Intentionally Created Surplus:

Boosting Colorado River Reservoirs by Two Million Acre-Feet

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The Metropolitan Water District of Southern California

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ABSTRACT

In this paper, we evaluate the effect of Extraordinary Conservation (EC) Intentionally Created Surplus (ICS) storage on the operations and levels of Lake Powell and Lake Mead, compared to a hypothetical scenario in which there was no EC ICS storage—a "No ICS World." The paper provides background on the history and rules of the ICS program, explains the methodology used for analyzing the effect of EC ICS storage on Lakes Powell and Mead, and concludes with a set of findings and recommendations for any future Colorado River reservoir storage program. The key findings of the paper are as follows:

- **The ICS program incentivized aggressive water conservation.** During the period of the program, Lower Basin annual consumptive use of mainstem water dropped from 7.5 million acre-feet (MAF) to 6.57 MAF.
- **The ICS program resulted in additional system water in Colorado River reservoirs** due to initial 5% system assessments on stored water and the conversion of EC ICS to system water due to the exceedance of EC ICS storage limits.
- **EC ICS provided critical water management flexibility, especially for junior priority water users**, whose supplies are impacted by higher priority water use each year, while not impacting senior priority water users.
- **The ICS program maintained more water in both Lakes Powell and Mead than would otherwise have been the case.** Of the 2.8 MAF of EC ICS stored in the Colorado River system, 1.3 MAF (47%) currently resides in Lake Mead while 0.658 MAF (24%) resides in Lake Powell due to reduced balancing or equalization releases. The remainder was withdrawn, converted to system water, or evaporated.
- **Storage reduced the frequency and magnitude of Lower Basin shortages**, thereby offsetting mandatory water use reductions for some Lower Basin water users.
- **Hypothetically, if all water stored as EC ICS were withdrawn, the system would have less water than if the EC ICS had never been stored at all.** The EC ICS credit currently available to Lower Basin entities is 2.3 MAF, which exceeds the EC ICS storage remaining by roughly 0.3 MAF.

Based on these findings, we offer the following key recommendations for any future storage program:

- **Given the benefits of the ICS program, a successor storage program should be developed as part of the post-2026 guidelines.**
- **Stored water attributable to individual contractors or entitlement holders should not count when determining water supply reductions.** Among other benefits, this policy would allow for a clearer understanding of the amount of system water in Colorado River reservoirs and would prevent the situation noted above in which the system could have less water than if water had never been stored at all.
- **A new stored water program should include appropriate system assessment and evaporation loss provisions.** This policy would ensure benefits for all water users—even those without storage in their name—and eliminate the impact of stored water on operational decisions.

I. BACKGROUND

Section 5 Contracts and Storage in Lake Mead

Section 5 of the 1928 Boulder Canyon Project Act authorized the Secretary of the Interior (Secretary) to enter into contracts with entities in the Lower Colorado River Basin (Lower Basin) to deliver water for irrigation and domestic purposes from the Boulder Canyon Reservoir, which would later be called Lake Mead. Entities with such contracts are referred to as "Section 5 contractors."

Among Section 5 contractors, the Metropolitan Water District of Southern California (MWD) is unique in that its 1931 contract with the Secretary provides MWD with "the exclusive right to withdraw and divert into its aqueduct any water in Boulder Canyon Reservoir [i.e., Lake Mead] accumulated to the individual credit of said district…by reason of reduced diversions by said district."[1] Thus, before the 2007 Interim Guidelines (Guidelines), MWD was the only Section 5 contractor with the right to store water in Lake Mead and then withdraw and divert it at a future date. However, MWD's provisions for storage were never implemented due to opposition from other states.

Prior to the year 2000, conditions in the Colorado River Basin were relatively wet and Lower Basin demands were not fully developed, leading to relatively high reservoir elevations. As a result, California had access to surplus or unused apportioned water from the Colorado River through 2002, and MWD did not pursue implementing agreements to exercise its right to store water in Lake Mead. Instead, MWD stored surplus water in its service area. However, beginning in 2003, surplus water was no longer available to California, which forced the state to rapidly reduce its annual consumption of Colorado River water by 800,000 acre-feet (AF) to its basic apportionment of 4.4 million acre-feet (MAF). Because MWD is the junior priority water user in California, this reduction significantly impacted MWD's supplies. With reduced supplies and variable demands for Colorado River water, surface water storage in Lake Mead became a critical need for MWD to manage its other variable supplies and meet its member agency demands. This need for storage on the Colorado River drove MWD to pursue its right to store water in Lake Mead as part of the development of the Guidelines.

