EXHIBIT 1

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead



The Colorado River Basin States Representatives of Arizona, California, and Nevada

February 13, 2025

Via email and U.S. Mail
c/o Daniel.gustafson@ios.doi.gov

The Honorable Doug Burgum
Secretary of the Interior
U.S. Department of the Interior
1849 C Street, NW
Washington, DC 20240

Re: Congratulations and Perspectives from the Lower Basin States on the Colorado River Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

Dear Secretary Burgum:

Congratulations on your appointment and confirmation as Secretary of the Interior. Your leadership in the West makes you exceptionally well-positioned to lead the Department at this critical time. We look forward to working with the Trump-Vance administration and you as we navigate the challenges and opportunities ahead for the Colorado River and the Nation.

A top priority for Arizona, California, and Nevada (the Lower Basin States) is developing the next set of operating guidelines for the Colorado River. As you know, the current guidelines governing the operations of Lake Powell and Lake Mead will expire next year in 2026, and the process of formulating new guidelines for implementation in 2027 is already underway. This effort, including the associated National Environmental Policy Act (NEPA) process, is crucial to the future management of the Colorado River system.

In a January 2025 letter to the seven Basin State Representatives, the fourteen United States Senators representing the Basin States underscored the importance of a seven-state consensus and urged Basin negotiators to commit to developing a consensus proposal for future Colorado River operations. The Lower Basin States strongly support a collaborative, consensus-driven approach to developing these guidelines and remain actively engaged in discussions among the seven Colorado River Basin States to reach a unified agreement. An imposed solution or litigation would undermine decades of cooperative progress and jeopardize our ability to continue managing the system effectively. Collaboration has long been a hallmark of the Colorado River Basin, and we are confident that, with your leadership and support, this tradition will endure and deliver success on the Colorado River in this administration.

Our commitment to this process is reflected in our proactive efforts. As an initial step, the Lower Basin States have voluntarily proposed conservation commitments totaling 1.5 million acre-feet per year under most system conditions, as part of a package that would include more substantial Basin-wide reductions when system contents fall below certain thresholds, among other operational components. We are

encouraged by the collaborative momentum ongoing among the Basin States, which we believe can lead to a consensus-driven agreement.

However, we remain concerned about the Biden-Harris administration's January issuance of the Post-2026 "Alternatives Report," which imposed a new milestone outside the standard NEPA process. This report sought to set the direction for future Colorado River operations while failing to consider the Lower Basin's proposed alternative. Of particular concern is the report's complete omission of compliance with the 1922 Colorado River Compact, the foundation of the Law of the River.

Additionally, the prior administration's approach to protecting the Lake Powell outlet works by reducing releases from Lake Powell—rather than making infrastructure repairs and improvements—is shortsighted and harms the Lower Basin States by slashing the water available to our farmers, communities, and economies. These profound impacts can be avoided by some combination of straight forward engineering fixes, moving water to Lake Powell from upstream reservoirs when necessary, and temporary reductions in Upper Basin use.

These fundamental issues, further detailed in the enclosed Attachment 1, have been repeatedly communicated to the Bureau of Reclamation and made clear in public discussions. Despite our well-documented objections during the last administration, these serious flaws were incorporated into the "Alternatives Report," undermining the negotiation process among the seven Basin States.

We are encouraged by the renewed spirit of collaboration in our ongoing discussions and optimistic that, under your leadership, we can refocus on achieving a durable, consensus-based agreement that respects the needs of our States and Nation. Our collective goal is to secure a solution that respects the cooperation of the States and avoids litigation.

Once again, congratulations on your appointment. We would welcome the opportunity to meet with you at your convenience to provide a more detailed briefing on our deep concerns with the Biden-Harris administration's "Alternatives Report" and our perspectives as Lower Basin States.

Thank you for your time and consideration. We look forward to working together in the months and years ahead.

Sincerely,

Thomas Buschatzke
Governor's Representative
State of Arizona

J. B. Hamby
Governor's Representative
State of California

John J. Entsminger
Governor's Representative
State of Nevada

cc: David Palumbo, Acting Commissioner, Bureau of Reclamation
Attachment

ATTACHMENT 1

Lower Basin States Comments on Alternatives Report

On January 17, 2025, the Bureau of Reclamation ("Reclamation") released a document entitled "Alternatives Report: Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead," (the "Alternatives Report"). For the reasons stated below, the Secretary should direct Reclamation to retract the Alternatives Report and to collaborate with the Lower Basin States to prepare an alternatives analysis compliant with the National Environmental Policy Act ("NEPA") and the Law of the River.[1]

INTRODUCTION

Reclamation is developing post-2026 operational plans for the Colorado River Basin and evaluating those plans and alternatives pursuant to NEPA. Several reservoir and water management decisions and agreements governing the operation and management of the Colorado River and its facilities are set to expire at the end of 2026. These include the 2007 Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead ("2007 Interim Guidelines"), 2019 Drought Contingency Plans, and international agreements between the United States and Mexico.

