregone water—this is a measure of harm to consumers grounded in consumer surplus theory. However, consumer surplus is not a measure of economic output and therefore cannot be used as an input to regional economic impact models such as IMPLAN. Lost provider revenues, by contrast, represent a reduction in economic output (utility sales) that can be traced through the regional economy.

consumers. IMPLAN uses these interindustry linkages and estimates the total economic effects within a region from a change in final demand associated with an economic sector. The industry linkages are estimated by economic multipliers. For example, a multiplier of 2.0 indicates that each dollar of direct sale generates another dollar of secondary sales in the regional economy.

Regional economic effects, estimated on an annual, point-in-time basis, include:

- Direct Effect: the initial exogenous change in final demand in terms of Industry Output, Employment, and Labor Income Dollars
- Indirect Effect: changes in the business-to-business purchases in the supply chain that stem from the initial industry input purchases
- Induced Effect: changes in expenditures of household income (typically the wages of employees working in the IMPLAN industries)[22]

Changes in population are estimated based on the changes in employment that are produced in the economic model.

# 7. Results

This section presents the economic impacts of reduced CAP deliveries under the Basic Coordination Scenario and Extreme Shortage Scenario relative to the Baseline Scenario. Results are organized into three categories: direct economic impacts, which measure the immediate effects of water supply reductions; indirect and induced impacts, which capture the broader effects on regional economic activity; and employment, housing, and population impacts, which translate economic losses into workforce and demographic outcomes.

All values are reported in real constant 2025 dollars unless otherwise noted. Impacts are cumulative over the analysis period (2027–2060) except where annual figures are specified.

## 7.1. Direct Economic Impacts

Direct economic impacts represent the initial, immediate economic losses resulting from reduced CAP deliveries. These impacts occur before accounting for the ripple effects through supply chains and household spending that are captured in the indirect and induced impact analysis.

Six categories of direct impacts are quantified:

**Depleted Water Resources.** As providers substitute groundwater and long-term storage credits for lost CAP deliveries, they deplete reserves accumulated over decades.

Between 2027 and 2060, the Basic Coordination Scenario results in an additional drawdown of 8.0 million acre-feet relative to the Baseline—4.4 million acre-feet of native groundwater and 3.6 million acre-feet of banked storage credits. Valued at projected market prices under shortage conditions, depleted water resources represent a loss of $19.8 billion.

Between 2027 and 2060, the Extreme Shortage Scenario results in an additional drawdown of 8.7 million acre-feet relative to the Baseline—4.5 million acre-feet of native groundwater and 4.2 million acre-feet of banked storage credits. Valued at projected market prices under shortage conditions, depleted water resources represent a loss of $167.8 billion.

**Tribal Water Resources.** Tribal contractors lose the ability to market surplus CAP water. Under the

[22] IMPLAN Support, How IMPLAN Works. August 30, 2023.

Baseline Scenario, tribes generate approximately 40,000 acre-feet annually of surplus water available for storage and sale; under the Basic Coordination Scenario, this volume falls to approximately 150 acre-feet, and under Extreme Shortage the volume is completely eliminated. The cumulative value of foregone tribal water marketing revenue totals $7.4 billion under Basic Coordination and $64.1 billion under Extreme Shortage over the analysis period.[23]

**Consumer Welfare Losses.** Residential customers who receive less water than they would prefer to consume experience welfare losses — reductions in economic well-being that exceed the financial cost of water. These losses reflect the full value households place on foregone water uses, from landscape irrigation to indoor consumption. Using the welfare methodology described in Section 5.3, cumulative residential welfare losses total $38.5 billion under Basic Coordination and $64.1 billion under Extreme Shortage.

**Business Interruptions.** Commercial and industrial water users experience production losses when they cannot obtain their desired quantity of water. Applying industry-specific output elasticities to projected C&I shortages, cumulative business interruption costs total $308 million under Basic Coordination and $462 million under Extreme Shortage.

**Foregone Development.** Water supply constraints preclude residential and commercial construction that would otherwise occur under Arizona's Assured Water Supply framework. The value of foregone development—measured through residential property values and commercial land values—totals $467 million under Basic Coordination and $550 million under Extreme Shortage over the analysis period.