Lake Mead Storage as "Intentionally Created Surplus"

However, Arizona objected to a straightforward exercise of MWD's Section 5 contract right to store water in Lake Mead based on the 1964 Arizona v. California Decree which states that Lower Basin deliveries of mainstream water above state apportionments are "surplus."[2] Instead, Arizona worked with California to develop the Guidelines such that conserved water left on the Colorado River by individual agencies was referred to as "Intentionally Created Surplus" (ICS) to ensure consistency with the decree. This new program in the Guidelines was not based on MWD's Section 5 contract storage right. Under the Guidelines, participation in the ICS program was open to any Section 5 contractor that could get authorization within its state. Strictly, the ICS program allowed for the generation of future delivery credits, not reservoir storage. However, since water users have come to refer to ICS credits as "storage," we will also use that term when referring to them.

ICS Types and Conservation

There are six types of ICS. Four of these were identified in the Guidelines, while two were established after the Guidelines were implemented **(Table 1)**.

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[1] MWD's Section 5 Contract, 1931, Sec. 8.
[2] *Arizona v. California*, Decree, 1964, Article II(B)(2).

Table 1. Types of ICS

Category of ICS	Implementing Documents
Extraordinary Conservation ICS (EC ICS)	Guidelines
Tributary Conservation ICS (Tributary ICS)	Guidelines
System Efficiency ICS	Guidelines
Imported ICS	Guidelines
Binational ICS (BICS)	Minute 319, Minute 323
Drought Contingency Plan ICS (DCP ICS)	2019 Drought Contingency Plan

The analysis in this white paper focuses on EC ICS as it is the type of ICS that parties have stored most extensively. EC ICS can be stored when a Section 5 contractor or entitlement holder (1) conserves water through an approved conservation activity and (2) reduces diversions by a like amount.

Conservation activities include fallowing land that would otherwise have been irrigated, reducing urban use by removing turf landscaping, and desalinating brackish groundwater for use in place of Colorado River water, among others. Some of these conservation activities yield short-term reductions in demand, while others generate long-term reductions in demand. Some of these conservation activities provide fixed volumes, while others can be increased or decreased from year to year. However, all are discretionary actions taken to reduce demands.

EC ICS Storage, Loss, and Delivery Rules

Both the volume of EC ICS that may be stored in a single year and the total volume of EC ICS that may be accumulated are limited. **Table 2** shows the annual and cumulative maximum limits on storage of EC ICS by state. The opportunity to store EC ICS extends through the period of the Guidelines (2026).

Table 2. Annual and Cumulative Maximum Limits on the Storage of EC ICS [3]

State	Annual Limit (acre-feet)	Cumulative Limit (acre-feet)
California	400,000	1,700,000
Nevada	125,000	500,000
Arizona	100,000	500,000
Total	**625,000**	**2,700,000**

Once EC ICS is stored, it is subject to various losses to benefit the system and to account for the additional evaporation occurring because of the stored water. Under the Guidelines, five percent (5%) of the EC ICS stored becomes Colorado River system water, i.e., water that is available for allocation to all Colorado River water users. Additionally, under the Guidelines, the amount of EC ICS attributable to a Section 5 contractor or entitlement

[3] Cumulative limits under the Guidelines were 1,500,000 AF, 300,000 AF, and 300,000 AF for California, Nevada, and Arizona, respectively. The cumulative limits were increased by 200,000 AF for each state under the Drought Contingency Plan (DCP). Under the DCP Contributions and ICS Accumulation Limits Sharing Agreement, California and Nevada each agreed to allow Arizona to borrow up to 50,000 AF of ICS accumulation space. Under the DCP, limits became applicable to EC ICS, BICS, and DCP ICS.

holder at the end of each year is reduced by three percent (3%), beginning in the year after the water is stored, to account for incremental evaporative losses. This 3% evaporation rate represents an upwardly rounded estimate of the additional evaporation occurring due to the stored EC ICS, based on an analysis of Lake Mead storage and evaporation rate data.

The rules related to EC ICS losses were changed under the 2019 Drought Contingency Plan (DCP) to provide an incentive for storing and retaining water in the Colorado River system in the short term. Under the DCP, the one-time deduction of EC ICS assessed in the year of storage was increased from five percent (5%) to ten percent (10%) of the stored volume, and the annual three percent (3%) evaporative loss was eliminated through 2026.[4] Under the Guidelines, there are also limits on the volume of EC ICS that can be delivered in any given year **(Table 3)**. Delivery of EC ICS is permitted through 2036.