The Lower Basin States remain committed to developing a consensus alternative that can achieve support among the Seven Basin States, the Tribes, the United States, Mexico, and Colorado River water users. However, developing such a consensus requires Reclamation's compliance with the requirements of NEPA to prepare an accurate and robust analysis of alternatives and likely environmental effects, including the effects of full implementation of the Law of the River as it currently stands. The analysis and modeling of compliance with the Colorado River Compact of 1922 (the "Compact") in all alternatives is mandatory pursuant to NEPA's informed decision-making and public disclosure requirements and is critical to understanding the real-world implications of each alternative. Doing so could encourage development of a consensus-based approach. However, Reclamation's failure to interpret and disclose application of the Law of the River, particularly the implications of a likely Compact Call, falls short of the minimum requirements of NEPA and leaves stakeholders to speculate regarding Reclamation's intentions regarding future Colorado River operations during low-flow conditions. Therefore, the Secretary should direct Reclamation to evaluate a range of

[1] The Secretary of the Interior has responsibility for ensuring operation of the Colorado River water delivery systems in compliance with the Law of the River. *E.g.,* Colorado River Basin Project Act ("CRBPA") § 602(a)-(b), 43 U.S.C. § 1552(a)-(b) (directing the Secretary to consultatively develop operational criteria—known as Long-Range Operating Criteria ("LROC")—for federally authorized Colorado River reservoirs); *see also Arizona v. California*, 376 U.S. 340 (1964).

alternatives in the upcoming draft environmental impact statement ("DEIS") that complies with NEPA and Reclamation's legal obligations under the Law of the River.

To facilitate this, the Secretary should direct Reclamation to retract its previously released Alternatives Report and meet with representatives of the Lower Basin States to discuss the technical and legal deficiencies in Reclamation's alternatives analysis as currently set forth in the Alternatives Report. Specifically, the Lower Basin States propose discussing in detail (a) why Reclamation believes the March 6, 2024 Lower Basin Alternative, as amended, fails to meet the Purpose and Need of the proposed action; (b) what additional information or analysis Reclamation needs to fully evaluate and carry forward the Lower Basin Alternative in the DEIS; (c) the need to include in the DEIS an additional alternative that includes a fix (such as repairs or structural modifications, or water management mechanisms in the Upper Basin) that would eliminate the infrastructure limitations at Glen Canyon Dam to ensure adequate water deliveries to the Lower Basin during low-flow conditions; (d) the need to include in each alternative Reclamation's proposed application of the Compact and other elements of the Law of the River; (e) what additional legal authority Reclamation believes it needs to both ensure deliveries to the Lower Basin and protect infrastructure during low-flow conditions; and (f) the technical and legal bases for the reasonable foreseeability of a Compact Call which needs to be reflected in the DEIS Alternatives Analysis.

BACKGROUND

NEPA Alternatives Process for Post-2026 Operational Guidelines and Strategies

Reclamation began developing alternatives for the NEPA process in late 2023. In March 2024, the Lower Basin States submitted their suggested alternative to Reclamation for consideration in the ongoing NEPA process. In December 2024 and January 2025, the Lower Basin States provided additional information, including assumptions and the bases for the Lower Basin Alternative.

In November 2024, Reclamation issued a summary of the anticipated alternatives that Reclamation would carry forward for detailed analysis in the Draft EIS, which included:

- No action alternative
- Federal authorities alternative
- Federal authorities hybrid alternative
- Cooperative conservation alternative
- Basin hybrid alternative

These alternatives did not include the Lower Basin Alternative, which Reclamation claims does not satisfy the purpose and need for its proposed action.[2] Reclamation maintains that the "Basin Hybrid Alternative" "reflects components of the proposals and concepts submitted by the . . . Lower Division States" and others, including the Upper Division States and Colorado River Basin Tribes.[3] But the Lower Basin States informed Reclamation that the various elements of their alternative "work synergistically and … it would be inappropriate to separate individual elements and presume their stand-alone implementability."[4]

On January 17, 2025, Reclamation published its Alternatives Report that described in more detail the five alternatives previously identified by Reclamation in its November 20, 2024 summary.

The Lower Basin States Submitted a Detailed, Viable Lower Basin Alternative

Importantly, the Lower Basin Alternative takes a holistic, science-based approach to Colorado River management:

> The Lower Basin Alternative shifts away from the reliance in the 2007 Interim Guidelines on the 24-Month Study forecasts and elevations in Lake Powell and Lake Mead to determine reservoir releases and Lower Basin shortages. This [Lower Basin] Alternative instead primarily uses actual hydrology and total system contents—a recognition that, whatever the elevation of a particular reservoir in the system may be, sustainable management must be focused on contents that are actually available in the system as a whole. "Total system contents" includes the contents of Flaming Gorge, Blue Mesa, Navajo, Powell, Mead, Mohave, and Havasu. In addition to more holistically managing the system, moving away from forecasts and reservoir elevations and instead relying on actual hydrology and system contents should reduce disagreements among and between the Basins that have resulted from reliance on Lake Powell and Lake Mead elevations and 24-Month Study forecasts in the past.[5]

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[2] Alternatives Report § 4, at 4.

[3] *See id*. at ES-1 to ES-2.

[4] *See* Email Correspondence from Tom Buschatzke (Arizona Department of Water Resources) to Reclamation (Jan. 13, 2025).

[5] Lower Basin States Alternatives Letter, at 3-4 (Mar. 6, 2024).

Specifically, the Lower Basin Alternative addresses "the impacts of drought and climate change through a holistic and sustainable approach to the coordinated operations of Lake Powell and Lake Mead that improves predictability for water users" by:[6]

- **Addressing the structural deficit in the Lower Basin.** It includes reductions from Lower Basin state apportionments and deliveries to Mexico by 1.5 million acre-feet (maf) (static reduction) under most system conditions. The static reduction is larger than the structural deficit in the Lower Basin regardless of the various ways that the structural deficit may be calculated.
- **Operating the reservoirs based on system contents rather than elevations at Lake Powell and Lake Mead.** It shifts to a more holistic, systemwide approach in which operations are dictated by overall system conditions instead of forecasts and elevations in the two main reservoirs.
- **Sharing water use reductions broadly.** It recognizes the need to make water use reductions from state apportionments under most system conditions and shares those reductions predictably among the Lower Basin water users and Mexico. Under the most critical system conditions, the Lower Basin Alternative shares water use reductions between the Upper Basin and Lower Basin including Mexico.
- **Including provisions for storage and delivery of stored water.** It includes opportunities for storage and augmentation that will encourage innovation and investment. [7]

Subsequent to the initial submittal of the Lower Basin Alternative in March 2024, the Lower Basin States in June and December 2024 requested that Reclamation include compliance with the 1922 Colorado River Compact in each alternative to be analyzed in the NEPA process. Also, in the December request, the Lower Basin States provided the Compact compliance assumptions to be incorporated into the DEIS alternatives, including:

- Required deliveries pursuant to Article III of the Compact.
- Compact Call by the Lower Basin States.
- Upper Basin curtailment or other reductions as necessary to comply with the Compact requirements.