**Lost Provider Revenues.** Water providers experience direct financial losses when they cannot deliver water to customers. Foregone retail water sales total $18 million under Basic Coordination and $27 million under Extreme Shortage cumulatively.

Figure 11 and Figure 12Figure 11 illustrate how direct economic impacts evolve over time. Impacts to water resources begin immediately in 2027 as providers draw down reserves and tribes lose marketing opportunities. Consumer welfare losses and business interruptions commence in 2030, the first year in which customer-level shortages are projected, and increase as shortages deepen through 2060.

[23] Tribes generate revenue from Intentionally Created Surplus (ICS) be reducing their Colorado River water usage to create savings stored in Lake Mead, which can then be leased or sold to off-reservation users, as well as through other types of leases and sales. This analysis values surplus Indian Priority CAP water as sales of LTSCs.

**Figure 11: Annual Direct Economic Impacts (Basic Coordination)**

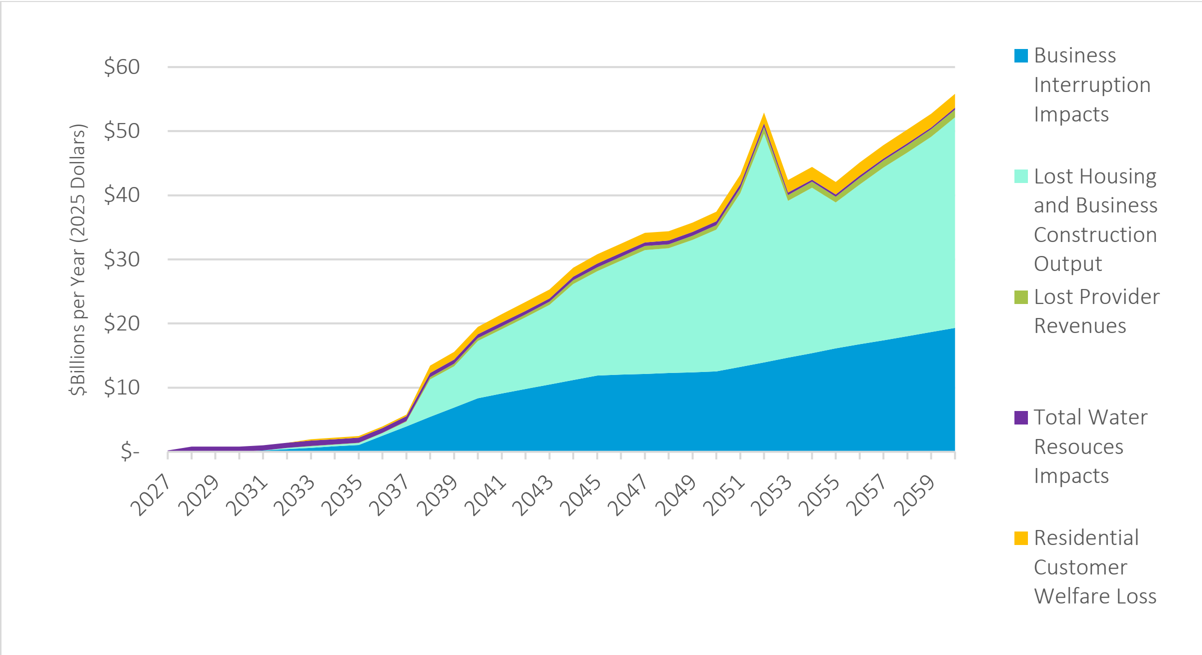



**Figure 12: Annual Direct Economic Impacts (Extreme Shortage)**

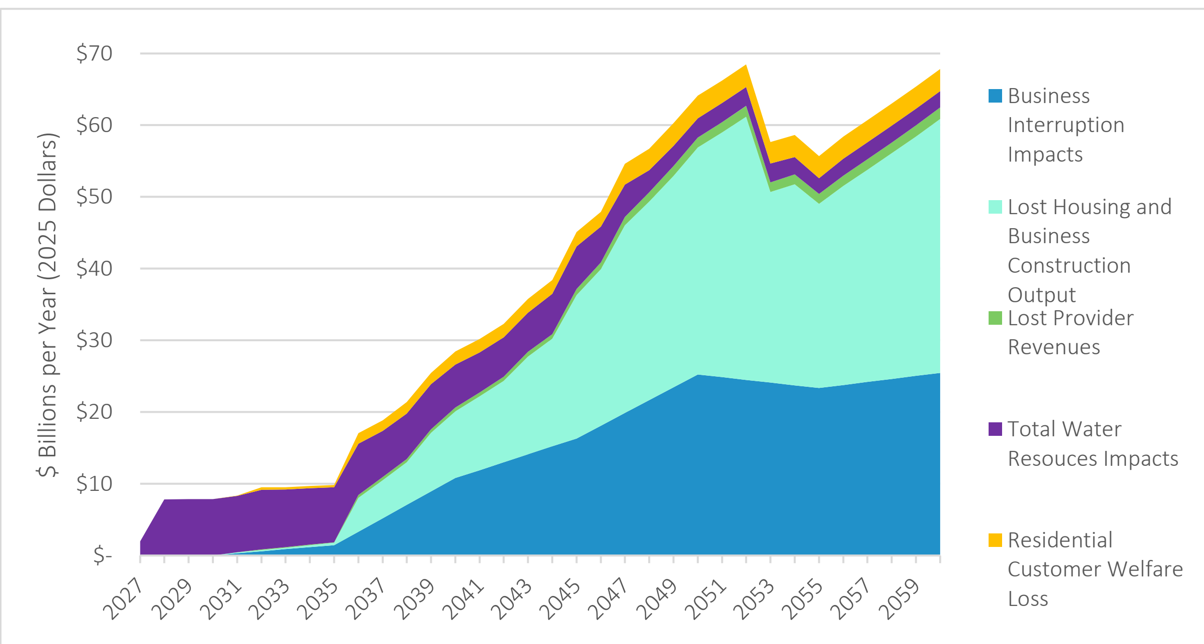


**Table 4: Direct Economic Impacts**

| Scenario | Year | Impacts to Water Resources | | | | Lost Economic Output | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Depleted GW and LTSC | Tribal Water Losses | Total | Welfare Losses (Existing Residents) | Business Interruptions (Existing Businesses) | Foregone Development (New Growth) | Lost Revenues (Water Providers) | Total |
| | | $ Billions (2025) | | | | | | | |