Table 3. Annual ICS Delivery Limits[5]

State	Limit (acre-feet)
California	400,000
Nevada	300,000
Arizona	300,000
Total	**1,000,000**

EC ICS Volumes Stored and Delivered

Prior to 2003, MWD filled its aqueduct almost every year. MWD did so during a period when its conservation program with Imperial Irrigation District (IID) was active (the program began in 1993), regardless of whether conditions on the California State Water Project (SWP) were wet or dry. MWD managed this by offering its member agencies a discounted rate for water that they would use to replenish their local groundwater basins. This action kept demands high while recharging local groundwater storage. Other agencies that use Colorado River water also stored water in local groundwater basins.

However, Colorado River system storage gave MWD a more effective place to store water since it could be available immediately when needed. Over time, a secondary purpose for this system storage emerged: management of water supply for mandatory storage requirements (e.g., DCP contributions) or water supply reductions. Instead of taking large reductions in water supply in specific years, water users could bank water ahead of time and use that water to offset 2019 DCP reductions during years in which they were required, which was an important factor in MWD's participation in the DCP. In the future, storage could also provide flexibility in meeting any water supply reductions required under the post-2026 operational guidelines. With this secondary purpose, all stored water is not expected to be withdrawn from the system. Storage in Colorado River reservoirs also provided more security for all water users and increased power generation.

[4] Exhibit 1 to the Lower Basin Drought Contingency Plan Agreement, Lower Basin Drought Contingency Operations ("LBOps"), IV.A.2, p. 9.

[5] Delivery provisions and limits apply to EC ICS, Tributary ICS, Imported ICS, and System Efficiency ICS when Lake Mead is in an "ICS Surplus" condition, i.e., when USBR's projection of January 1st Lake Mead elevation is above 1,075 feet (a non-shortage condition) and Lake Mead is not in a Flood Control Surplus condition. During the formulation of the Guidelines, parties disagreed over whether ICS delivery should be allowed when Lake Mead's elevation was below 1,075 feet. Under the DCP, the rules were clarified to allow ICS delivery when USBR's projection of January 1st Lake Mead elevation is below 1,075 feet (i.e., during a shortage condition) but above 1,025 feet.

With decreasing supply and this increase in storage capacity, MWD began aggressively funding higher volumes of conservation. For example, since the implementation of the Guidelines, MWD has spent approximately $1.5 billion on new and enhanced conservation programs and local resource development within its service area. Knowing that there was an additional place to store conserved water provided the security to make such a large investment. MWD also took operational actions to store conserved water specifically in the Colorado River system; these included ending the discounted water rate for replenishment supplies. Others in the Lower Basin took similar actions, aggressively implementing conservation and taking intentional steps to leave water on the river instead of storing it in local groundwater basins.

Through these actions, the Lower Basin has been able to reduce diversions of Colorado River water **(Figure 1)**. By the end of 2023, annual consumptive use in the Lower Basin had decreased from 7.5 MAF, on average, to a 5-year average of just 6.57 MAF, even with the inclusion of the 2020-2022 critical dry period within the averaging period (diversions are typically higher during dry periods).