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[6] Letter from Lower Basin States to Camille Touton, Commissioner, Reclamation at 2 (Mar. 6, 2024).

[7] *See id*. at 2-3. Originally, the Lower Basin Alternative included a Powell to Mead release regime designed to reflect Upper Basin "hydrologic shortage" by varying the release in part based upon use volumes in the Upper Basin. As discussed infra, the Lower Basin altered the approach to ensure that Lake Powell operates above critical elevations in a broader range of hydrologies.

- Actions by the United States in management of federal reservoirs.

These assumptions are described more fully in the December 24, 2024 email from JB Hamby to Reclamation staff.

Following that, in January 2025, the Lower Basin States provided Reclamation an amended Lower Basin Alternative. Those modifications included refinements on the proposed releases from Lake Powell to better protect Lake Powell over the analysis period.[8] Nonetheless, Reclamation did not consider any of the Lower Basin States' post-March 2024 submitted information as part of Reclamation's Alternatives Report.[9]

Reclamation's Alleged Basis for Failing to Consider the Lower Basin Alternative

In the Alternatives Report, Reclamation claimed in conclusory fashion that "as submitted in the spring of 2024" the Lower Basin States' proposal "d[id] not provide an appropriate basis for comprehensive and coordinated operations of Lake Powell and Lake Mead, a necessary component of the purpose and need for this proposed action."[10] Reclamation also claimed that it had "identified and communicated concerns about imbalanced Basin impacts and lack of reservoir coordination."[11]

In fact, the Alternatives Report failed to provide a sufficient and documented basis for not including detailed analysis of the entire Lower Basin Alternative in the DEIS. Instead, Reclamation's "explanation" focused on the incorrect assumption that Reclamation needs to maintain the power pool elevation of 3,490 feet in Lake Powell to protect Glen Canyon Dam infrastructure. But that assumption is mistaken for three reasons. *First*, the Lower Basin Alternative, particularly as amended, provides adequate protection of Lake Powell elevations.[12]

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[8] *See* email from Tom Buschatzke to Reclamation Staff (Jan. 13, 2025).

[9] *See* Alternatives Report § 2, at 2 ("Reclamation will continue its efforts working with Basin partners and stakeholders and will analyze information submitted after November 20, 2024.").

[10] *See* Alternatives Report § 6.2, at 9.

[11] *Id*.

[12] *See, e.g.*, Lower Basin States Alternatives Letter (Mar. 6, 2024), at 3 ("storage [opportunities provided by the alternative] will help to protect infrastructure and habitat and provide predictability for water users"); 6-7 ("[B]ased on our preliminary reviews, the Lower Basin Alternative is highly effective at keeping Lake Powell above critical elevations. Even during drier hydrologies, when Lake Powell's elevation may temporarily fall below 3500 feet, the use of total system contents . . . improves flexibility to protect critical infrastructure by enabling the movement of water through the system as necessary for infrastructure protection and

Second, consistent with NEPA and sound decision-making principles, Reclamation must evaluate alternative methods to protect the infrastructure at Glen Canyon Dam other than relying solely on reducing releases to the Lower Basin to maintain a hard elevation floor.[13] Such alternatives could include, for instance, short-term or long-term repairs or modification of the infrastructure at Glen Canyon Dam, conservation or curtailment in the Upper Basin, revised operation of federal infrastructure upstream of Lake Powell, or operational regimes—such as proposed in the Lower Basin Alternative—that, assuming Reclamation adheres to the Law of the River, would both protect the infrastructure at Lake Powell and provide legally sufficient deliveries to the Lower Basin.[14] Proceeding on the basis of a mistaken or invalid assumption—namely that Reclamation can maintain Lake Powell above elevation 3,490 feet solely by reducing releases from Glen Canyon Dam—would invalidate Reclamation's alternatives analysis in the EIS.[15] *Third*, as explained below, Reclamation's apparent top priority of maintaining Lake Powell's elevation above 3,490 feet at the sole expense of the Lower Basin directly contravenes numerous foundational elements of the Law of the River including the Compact, the 1944 Treaty with Mexico, LROC, and the Colorado River Basin Project Act Section 602.[16]

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environmental flows while satisfying water delivery requirements and Compact obligations."); email correspondence from Tom Buschatzke, *supra* n. 4 (providing modification to Lower Basin Alternative to provide "refinements to the releases from Lake Powell" for "Lake Powell release[s] to avoid critical elevations"). *See also supra* nn. 7-8 and accompanying text.