| Basic Coordination | 2027 | $0.00 | $0.21 | $0.21 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 |
| | 2031 | $0.57 | $0.21 | $0.78 | $0.00 | $0.21 | $0.00 | $0.00 | $0.21 |
| | 2040 | $0.42 | $0.21 | $0.63 | $1.13 | $8.37 | $8.93 | $0.41 | $17.71 |
| | 2050 | $0.40 | $0.21 | $0.61 | $1.47 | $12.52 | $22.13 | $0.68 | $35.34 |
| | 2060 | $0.08 | $0.21 | $0.29 | $2.16 | $19.32 | $32.86 | $1.21 | $53.38 |
| | Total (2027-2060) | **$12.36** | **$7.37** | **$19.73** | **$38.45** | **$307.67** | **$467.11** | **$17.51** | **$792.28** |
| Extreme Shortage | 2027 | $0.23 | $2.63 | $2.86 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 |
| | 2031 | $6.09 | $2.63 | $8.72 | $0.06 | $0.31 | $0.13 | $0.02 | $0.46 |
| | 2040 | $4.23 | $2.63 | $6.86 | $1.84 | $10.80 | $9.30 | $0.51 | $20.62 |
| | 2050 | $0.92 | $2.63 | $3.55 | $3.15 | $25.24 | $31.65 | $1.40 | $58.30 |
| | 2060 | $0.54 | $2.63 | $3.17 | $3.08 | $25.46 | $35.42 | $1.58 | $62.46 |
| | Total (2027-2060) | **$108.06** | **$64.08** | **$172.14** | **$64.14** | **$462.38** | **$550.38** | **$26.54** | **$1,039.31** |

## 7.2. Total Economic Impacts

Direct economic impacts generate secondary effects as reduced economic activity propagates through the regional economy. Businesses that lose output reduce purchases from suppliers (indirect effects), and households with reduced income curtail consumer spending (induced effects). IMPLAN modeling for Maricopa, Pinal, and Pima counties indicates a total impact multiplier of 2.68, meaning that each dollar of direct economic impact generates an additional $1.68 in indirect and induced effects.