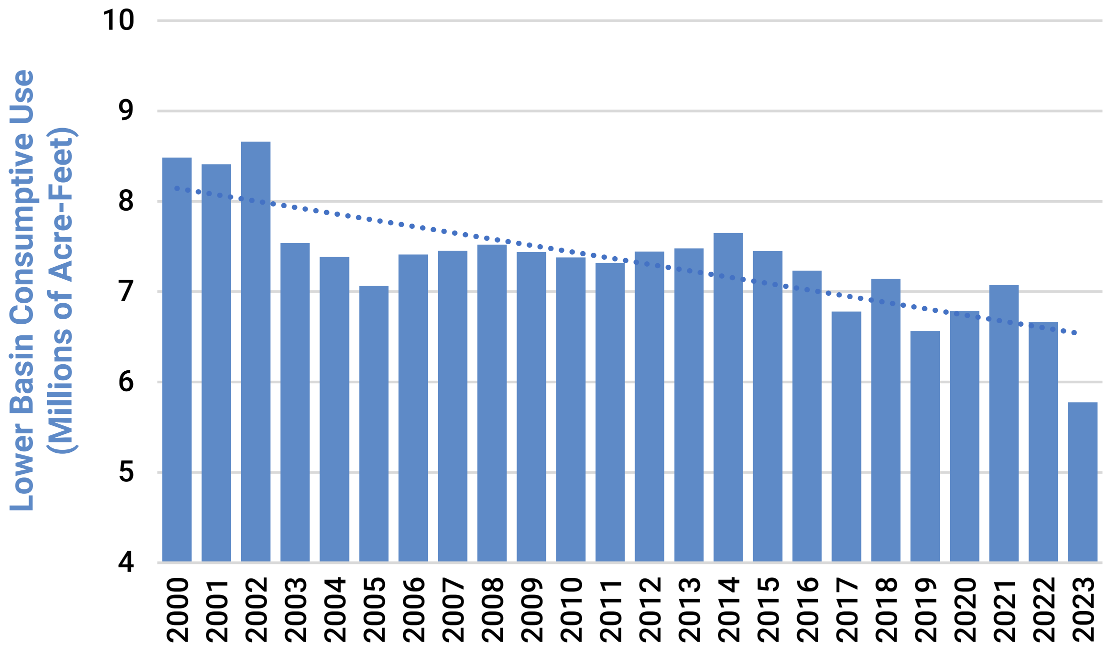

Figure 1. Lower Basin consumptive use of mainstem Colorado River water as documented in USBR's annual water accounting reports. Consumptive use shows a decreasing trend representative of increasing conservation efforts, despite interannual hydrologic variability

This reduction in use and the volume of water stored as EC ICS have exceeded expectations. In 2007, when the Guidelines were developed, it was expected that the accumulation limits would be more than sufficient. Yet, as of 2023, the Lower Basin has stored enough water to reach the maximum accumulation limits of the program.

Overall, due to conservation efforts reducing consumptive use in the Lower Basin and agency operational decisions to leave conserved water in the Colorado River system, as of 2023 entities have stored 3.465 MAF of EC ICS **(Table 4)**.

Table 4. EC ICS storage and delivery activity during the period of the Guidelines

Entity	EC ICS Storage (AF)	System/Evap Assessments* (AF)	Delivery of Stored Water (AF)	Remaining Storage Credits (AF)
Metropolitan Water District of Southern California	2,307,935	232,421	618,763	1,456,751
Imperial Irrigation District	73,011	11,978	11,033	50,000
Southern Nevada Water Authority (SNWA)**	330,570	116,636	-	213,934
Central Arizona Water Conservation District (CAWCD)	425,078	87,604	58,493	278,981
Colorado River Indian Tribes (CRIT)	10,010	1,001	-	9,009
Gila River Indian Community (GRIC)	318,565	31,857	-	286,708
Total	**3,465,169**	**481,497**	**688,289**	**2,295,383****

Based on end-of-calendar-year 2023 accounting
*Includes System Assessments, evaporation charges, and conversion of storage to system water due to exceedance of storage limits
**Does not include water originally stored as Tributary ICS

Of the 3.465 MAF stored as EC ICS, approximately 75% was stored over the last 7 years, which includes the 2020-2022 critical drought period. Only 0.688 MAF, or approximately 20%, has been withdrawn for delivery **(Figure 2)**. Of the amount withdrawn, over 70% was withdrawn in the first ten years of the ICS program. Therefore, most of the water left in the Colorado River system as EC ICS has remained in the system. Furthermore, of the almost 2.8 MAF remaining in the system, 481,497 acre-feet became system water through system assessments, evaporation charges, or conversion due to the exceedance of accumulation limits on EC ICS storage. Thus, approximately 2.3 MAF of EC ICS and DCP ICS credits remain in the system.[6] As noted, over time progressively more water was left in the system as EC ICS, and less was withdrawn. This progressive trend further shows that the reduced consumption of Colorado River water observed in the Lower Basin over the past twenty years is attributable to sustained conservation efforts and not merely variable interannual hydrologic conditions.

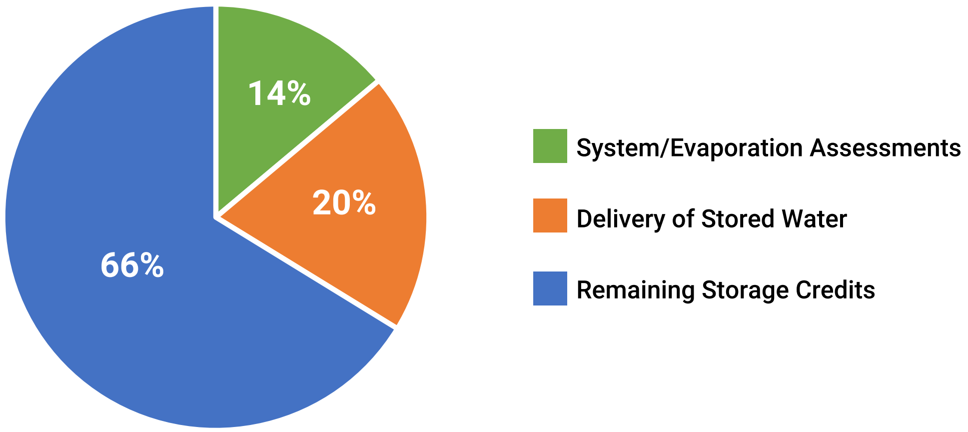

Figure 2. Disposition of water left in the Colorado River system for the purposes of EC ICS storage.