[13] *See 'Ilio'ulaokalani Coalition v. Rumsfeld*, 464 F.3d 1083, 1098 (9th Cir. 2006) ("When the proposed action is an integral part of a coordinated plan to deal with a broad problem, the range of alternatives that must be evaluated is broadened.") (cleaned up); *Friends of Yosemite v. Kempthorne*, 520 F.3d 1024, 1039 (9th Cir. 2007) (agency violated NEPA because the "the action alternatives were not varied enough to allow for a real, informed choice"); *Alaska Wilderness Recreation & Tourism Ass'n v. Morrison*, 67 F.3d 723, 729 (9th Cir. 1995) ("An agency must look at every reasonable alternative, with the range dictated by the nature and scope of the proposed action, and sufficient to permit a reasoned choice.") (cleaned up).

[14] *See infra* pp. 19-23.

[15] *See, e.g.*, *Natural Resources Defense Council v. U.S. Forest Serv.*, 421 F.3d 797, 810-13 (9th Cir. 2005) (holding EIS inadequate where economic effects analysis was based on faulty timber demand forecasts, which also failed to allow for an informed comparison of alternatives in the EIS); *Alaska Wilderness Recreation & Tourism Ass'n v. Morrison*, 67 F.3d 723, 733 (9th Cir. 1995) (use of no-longer-applicable timber sale contract as constraint on selection of alternatives in EIS was inconsistent with NEPA's requirements).

[16] *See infra* nn. 51-54 and accompanying text.

Reclamation's Purpose and Need for the Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

In the Alternatives Report, Reclamation reiterated its detailed purpose of and need for the proposed federal action,[17] which was also included in the June 2023 Scoping Notice for the post-2026 Operations process. At a high level, Reclamation's "need" includes:

- The Secretary is legally required to **coordinate operations** of Colorado River reservoirs;
- 2007 Interim Guidelines are expiring;
- 2007 Interim Guidelines have not sufficiently reduced risk;
- Imbalance between water supply and demand will be exacerbated by **increasingly likely low-runoff conditions**;
- Expanded and innovative use of conservation is needed; and
- Addressing Tribal concerns regarding Colorado River Basin management.

The "purpose" for the proposed federal action is to:

- Update and expand management guidelines for Colorado River reservoirs, particularly for Lake Powell and Lake Mead;
- Provide Colorado River water users a **greater degree of predictability** with respect to the amount of annual water available in future years under anticipated increasing variability, low runoff, and low reservoir conditions;
- Provide **additional mechanisms** for the conservation, storage, and delivery of water supplies in Colorado River reservoirs;
- Provide new or enhanced opportunities for Basin Tribes to benefit from their water rights; and
- Provide flexibility to build resilience and accommodate future needs and growth that are supported by Colorado River water supplies, including the integration of unquantified Tribal water rights once they are resolved.[18]

[17] *See* Alternatives Report § 5, at 6-7.

[18] *See* Alternatives Report § 5, at 6-7 (emphases added); *see also* 88 Fed. Reg. 72535, 72536 (Oct. 20, 2023) (Reclamation Scoping Notice for the proposed action).

Reclamation's Stated NEPA Approach to Alternatives Development

Reclamation emphasized in its scoping Notice of Intent that "Future operational guidelines and strategies should incorporate a **more holistic approach to Colorado River water management** …; [d]etermine[] those conditions under which the Secretary would **reduce the annual amount of water available for consumptive use**…; [and] expand[] participation in **conservation and Basin-wide programs**."[19]

The factors that Reclamation said it would consider include the "circumstances under which the Secretary would allocate, **reduce**, or increase the annual amount of water available for **consumptive use** from Lake Mead …; [s]torage and delivery **of conserved water in Lake Mead and/or Lake Powell to increase . . . flexibility** …; [a]pproaches that consider **total system storage in all major Colorado River reservoirs** and/or actual inflows …; [a]pproaches that include opportunities for **conservation, augmentation, demand management**, or other water management strategies…; and [use of] the **best scientific information currently available**; actual operating experience since 2007; updated information on infrastructure considerations at Glen Canyon Dam and Hoover Dam; tradeoffs between the frequency and **magnitude of reductions in water deliveries**; mechanisms to **encourage water conservation**, efficiency improvements, and augmentation."[20]

The Lower Basin Alternative accomplishes those objectives and is consistent with Reclamation's stated purpose and need. Reclamation has not shown otherwise. Thus, not carrying forward the Lower Basin Alternative for detailed consideration in the NEPA alternatives analysis would contravene Reclamation's stated purpose and need, objectives, and approach to the NEPA alternatives, and would violate NEPA's alternatives consideration requirements. While this letter does not provide an exhaustive list, the primary deficiencies in the current alternatives analysis are explained further below.

DISCUSSION

I. Lack of Detailed Analysis of the Lower Basin Alternative Violates NEPA

Reclamation must consider a "reasonable range of alternatives," and identify the more "environmentally preferable alternative" that "best promote[s] the national environmental

[19] 88 Fed. Reg. 39455, 39456-57 (Jun. 16, 2023) (emphases added).

[20] 88 Fed. Reg. 72545, 72536 (Oct. 20, 2023) (emphases added).

policy … by maximizing environmental benefits."[21] Moreover, Reclamation must consider an alternative that stakeholders show to be reasonable and distinguishable from other alternatives considered.[22]

The Lower Basin Alternative satisfies the reasonable alternative requirement. The Lower Basin States informed Reclamation in their March 6, 2024 Letter as to why the Lower Basin Alternative is viable and environmentally beneficial.[23] A viable alternative includes one that is technically and economically feasible, consistent with the purpose and need statement for the proposed action, and matches the deciding agency's statutory or congressionally directed duties, which the Lower Basin Alternative does.[24]

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[21] 42 U.S.C. § 4332(2)(C)(iii); 43 C.F.R. §§ 46.30, 46.450 (2024); 40 C.F.R. § 1502.14(f) (2024) (subject to rescission).