Table 5 summarizes direct, indirect, and induced impacts on GDP across the analysis period. Figure 13 and Figure 14 illustrate how these impacts grow over time as water shortages deepen.

**Table 5: Direct, Indirect and Induced Impacts on GDP**

| Scenario | Year | Direct Impacts | | Indirect Impacts | | Induced Impacts | | Total Impact | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $ Billions (2025) | % of GDP | $ Billions (2025) | % of GDP | $ Billions (2025) | % of GDP | $ Billions (2025) | % of GDP | GDP Multiplier |
| Basic Coordination | 2027 | $0.00 | 0.00% | $0.00 | 0.00% | $0.00 | 0.00% | $0.00 | 0.00% | 0.00 |
| | 2031 | $0.21 | 0.04% | $0.02 | 0.00% | $0.03 | 0.01% | $0.26 | 0.05% | 1.25 |
| | 2040 | $17.71 | 3.12% | $11.58 | 2.04% | $17.80 | 3.14% | $47.09 | 8.31% | 2.66 |
| | 2050 | $35.34 | 5.37% | $26.83 | 4.08% | $41.05 | 6.24% | $103.21 | 15.69% | 2.92 |
| | 2060 | $53.38 | 6.99% | $39.80 | 5.21% | $60.68 | 7.95% | $153.86 | 20.16% | 2.88 |
| | **Total (2027-2060)** | **$792.28** | **3.86%** | **$565.96** | **2.76%** | **$866.04** | **4.22%** | **$2,221.40** | **10.83%** | **2.81** |
| Extreme Shortage | 2027 | $0.00 | 0.00% | $0.00 | 0.00% | $0.00 | 0.00% | $0.00 | 0.00% | 0.00 |
| | 2031 | $0.46 | 0.09% | $0.19 | 0.04% | $0.29 | 0.06% | $0.94 | 0.19% | 2.03 |
| | 2040 | $20.62 | 3.64% | $12.68 | 2.24% | $19.53 | 3.45% | $52.83 | 9.32% | 2.56 |
| | 2050 | $58.30 | 8.86% | $39.80 | 6.05% | $60.91 | 9.26% | $159.01 | 24.18% | 2.73 |
| | 2060 | $62.46 | 8.18% | $43.79 | 5.74% | $66.77 | 8.75% | $173.02 | 22.67% | 2.77 |
| | **Total (2027-2060)** | **$1,039.31** | **5.06%** | **$689.72** | **3.36%** | **$1,055.52** | **5.14%** | **$2,780.52** | **13.55%** | **2.68** |