Despite this reduced consumptive use in recent years, without the ability to store conserved water in the Colorado River system, future consumptive use in the Lower Basin could rise to pre-conservation levels. While urban conservation would likely not cease, activities like fallowing in PVID could be ramped down. Additionally, Lower Basin agencies that make use of EC ICS storage all have off-stream storage options that could be used to maximize Colorado River diversions up to state apportionments. Both SNWA and CAWCD currently use off-stream groundwater storage facilities to store Colorado River water.[7] These low-cost facilities could be expanded. MWD could store water in its multiple in-state storage accounts. In light of these off-stream storage options, the storage of conserved Lower Basin water in the Colorado River system is not a foregone conclusion.

[6] Remaining EC ICS credits do not include water that originated as Tributary ICS and was later converted to EC ICS.

[7] In 2021, groundwater recharge facilities adjacent to the Central Arizona Project received almost 600,000 AF of Colorado River water for storage (https://www.cap-az.com/water/cap-system/water-operations/recharge/). Through 2023, SNWA has stored over 600,000 AF of conserved Colorado River water in Arizona's groundwater banking facilities, in addition to over 340,000 AF of conserved Colorado River water in local groundwater storage facilities in the Las Vegas Valley (https://www.snwa.com/assets/pdf/water-resource-plan-2025.pdf, p. 33).

2. METHODOLOGY

Conserving and storing 3.465 MAF of EC ICS impacted the coordinated operations of Lakes Powell and Mead during the period of the Guidelines. But how did it do so? To quantify the impact, we analyzed, year-by-year, what operations would have been if the 3.465 MAF of stored water had instead been consumptively used (i.e., operations in a "No ICS World"). We then compared the results of that analysis to actual historical operations.

This analysis factored in the water stored as EC ICS (less any EC ICS deliveries) and looked at USBR's annual operation plans, 24-month study (24 MS) projections (specifically, in decision-making months), and volume/elevation tables for both Lakes Powell and Mead to determine what Powell releases and Lower Basin shortage declarations would have been. These changes were then cumulatively tracked over time, though differences in incremental evaporation due to these changes were not included. In this manner, we were able to compare a No ICS World to actual historical operations. We used the following methods and assumptions when evaluating the No ICS World:

- We made no adjustments to account for differing rates of incremental evaporation in different years.
- Although without EC ICS the DCP would not have been implemented in its existing form, we made no assumptions regarding how DCP operations might have differed.
- The August 24 MS forecast of end-of-calendar year conditions sets the operational tier for Lakes Powell and Mead in the following calendar year, including any Lower Basin shortages. For our analysis, we adjusted the lake levels forecasted by the August 24 MS by the cumulative volume impact of previous operational changes and stored water as of the end of the calendar year for each reservoir.
- The April 24 MS forecast of end-of-water year conditions governs shifts in Lake Powell operations. For the study, we adjusted the lake levels forecasted by the April 24 MS by the cumulative volume impact of previous operational changes and stored water on each reservoir at the end of the previous calendar year; changes to equalization or balancing releases were based on end-of-water-year conditions and end-of-existing-calendar-year storage volumes.

3. FINDINGS

Since the purpose of our analysis was to understand the impact of EC ICS on the coordinated operations of Lake Powell and Lake Mead, we present our findings in three categories related to that purpose: impacts to Lake Powell, impacts to Lower Basin shortages, and impacts to Lake Mead. We also present findings on the sensitivity of our analysis to different analysis assumptions.

Impacts to Lake Powell

While volumes of EC ICS storage were small in the initial years of the program, they had an immediate impact on Lake Powell operations. In 2008, approximately 32,000 AF were left on the river for EC ICS creation purposes. That year, Lake Powell also shifted to equalization releases. Without the volume stored as EC ICS, Lake Powell would have had to release more water to equalize volumes between the two reservoirs. This dynamic was repeated several times between 2007 and 2024.[8] Without the water stored as EC ICS, Lake Powell would have been required to release additional volumes during equalization years and there would have been additional 9.0-MAF balancing releases. Overall, EC ICS reduced Powell releases by 658,000 AF through 2024, thereby increasing Lake Powell's storage by the same amount **(Figure 3)**.