[22] *Env't Def. Ctr. v. Bureau of Ocean Energy Mgmt.*, 36 F.4th 850, 877 (9th Cir. 2022) ("The existence of a viable but unexamined alternative renders the environmental review conducted under NEPA inadequate.") (invalidating an environmental assessment for failing to consider commenter-proposed alternatives) (cleaned up); *High Country Conservation Advocates v. U.S. Forest Serv.*, 951 F.3d 1217, 1224-27 (10th Cir. 2020) (invalidating an environmental impact statement for failing to consider a commenter-proposed alternative that met the Forest Service's statutory mandate, its objectives for the project, and was significantly distinguishable from the alternatives considered).

[23] *See Morongo Band of Mission Indians v. FAA*, 161 F.3d 569, 576 (9th Cir. 1998) (A "specific, detailed counterproposal that ha[s] a chance of success" must be considered by agency); *New Mexico ex rel. Richardson v. Bureau of Land Mgmt.*, 565 F.3d 683, 711 (10th Cir. 2009) (an agency must evaluate a commenter-proposed alternative that "falls within the agency's statutory mandate" and meets "the agency's objectives for a particular project.").

[24] *See* 43 C.F.R. § 46.420(b) (DOI NEPA regulation defining "reasonable alternatives" to include "alternatives that are technically and economically practical or feasible and meet the purpose and need of the proposed action"); *Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 814 (9th Cir. 1999) (non-land exchange options such as outright purchase of lands or placing conditions on land leaving federal ownership were viable alternatives and rendered EIS range of alternatives inadequate where Forest Service failed to consider such options); *WildEarth Guardians v. Bureau of Land Mgmt.*, 870 F.3d 1222, 1237-38 (10th Cir. 2017) (agency coal lease EIS had inadequate range of alternatives where it was premised on "an economic assumption [substitutability of coal from other sources if proposed leases were not approved], which contradicted basic economic principles, as the basis for distinguishing between the no action and the preferred alternative"); *Richardson*, 565 F.3d at 710-11 (agency range of alternatives in land management planning EIS held inadequate and violative of NEPA where it did not consider options of prohibiting surface disturbance in an environmentally sensitive area (Otero Mesa),

The Lower Basin Alternative, including its initial anticipated environmental effects, is "significantly distinguishable" from other alternatives.[25] Also, considering the Lower Basin Alternative in detail fosters NEPA's twin goals of informed agency decision-making and public participation.[26] It may also facilitate efforts by the Seven Basin States to make progress on a consensus-based approach.

II. Reclamation's Alternatives Analysis Failed to Adequately Address Application of the Law of the River and a Reasonably Foreseeable Compact Call

The Lower Basin States endorse the following statement contained in the Alternatives Report:

> Since 1970, the Basin States have supported operations and reached agreements among themselves and with the Secretary on various aspects of Colorado River reservoir operations. It is beyond question that, historically**, achieving a consensus-based approach to Basin reservoir operations has proved critical to the long-term operating success of the Basin**.[27]

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which was a reasonable management option); *Utahns v. U.S. Dep't of Transp.*, 305 F.3d 1152, 1164-66, 1169-71, 1192 (10th Cir. 2002) (range of alternatives in agency highway project EIS was inadequate and violated NEPA where it failed to document cost methodology for eliminating alternative alignment from detailed consideration in EIS, failed to consider alternative of whether public transportation could alleviate "the immediacy of the need for" the highway project, and failed to consider integrating developing new highway capacity with expansion of public transit), *amended on other grounds on partial grant of reh'g*, 319 F.3d 1207 (10th Cir. 2003).

[25] *See, e.g.*, *Friends of Yosemite Valley v. Kempthorne*, 520 F.3d 1024, 1038 (9th Cir. 2008) (range of action alternatives in National Park Service EIS for management of Merced River through Yosemite Valley was "unreasonably narrow because the alternatives are virtually indistinguishable from each other"; "An agency must look at every reasonable alternative, with the range dictated by the nature and scope of the proposed action, and sufficient to permit a reasoned choice.") (cleaned up); *see also Headwaters, Inc. v. Bureau of Land Mgmt.*, 914 F.2d 1174, 1181 (9th Cir. 1990) (agency is not required to undertake a "separate analysis of alternatives which are not significantly distinguishable from alternatives actually considered, or which have substantially similar consequences").

[26] *Env't Def. Ctr. v. Bureau of Ocean Energy Mgmt.*, 36 F.4th 850, 878 (9th Cir. 2022).

[27] *See* Alternatives Report § 7.1, at 12 (emphasis added).

The Lower Basin States remain committed to working with Reclamation and the Upper Basin States towards a consensus-based approach as occurred with the near-term Lower Colorado River operational guidelines.[28] However, the Lower Basin States believe that Reclamation must provide all the "relevant information" needed for the Seven Basin States and other stakeholders to fully understand how Reclamation will apply the Law of the River in each alternative.

NEPA's procedural and analytical requirements are designed to ensure that all "**relevant information** will be made available to the larger audience that may also play a role in both the decision making process and the implementation of that decision."[29] To do so, Reclamation must identify and interpret legal obligations relating to the proposed action. NEPA itself requires that "to the fullest extent possible … the policies, regulations, and public laws of the United States shall be **interpreted** and administered in accordance with the policies set forth in this [Act]."[30] Nothing in NEPA absolves Reclamation from interpreting and applying other "**specific statutory obligations**," such as the Law of the River.[31] These provisions require that "unless there is an exemption from NEPA compliance, [Reclamation] must comply with NEPA" and other applicable laws, and the NEPA decision-making process analysis must reflect the same.[32] Similarly, courts will hold unlawful agency actions, findings and conclusions if the agency's decision is "arbitrary, capricious, an abuse of discretion, or otherwise not in **accordance with law**," "in excess of **statutory jurisdiction, authority, or limitations**," or "without observance of **procedure required by law**."[33]

For the current NEPA process, the most "**relevant information**" includes how, under each alternative, Reclamation will apply the Law of the River in "accordance with" and subject to the "statutory jurisdiction, authority, or limitations," and "procedures" set forth in applicable laws governing Colorado River operations. Reclamation's "operational concepts" common to each alternative that "[r]eleases from Lake Powell may be less than the specified release at

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[28] *See* DOI Press Release (May 22, 2023), available here.