**Figure 13: Direct, Indirect and Induced Economic Impacts of a reduction in CAP Deliveries Under Basic Coordination**

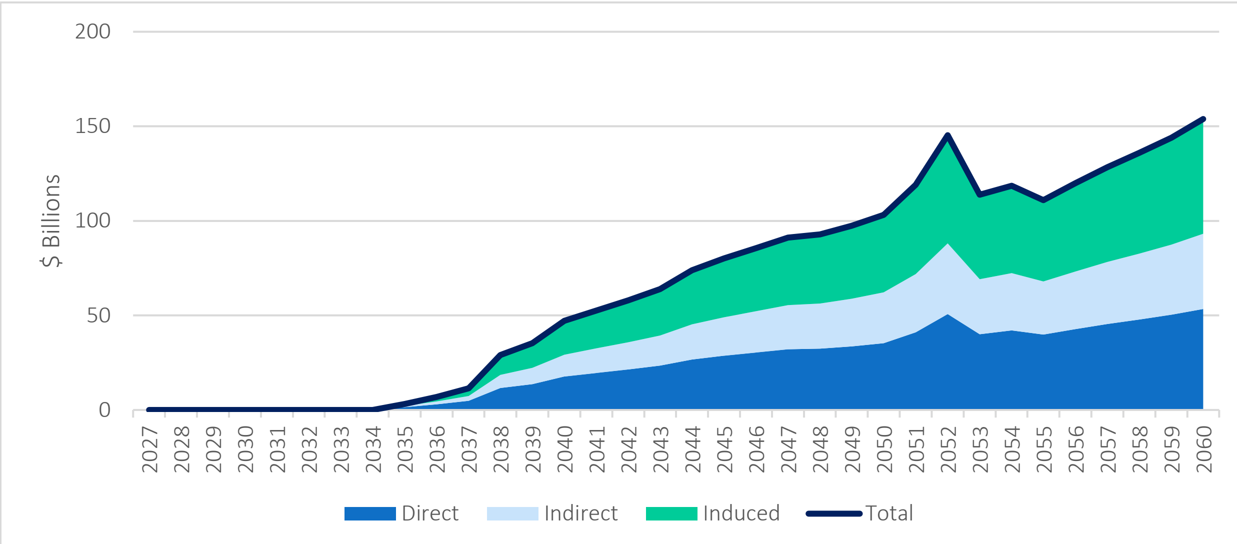
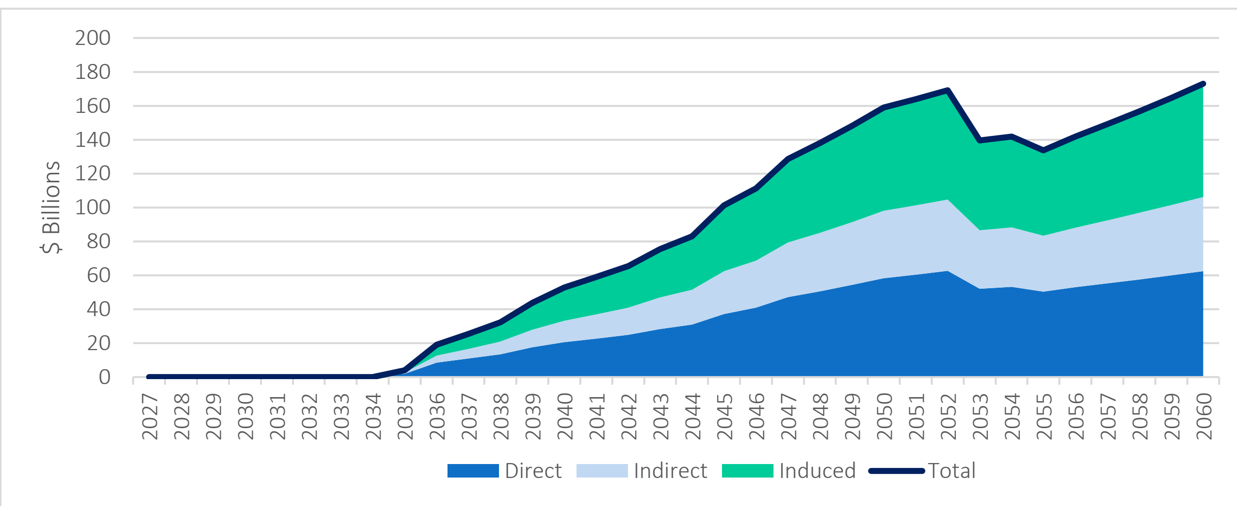



**Figure 14: Direct, Indirect and Induced Economic Impacts of a reduction in CAP Deliveries Under Extreme Shortage Scenario**




## *7.3. Population, Employment and Housing*

Economic losses translate into reduced employment, forgone housing development, and slower population growth. This section quantifies these demographic and labor market effects.

The IMPLAN analysis estimates that reduced CAP deliveries would eliminate 5.27 million job-years of employment between 2027 and 2060 under Basic Coordination, equivalent to 3.34% of total regional employment, and would eliminate 6.98 million job-years of employment under Extreme Shortage, equivalent to 4.42% of total regional employment. Employment impacts grow as water shortages deepen: annual job losses reach 127,028 (Basic Coordination) to 147,489 (Extreme Shortage) by 2040 and 348,494 (Basic Coordination) to 406,460 (Extreme Shortage) by 2060, a reduction of 7.96% relative to projected employment.

Employment losses translate into slower population growth and foregone housing development. Using an employment-to-population ratio of 2.10 based on Census data, the region would support 266,758 fewer residents by 2040 and 731,837 fewer by 2060, a 7.90% reduction under Basic Coordination, and 309,726 fewer residents by 2040 and 853,566 fewer by 2060, a 9.21% reduction under Extreme Shortage.