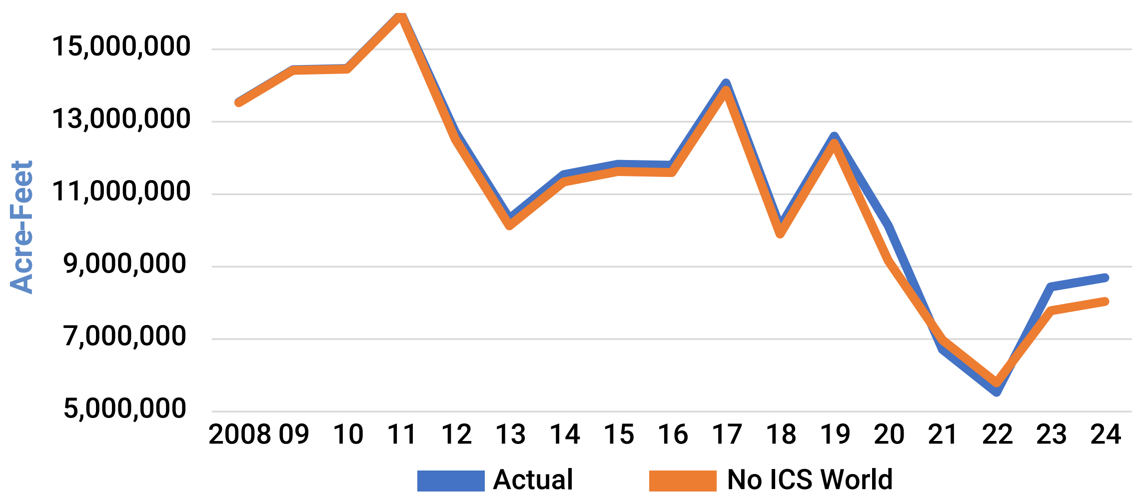

Figure 3 - Lake Powell storage with and without EC ICS. Without EC ICS storage (in a No ICS World), Lake Powell would have 658,000 MAF less in storage at the end of 2024 (orange line). Value for 2024 is projected using November 24 MS values.

[8] 2021 produced a counterintuitive result due to balancing under 6.B.2 of the 2007 Interim Guidelines.

Impacts to Lower Basin Shortages

Under the Guidelines, Lower Basin shortage determinations are based on the end-of-year elevation of Lake Mead as forecasted in August. The elevation forecast includes EC ICS stored in the lake. If the volume of stored water increases Lake Mead's elevation above a shortage threshold, stored water can reduce instances and depths of shortage, and thereby increase use. Should all the storage later be withdrawn, Lake Mead would then be lower than it otherwise would have been in the absence of the storage. Our analysis showed that EC ICS storage did, in fact, reduce the frequency and depths of shortage in the Lower Basin. Without storage, there would have been two extra years of Lower Basin shortages, one at Level 2 and the other at Level 3, after accounting for changes to Lake Powell releases **(Table 5)**.

Table 5. Instances of Lower Basin shortages

Shortage Level	With Storage	Without Storage (No ICS World)
Level 1	2	2
Level 2	1	2
Level 3	0	1
All	**3**	**5**

After factoring in the additional shortages, including the suspension of the Incidental Overrun and Payback Policy (IOPP) during shortage years, our analysis showed that decreased shortages in the Lower Basin due to EC ICS storage allowed other users to increase water use by 820,000 AF.[9]

Additionally, by reducing the frequency and depth of shortages, water that would have become system water under shortage conditions instead was available to create EC ICS or was available for paid system conservation programs. Overall, approximately 71,000 AF of water became EC ICS that otherwise would have become system water under a shortage, and approximately 140,000 AF became paid system conservation instead of unpaid system water under a shortage.

[9] The total volume of increased use is not a direct calculation of additional shortage years and shortage volumes. The calculation accounts for storage added in a year that would have been a shortage in the absence of the ICS program. The volume also includes differences related to the additional shortage years resulting in additional years with a suspension of the Incidental Overrun and Payback Policy.

Impacts to Lake Mead

The storage of EC ICS directly impacts Lake Mead. When demands are reduced to store EC ICS, less water is released from Lake Mead, and the lake rises higher than it otherwise would have. However, due to the coordinated operations of Lake Powell and Lake Mead under the Guidelines, Lake Mead would also be impacted by the changes to Powell releases and the differing frequency and depths of shortages. Overall, stored water increased the volume in Lake Mead by 1.3 MAF through 2024
(Figure 4).