[29] *See Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989) (emphasis added); *see also WildEarth Guardians v. Bureau of Land Mgmt.*, 870 F.3d 1222, 1237 (10th Cir. 2017) ("NEPA has two purposes: prevent uninformed agency decisions and provide adequate disclosure to allow public participation in those decisions.") (citing *Methow Valley*, 490 U.S. at 349).

[30] NEPA § 102, 42 U.S.C. § 4332 (emphasis added).

[31] NEPA § 104, 42 U.S.C. § 4334 (emphasis added).

[32] *See, generally*, Daniel R. Mandelker et al., NEPA Law & Litig. § 2:22 (2d ed., 2024 update) (online edition).

[33] Administrative Procedure Act ("APA"), 5 U.S.C. § 706(2)(A), (C), (D).

elevations below 3,490 feet" and "[a]dditional Lower Basin shortages (and potential additional reductions in water deliveries to Mexico) may be necessary under future hydrologic scenarios" mandate full consideration of how the Law of the River factors into each alternative.[34] If Reclamation fails to explain its interpretation of the key components of the Law of the River and how they apply to each alternative especially during low-flow conditions, the EIS analysis will be incomplete and lack transparency.

While the Lower Basin understands that the Alternatives Report is not Reclamation's full EIS analysis, assuming that it accurately reflects the direction of the DEIS, the alternatives analysis is legally deficient and falls short of providing the most **relevant information**, as explained below:

First, Reclamation commits in the Alternatives Report that it "will follow all relevant provisions of federal law to implement the proposed federal action, including relevant provisions of the Law of the River."[35] Reclamation further acknowledges that its decisions are governed by the following legal requirements comprising the "Law of the River":[36]

- 1922 Colorado River Compact;[37]
- Colorado River Basin Project Act § 602(a);[38]

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[34] Alternatives Report § 7.2, at 12.

[35] *Id*. § 7.1.1, at 11.

[36] Alternatives Report § 4, at 5, n. 5 ("[I]t is the intent of the Department to adopt and implement the guidelines in a manner consistent with the Law of the River….").

[37] *Id*. § 7.1.1, at 12 ("Reclamation's goal in providing detailed information on the potential flow of the river at Lee Ferry under all analyzed alternatives is to ensure that all entities, including the Upper and Lower Division States, **can use the relevant flow information to assess how potential future operations under the various alternatives comply with their respective views of the 1922 Colorado River Compact**.") (emphasis added).

[38] *Id*. § 7.3.2.1, at 15 n. 18 ("For modeling purposes, Reclamation intends that the equalization line concept used in the 2007 Interim Guidelines be applied and extended **in the same manner as adopted in the 2007 Interim Guidelines with reference to 602(a) considerations**.") (emphasis added); § 7.4.2.1, at 18, n. 20 (repeating the same footnote for the Federal Authorities Alternative). Ironically, while the Alternatives Report claims that Reclamation is seeking to avoid weighing in on disputes among the States regarding the Law of the River, this assumption evolved from a contentious dispute in Fall 2007, when one State invoked consultation under the April 2007 Seven States' Agreement. The matter is still likely subject to dispute among the States, and the Lower Division States have not consented to the use of this assumption for implementation purposes after 2026. Reclamation's choice to use this

- Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs ("LROC");[39]
- 2006 Consolidated Decree in *Arizona v. California*, 574 U.S. 150 (2006);[40] and
- 1944 Water Treaty.[41]

Based on Reclamation's commitments above, one anticipates that Reclamation would explain how the Law of the River will be applied to each alternative. But Reclamation avoids this NEPA analysis and disclosure obligation and claims that it does not need to do so, stating "The proposed federal action is not designed to provide interpretation of the 1922 Colorado River Compact or resolve **differing interpretations** by Basin States, Basin Tribes, and other stakeholders."[42]

Reclamation's unwillingness to disclose application of the Law of the River to each alternative and modeled scenario contradicts Reclamation's own admission that Reclamation itself is legally obligated to apply the Law of the River to future Colorado River operations. Reclamation's posture seems to be "kick the can down the road." NEPA forecloses such an approach.[43]

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particular assumption for modeling purposes is effectively an interpretation of the Law of the River with which the Basin States disagree.

[39] *Id*. § 7.1.1, at 11 ("Reclamation recognizes that, under Article II(2) of the LROC, the 'objective shall be to maintain a minimum release of water from Lake Powell of 8.23 [maf].)' Reclamation also recognizes that variation in releases of water above and below the minimum objective release of 8.23 maf can, in **appropriate circumstances**, be adopted.") (emphasis added).

[40] *Id*. § 4, at 4 n. 4 ("intends to meet any consultation requirements identified in Article II(B)(3) of the Supreme Court Decree in ***Arizona v. California*** through the ongoing NEPA process initiated by the Federal Register Notice of June 16, 2023 (88 Federal Register 39455), and the annual implementation of guidelines developed through this process") (emphasis added).