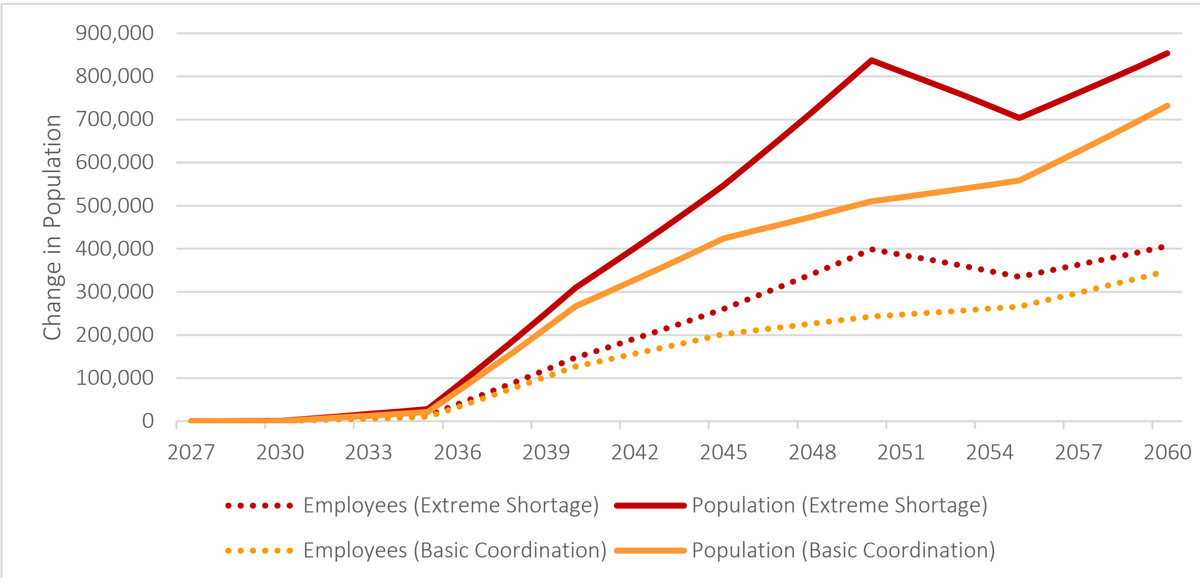
Foregone housing is estimated separately from the IMPLAN model based on the volume of water shortage allocated to new residential demand in the water supply model, rather than derived from IMPLAN. By 2060, under Basic Coordination, foregone housing totals 248,558 units annually, with 4.60 million units foregone over the full analysis period. Under Extreme shortage, forgone housing totals 268,422 units annually by 2060 and 5.65 million units over the full analysis period.

Table 6 summarizes employment, population, and housing impacts at key years and cumulatively. Figure 15 illustrates the trajectory of employment and population losses.

**Table 6: Employment, Population, and Housing Impacts**

| Scenario | Year | Jobs Lost | | Population Lost | | Lost Housing Units | |
|---|---|---|---|---|---|---|---|
| | | Employees | % | Population | % | Units | % |
| Basic Coordination | 2027 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| | 2031 | 1,977 | 0.05% | 4,152 | 0.06% | 0 | 0.00% |
| | 2040 | 127,028 | 3.03% | 266,758 | 3.46% | 124,045 | 3.71% |
| | 2050 | 242,873 | 5.25% | 510,034 | 6.01% | 214,155 | 5.77% |
| | 2060 | 348,494 | 6.82% | 731,837 | 7.90% | 248,558 | 6.09% |
| | **Total (2027-2060)** | **5,272,838** | **3.34%** | **11,072,961** | **3.83%** | **4,599,218** | **3.65%** |
| Extreme Shortage | 2027 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| | 2031 | 2,684 | 0.07% | 5,637 | 0.08% | 2,917 | 0.10% |
| | 2040 | 147,489 | 3.52% | 309,726 | 4.02% | 131,462 | 3.93% |
| | 2050 | 398,487 | 8.62% | 836,823 | 9.86% | 333,036 | 8.97% |
| | 2060 | 406,460 | 7.96% | 853,566 | 9.21% | 268,422 | 6.58% |
| | **Total (2027-2060)** | **6,980,079** | **4.42%** | **14,658,166** | **5.07%** | **5,648,232** | **4.50%** |

**Figure 15: Forecast Changes in Employment and Population**




## 8. Other Impacts not Quantified

The economic impacts presented in this report are conservative. Several categories of likely impacts have not been quantified due to data limitations or methodological complexity.