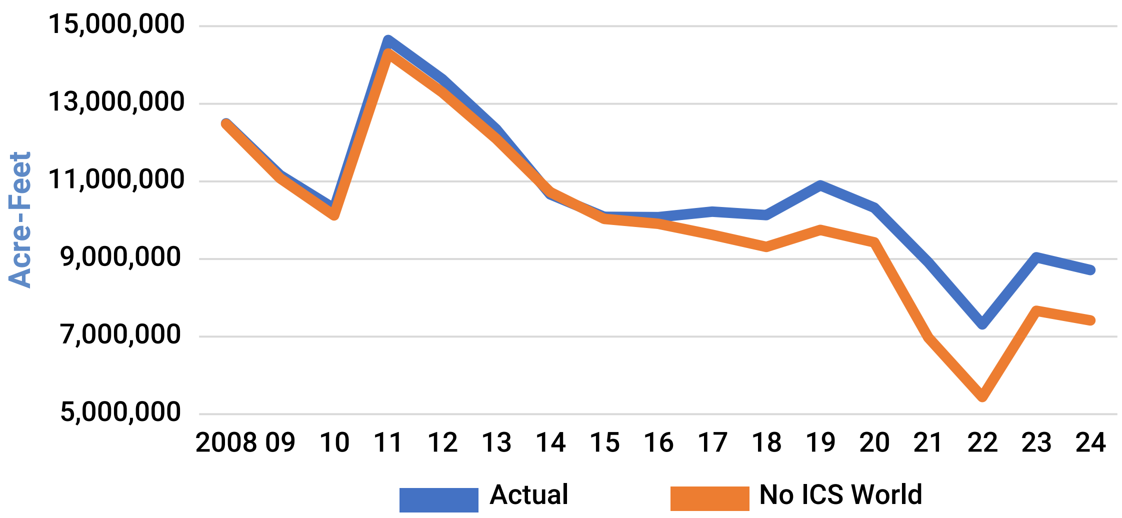

Figure 4 - Lake Mead with and without EC ICS. Without EC ICS (in a No ICS World), Lake Mead would have 1.3 MAF less in storage at the end of 2024 (orange line). Value for 2024 is projected using November 24 MS values

Sensitivity Analysis

Due to the tiered nature of operations under the Guidelines, small changes in assumptions can yield substantially different results. Therefore, we also performed a sensitivity analysis to determine if the results were dependent on the assumptions made. While the sensitivity analysis showed that assumptions could influence the storage that would accumulate in Lake Mead versus Lake Powell or result in reduced instances of shortages, it also showed that both reservoirs still benefited from storage when compared to scenarios without storage over the period of the analysis.

4. CONCLUSIONS

Key conclusions from our analysis of EC ICS storage as historically implemented and our comparison of program outcomes to a hypothetical scenario in which the program was never implemented—a No ICS World—are as follows:

1. **The ICS program incentivized aggressive water conservation.** With the implementation of ICS, conservation programs throughout the Lower Basin states have become wildly successful and have driven down consumptive use of mainstem water from 7.5 MAF per year to a 5-year average of 6.57 MAF. Some of that reduction has been stored as EC ICS.

2. **The ICS program resulted in additional system water in Colorado River reservoirs.** Because of the initial 5% system assessments on water stored as EC ICS and the conversion of EC ICS to system water due to the exceedance of EC ICS storage limits, the ICS program contributed system water to Colorado River reservoirs to the benefit of all users.

3. **EC ICS provided critical water management flexibility, especially for junior priority water users**, whose supplies are impacted by higher priority water use each year. For example, the ability to withdraw EC ICS stored in Colorado River system reservoirs helped MWD navigate the California drought of 2013–2015 without imposing drastic water supply reductions on its member agencies. When the SWP provided significantly reduced supplies during those years, MWD compensated by delivering EC ICS to keep its Colorado River Aqueduct full. This water management flexibility did not affect the ability of senior priority water users to access water. In fact, as noted above, storage of EC ICS resulted in more system water in the reservoirs than otherwise would have been the case—a benefit to senior priority users.

4. **The ICS program resulted in more water in both Lakes Powell and Mead than would otherwise have been the case.** Of the 2.8 MAF of EC ICS remaining in the Colorado River system, our analysis shows that 1.3 MAF (47%) currently resides in Lake Mead while 0.658 MAF (24%) resides in Lake Powell due to reduced balancing or equalization releases. Without the ICS program, Lakes Mead and Powell would have been smaller by those volumes, respectively. This additional 2 MAF provides systemwide benefits, including improved recreational opportunities and power generation at both reservoirs. Power generation benefits could be quantified in a future study.

5. **Hypothetically, if all EC ICS were withdrawn, the reservoirs would have less water in storage than if the EC ICS had never been stored at all.** The EC ICS credit currently available to Lower Basin entities is 2.3 MAF, which exceeds the EC ICS storage remaining in the reservoirs (roughly 2.0 MAF) by 0.3 MAF. Therefore, if all 2.3 MAF were to be withdrawn from the system, the system would have 0.3 MAF less in it than in the No ICS World. However, withdrawal of all EC ICS for delivery is unlikely given the second purpose of EC ICS: offsetting reductions. When stored water is used to offset reductions, water formerly stored in a particular entity's name remains in the reservoir but is no longer attributable to the particular entity.