[41] *Id*. § 7.2, at 12-13 ("Modeling assumptions that identify water deliveries to Mexico pursuant to the **1944 Water Treaty** would be developed after all necessary and appropriate discussions have been completed with the United States International Boundary and Water Commission in consultation with the Department of State.") (emphasis added).

[42] *Id*. § 7.1.1, at 11 (emphasis added).

[43] *See Methow Valley Citizens Council*, 490 U.S. at 349 ("NEPA ensures that important effects will not be overlooked or underestimated only to be discovered after resources have been committed or the die otherwise cast."); *see also* 43 C.F.R. §§ 46.200(a), 46.235(a) (2024) (requiring "as early as feasible" coordinating and "integrating other environmental reviews"); 40 C.F.R. § 1501.2(a) (2024) (subject to rescission) ("Agencies should integrate the NEPA

Second, while the Lower Basin States believe that Reclamation must provide in the alternatives analysis an analysis of application of the Law of the River to each alternative, it is imperative that Reclamation include a detailed analysis of Law of the River impacts in the "Federal Authorities Alternative" because it "does not presume water users within the Basin would voluntarily agree to depart from the priority system for water use reductions, give their consent to water conservation mechanisms, or enter into other voluntary agreements."[44] The following excerpt from Reclamation's description of the "Federal Authorities Alternative" illustrates the incompleteness of the analysis:

> This action alternative would represent **specific decisions** by Reclamation about how to best operate the system to meet the purpose and need while informing the public about the environmental effects and **operational challenges** that would result under existing federal authorities **without the development and adoption of new authorities or water management mechanisms**.[45]

Reclamation acknowledges that it must make "specific decisions" to address "operational challenges," but currently lacks legal authority to do so—without disclosing what additional authority is needed:

> The full extent of Reclamation's operational authority has not been tested to date—either operationally or through legislative or judicial review. Accordingly, Reclamation's description of how this alternative would be implemented relies on **legal, operational, and engineering judgment** regarding future operations under a broad range of hydrologic conditions. To mitigate the reasonably foreseeable undesirable consequences if authorities are limited to those already existing, **Reclamation would**

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process with other planning and authorization processes **at the earliest reasonable time** to ensure that agencies consider environmental effects in their planning and decisions, to avoid delays later in the process, and to head off potential conflicts.") (emphasis added).

[44] Alternatives Report § 7.4, at 16. Although Reclamation correctly assumes that this alternative does not constitute "Reclamation's version of a **potential consensus alternative**," Reclamation asserts, without analysis or explanation, that the Federal Authorities Alternative "provides environmental compliance for a specific set of operations as a NEPA alternative that Reclamation could implement beginning in WY 2027 (that is, beginning October 1, 2026) if either no consensus among relevant entities in the Basin is developed or no additional congressional authorizations are adopted." *Id*. at 17 (emphasis added).

[45] *Id*. at 17 (emphases added).

> **actively seek additional authorities from Congress (and potentially the Supreme Court)** to protect critical infrastructure if this alternative were to be selected in the ROD.[46]

Based on the above, Reclamation has in fact evaluated its existing "legal authority" and concluded that without additional authority from Congress or the Supreme Court, it cannot protect "critical infrastructure." Yet, Reclamation fails to explain:

- The contours of the "legal, operational, and engineering judgment" Reclamation must exercise under its Federal Authorities Alternative;
- What specific authority Reclamation believes it currently lacks;
- What additional authority Reclamation believes it needs to protect critical infrastructure;
- What specific "critical infrastructure" Reclamation refers to and what other means Reclamation could use to protect such infrastructure (e.g., major repairs, structural changes, or other "water management mechanisms") without additional legal authority.

The fact that the "full extent of Reclamation's operational authority has not been tested" in the courts does not relieve Reclamation from explaining its understanding of its current operational authority and how it will be exercised under low-flow scenarios. Otherwise, the alternatives analysis is incomplete, and the Basin States and other stakeholders are left to speculate regarding operations under low-flow conditions in the absence of a consensus agreement. In contrast, as mentioned above, a complete analysis could provide a needed foundation for the Seven Basin States to develop a new consensus approach.

Moreover, Reclamation asserts that it is not possible to provide additional details regarding this alternative:

> While Reclamation has had experience with high-flow Flood Control operations at Lake Powell and Lake Mead, the agency does not have experience at these reservoirs with **extreme low-flow conditions** threatening critical infrastructure, which **makes it impossible to predict outcomes with any certainty**. Reclamation would need to **balance equity and infrastructure concerns** in real time under such conditions.[47]

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[46] *Id*. at 16-17 (emphases added).

[47] *Id*. at 17 (emphases added).

Reclamation applies the wrong legal standard to determine how much analysis is required to describe the Federal Authorities Alternative. NEPA does not require "certainty" of the outcome of each alternative analyzed, the ultimate legal authority it will exercise, or how it will be exercised under low-flow conditions.[48] Rather, NEPA requires that Reclamation "utilize a systematic, interdisciplinary approach" based on "natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment."[49] Moreover, the alternatives analysis "should sharply define the issues for the decision maker and the public and provide a clear basis for choice among options,"[50] which here requires an explanation of application of the Law of the River to each alternative. Similarly, Reclamation fails to disclose the "equity and infrastructure" concerns and how they will be balanced, all of which relate to Reclamation's interpretation of the Law of the River and application of the same.

Third, the Lower Basin and Upper Basin States have differing interpretations of key components of the Law of the River and how they would apply especially to the Federal Authorities Alternative and the No Action Alternative, both of which assume no Seven Basin State consensus approach or additional Reclamation legal authority.