**Land Subsidence.** Groundwater overdraft causes land subsidence—the gradual sinking of the land surface as aquifer compaction occurs. Renewed large-scale groundwater extraction to replace lost CAP supplies could accelerate subsidence, damaging roads, canals, building foundations, and other infrastructure. In California's Central Valley, subsidence has reduced the capacity of major aqueducts including the California Aqueduct and the Delta-Mendota Canal, requiring costly repairs and limiting water delivery capability. Quantifying potential subsidence impacts in Central Arizona would require detailed geologic and hydrogeologic study beyond the scope of this analysis.

**Increased Energy Costs.** As groundwater levels decline from increased pumping, the energy required to lift water to the surface increases. The magnitude of this effect depends on the relationship between withdrawal rates and depth to groundwater, which varies spatially across the region and would require hydrogeologic modeling to estimate. Energy cost increases could be substantial but have not been quantified.

**Infrastructure Investment.** The analysis assumes providers have physical capacity to pump groundwater and recover long-term storage credits as needed. In practice, many providers would need to construct new wells, expand treatment facilities, and build conveyance infrastructure to access alternative supplies at the scale required. Additionally, increased reliance on deeper groundwater may present water quality challenges in some areas, potentially requiring additional treatment investment. These capital requirements have not been estimated.

**Alternative Supply Development.** The analysis does not assume development of new water supplies such as desalination or importation from other basins. If pursued, these alternatives would require substantial capital investment. Recent seawater desalination contracts in Southern California—including projects in San Diego and Montecito—suggest delivered costs in the range of $3,500 to $5,000 per acre-foot before accounting for conveyance to Central Arizona. Delivering desalinated water to the region would require either an exchange arrangement with an entity such as the Metropolitan Water District of Southern California or development of new conveyance infrastructure. The costs of such arrangements have not been estimated.

These unquantified impacts reinforce the conclusion that the total economic impact estimates presented in this report represent a conservative, lower-bound estimate of the true economic consequences of severely reduced CAP deliveries.

### 8.1. Case Study: TSMC Arizona

Arizona has attracted several large advanced manufacturing investments in recent years, including semiconductor fabrication and packaging facilities from TSMC ($165 billion)[24], Intel ($20 billion)[25] and Amkor ($7 billion)[26] and a battery manufacturing facility from LG Energy Solution ($5.5 billion)[27]. While these facilities are not currently constrained by physical water availability, their long-term viability depends on corporate assessments of water supply reliability, regulatory stability, and political risk associated with their water supplies, including those from the Colorado River. The TSMC facility—the largest foreign greenfield investment in U.S. history—illustrates the scale of investment potentially at risk.

TSMC initially announced a $65 billion investment in three Arizona fabrication facilities in 2020. An economic impact analysis prepared by the Greater Phoenix Economic Council (GPEC) in 2024 estimated this investment would generate approximately $32.9 billion in total economic output over 13 years; $17.3 billion in direct economic output generated by TSMC operations and an additional $15.6 billion in indirect output arising from supply-chain activity and household spending effects—implying an output multiplier of approximately 1.9. The total economic output of $32.9 billion represents how much of the capital spend of TSMC will be profits and revenues to local firms. These outputs include revenues and profits associated with the correlated study area and timing. The initial investment may include significant costs outside of the study area and the costs are timed differently from future profits, which will occur after the factory is constructed. The analysis also projected $9.3 billion in personal income and $1.4 billion in state and local tax revenues over the same period.[28]

In 2025, TSMC announced plans to substantially expand its Arizona investment to approximately $165 billion, encompassing six semiconductor fabrication facilities, two advanced packaging facilities, and a research and development center. At the time of writing, no updated economic impact analysis has been published reflecting this expanded scope. However, because IMPLAN is a linear input–output modeling framework with constant returns to scale, it is reasonable—absent project-specific information on procurement, workforce localization, or changes in supplier sourcing—to use linear scaling of the 2024 GPEC results as a first-order approximation of the expanded investment's potential impacts. [29] Applying this approach, the $165 billion investment (approximately 2.54 times the original $65 billion program) would be expected to generate on the order of $84 billion in total economic output over a comparable analysis horizon, including approximately $24 billion in personal income and nearly $3.6 billion in