6. **Storage reduced the frequency and magnitude of Lower Basin shortages.** Under the assumptions in this analysis, Arizona and Nevada were able to avoid shortage determinations that would have otherwise resulted in the storage of approximately 820,000 AF of additional system water. By increasing Lower Basin water use, this approach to shortage determinations contributed to the current circumstance such that if all EC ICS were withdrawn from the system, there would be less water in storage than in the No ICS World.

5. RECOMMENDATIONS

Based on the conclusions of this analysis, we make the following recommendations for any new storage program developed in the Colorado River Basin—recommendations that would allow the system and its water users to retain the benefits of storing water while minimizing negative unintended consequences:

1. **Given the benefits of the ICS program, a successor storage program should be developed as part of the post-2026 guidelines**. Like the ICS program, the successor program would incentivize conservation, raise reservoir elevations, increase volumes of system water, provide water management flexibility, improve recreational opportunities, and boost power generation. While this paper only looked at the existing ICS program in the Lower Basin, a similar program with similar benefits could be implemented in the Upper Basin as part of the post-2026 guidelines.

2. **Stored water attributable to an individual contractor or entitlement holder should not count when determining agreed-upon water supply reductions.** Excluding newly stored water from reduction determinations, i.e., treating it as if it did not exist when determining reductions, would have several benefits. First, stored water would have no impact on reduction determinations and thereby would not reduce the instances or depth of shortages in the way the ICS program did.

   Second, by eliminating the effect of stored water on reductions, this policy would also eliminate the hypothetical circumstance whereby removing all stored water attributable to a contractor or entitlement holder would leave the system with less storage than if attributed stored water had never existed.

   Third, this policy should also eliminate the resistance to entities choosing to withdraw stored water for water supply purposes since withdrawals would not affect reduction determinations.

   Fourth, and more generally, if stored water did not impact reduction determinations, all parties on the river would maintain a clearer understanding of the amount of system water in the reservoirs. Storage attributable to a particular contractor or entitlement holder would be a complementary, additional action, and would not displace reductions that generate additional water for the system as a whole.

   Given the benefits of excluding newly stored water from reduction determinations, it could also be beneficial to transition ICS from its current status of affecting reduction determinations to a status of not affecting them. This transition should be gradual over the first years of the post-2026 guidelines to avoid jarring shifts in operations.

3. **A new stored water program should include appropriate system assessment and evaporation loss provisions.** A reasonable up-front system assessment, such as the 5% implemented in the Guidelines, would ensure that the system benefits from the new stored water program without disincentivizing storage. An appropriate evaporation loss provision, based on a realistic estimate of incremental physical evaporation from the Colorado River system reservoirs due to the stored water, would eliminate the impact of the stored water on operational decision-making.

> While these losses should apply to most types of stored water, some types of stored water might be exempted from the losses on a case-by-case basis. For example, stored water generated by a system efficiency project like Brock Reservoir might be exempted to incentivize investment in the facility, especially when the lifetime savings of the project are expected to far exceed the stored water credits assigned to the project investors. In the case of Brock Reservoir, total system water storage is expected to be 2 MAF more than the 600,000 AF of ICS credits assigned to project investors—more than enough to cover any evaporation of the stored water credits.

Storage is a critical tool for water managers in the Colorado River Basin and provides systemwide benefits. While especially important for junior priority water users, the flexibility afforded by storage is important to all water managers. Storage helps water managers reliably meet the needs of their customers in the face of increased water supply variability due to climate change.

Since storage is an important tool for water managers, and since the Colorado River system has unused storage capacity, continuing to provide some of this capacity for storage attributable to individual entities in Colorado River reservoirs makes sense. Moreover, it makes sense not just for those individual entities with storage rights; it makes sense for all users because storage also increases power generation, recreational opportunities, and system water. Using this available resource surely makes more sense than heavily penalizing or eliminating on-river storage opportunities, which would send water users in search of storage elsewhere.

Intentionally Created Surplus:
Boosting Colorado River Reservoirs
by Two Million Acre-Feet

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

About Metropolitan

The Metropolitan Water District of Southern California is a state-established cooperative of 26 member agencies - cities and public water agencies - that serve 19 million people in six counties. Metropolitan imports water from the Colorado River and Northern California to supplement local supplies and helps its members develop increased water conservation, recycling, storage and other resource management programs.