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24 TSMC press release announcing total expected U.S. investment reaching $165B (Mar. 4, 2025)

25 Intel Breaks Ground on Two New Leading-Edge Chip Factories in Arizona (Sep. 24, 2021)

26 Amkor breaks ground in Peoria's Innovation Core (Oct. 6, 2025)

27 LG Energy Solution to Invest 7.2 Trillion to Build Battery Manufacturing Complex in Arizona, Step Up EV and ESS Battery Production in North America (Mar. 24, 2023)

28 TSMC Arizona's Economic Impact, 2024. TSMC Arizona, https://www.tsmc.com/static/abouttsmcaz/index.htm

29 Detailed Key Assumptions of IMPLAN & Input-Output Analysis – IMPLAN - Support

Miller, Ronald E. and Peter D. Blair. 2009. *Input-Output Analysis: Foundations and Extensions*, 2nd ed. Cambridge: Cambridge University Press.

combined state and local tax revenues.[30]

Together, the scale of the TSMC Arizona and other advanced manufacturing investments underscore the risks associated with reduced Colorado River deliveries that cannot be adequately captured in economic model. Even if near-term physical water for these projects can be secured, perceived sustainability risks associated with prolonged Colorado River shortages may influence future investment decisions, expansion timelines, and corporate location strategies.

# 9. Discussion and Conclusion

The Central Arizona Project enabled four decades of economic growth by providing a renewable water supply to replace overdrafted groundwater. The region's economy—now generating nearly $500 billion annually in GDP and supporting 2.8 million jobs—was built on the foundation of reliable CAP deliveries.

This study estimates the economic impact of a reduction in CAP supplies from 900,000 acre-feet to 236,900 acre-feet per year under a Basic Coordination Scenario, and down to zero acre-feet per year under an Extreme Shortage Scenario. Under the Extreme Shortage Scenario, deliveries to Tribal contractors and M&I subcontractors are zero.

The water supply model incorporates the complete water supply portfolio of all 40 CAP M&I subcontractors, including CAP allocations, groundwater allowances, long-term storage credits, effluent, and alternative surface water supplies. The model simulates how contractors substitute for lost CAP deliveries by drawing down long-term storage credits and groundwater stocks before shortages reach customers.

The analysis models the regulatory availability of groundwater under Arizona's Active Management Area framework, not physical aquifer limits. Providers experience shortages when they exhaust their authorized groundwater allowances and available storage credits, even if additional physical groundwater might exist. The analysis does not model costs or other impacts of increased groundwater reliance, including potential subsidence, water quality degradation, or increased pumping costs.

Water supply shortages in the CAP service area are significantly larger and occur much sooner under the basic coordination and extreme shortage scenarios. Some providers begin experiencing shortages as early as 2030, with shortfalls expanding as backup supplies are exhausted. By 2060, annual shortages from Baseline reach 588,200 acre-feet under Extreme Shortage—34% of regional municipal demand.

The water market pricing model estimates that wholesale water prices in Arizona would increase from approximately $500 per acre-foot under current conditions to $12,840 per acre-foot under the Extreme Shortage Scenario. This price response reflects the increasing scarcity value of water as CAP supplies decline.

The analysis assumes no new supply development beyond projects already underway. Providers facing shortages might pursue alternative supplies such as seawater desalination, basin importation, or advanced water recycling. However, these alternatives could reduce future shortages and the associated economic impacts but would require substantial capital investment at costs comparable to or exceeding the forecast water market prices.

[30] These figures should be interpreted as order-of-magnitude indicators rather than precise forecasts, as actual impacts will depend on the final composition of facilities, construction phasing, supply-chain localization, labor market conditions, and infrastructure constraints.

Severe reductions in CAP water would significantly slow economic growth in Central Arizona. Economic impacts between 2027 and 2060 total $2.22 trillion under Basic Coordination and $2.78 trillion under Extreme Shortage—an 11%-14%reduction in average regional GDP over that period. In 2060, the region would support 348,500-406,500 fewer jobs, 731,800-853,600 fewer residents, and 248,600-268,400 fewer housing units than under current conditions.