The following provides one crucial example of differing interpretations of application of the Law of the River to long-term Colorado River management under low-flow conditions. The LROC requires Reclamation to create annual plans of operation for the Colorado River Storage Project ("CRSP") units and Lake Mead. Such plans must include a determination, consistent with Colorado River Basin Project Act § 602(a)(3), as to how much water is needed in storage to satisfy future delivery requirements to Mexico and the Lower Basin States under 602(a)(1) and (2).[51] Importantly, the Upper Basin States have asserted that Section 602(a) "allow[s] the

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[48] *See* NEPA § 102(2)(A), 42 U.S.C. § 4332(2)(A); 40 C.F.R. § 1502.15(b) (2024) (subject to rescission) (requiring agencies to "use high-quality information, including reliable data and resources, [and] models.").

[49] NEPA § 102(2)(A), 42 U.S.C. § 4332(2)(A).

[50] *See* 40 C.F.R. § 1502.14 (2024) (subject to rescission).

[51] The relevant statutory language provides: "In order to comply with and carry out the provisions of the Colorado River Compact [of 1922], the Upper Colorado River Basin Compact, and the Mexican Water Treaty, the Secretary shall propose criteria for the coordinated long-range operation of [the CRSP reservoirs and Lake Mead] . . . . **The criteria shall make provision for the storage of water in [CRSP Reservoirs] and releases of water from Lake Powell in the following listed order of priority**: (1) releases to supply one-half the deficiency described in article III(c) of the Colorado River Compact, if any such deficiency exists and is chargeable to the States of the Upper Division . . . ; (2) releases to comply with article III(d) of the Colorado River

Upper Division States to continue to meet their obligations under the [Compact] without impairing their ability to consumptively use the waters of the Colorado River System apportioned to them in perpetuity by the Compact" notwithstanding the annual releases prioritized in 602(a)(1)-(2).[52] However, nothing in Section 602(a) or the LROC suggests the conditions under which less than 8.23 maf would be released each year for the Lower Basin and Mexico.[53] In the reasonably foreseeable event of ongoing low-flow conditions, it is certain that Reclamation will be required to render its own interpretation of the Colorado River Basin Project Act and other elements of the Law of the River. Reclamation can and must analyze the same in the alternatives analysis.

Fourth, if low-flow conditions continue to occur in the future, which the Alternatives Report seems to assume, it is then reasonably foreseeable that Compact curtailment (also known as a "Compact Call") will result if the Basin States do not reach a consensus approach. The Lower Basin States have already submitted comments to Reclamation emphasizing the need to analyze the impacts of a Compact Call under each alternative and why a Compact Call is reasonably foreseeable.[54] A core NEPA requirement is that an EIS include consideration of reasonably foreseeable effects and actions, such as the Compact Call.[55] To ensure a legally sufficient analysis of a reasonably foreseeable Compact Call, the Lower Basin States request

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Compact, less such quantities of water delivered into the Colorado River below Lee Ferry to the credit of the States of the Upper Division from other sources; and (3) **storage of water not required for the releases specified in clauses (1) and (2)** of this subsection **to the extent the Secretary . . . shall find this to be reasonably necessary to assure deliveries under clauses (1) and (2)** without impairment of annual consumptive uses in the upper basin pursuant to the Colorado River Compact: Provided, That water not so required to be stored shall be released from Lake Powell: (i) to the extent it can be reasonably applied in the States of the Lower Division to the uses specified in article III(e) of the Colorado River Compact [except when] the active storage in Lake Powell is less than the active storage in Lake Mead, (ii) to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell…." CRBPA § 602(a), 43 U.S.C. § 1552(a) (emphases added).

[52] *See* Upper Basin States, Letter regarding "Reclamation's Consideration of 602(a) Storage in the No Action Alternative," at 1 (Jun. 11, 2024).

[53] For more information regarding the disagreement between the Upper and Lower Basin States on this issue, *see* Lower Basin States Letter to Reclamation re "Upper Division States' June 11, 2024 Letter Regarding 602(a) Storage Considerations in the No-Action Alternative" (June 25, 2024).

[54] *See* Lower Basin Letter to Reclamation re "Upper Division States' June 11, 2024 Letter Regarding 602(a) Storage Considerations in the No-Action Alternative" (June 25, 2024).

[55] *See* NEPA § 102(2)(C)(i),(ii), 42 U.S.C. § 4332(2)(C)(i),(ii).

that Reclamation include the following assumptions regarding a Compact Call in the analysis of each alternative other than the Lower Basin Alternative:[56]

- **Required deliveries pursuant to Article III of the Compact**: The Compact requires the delivery of the following at Lee Ferry: 75 MAF every 10 years, on a rolling basis, plus the Upper Basin States' share of the Mexico Treaty obligation.
- **Compact call by the Lower Division States**: As stated above, it is reasonably foreseeable that if deliveries at Lee Ferry fail to satisfy the Compact requirements, the Lower Basin States will make a Compact Call for delivery of the deficit.
- **Upper Basin curtailment or other reductions**: It is reasonably foreseeable that, in the event of a Compact Call, the Upper Basin States will take, or be compelled to take, the necessary steps to comply with the Compact requirements, whether through curtailment, demand management storage in Lake Powell, or voluntary conservation measures. If a particular alternative incorporates a demand management storage program in Lake Powell or other conservation measures, it would be appropriate to assume utilization of that program according to its terms. Otherwise, it should be assumed that the Upper Basin States will curtail users as necessary (i.e., implement reductions) to satisfy their obligation. The Lower Basin States would support modeling of curtailment consistent with the requirements of the 1948 Upper Colorado River Basin Compact and the 1922 Colorado River Compact.
- **Actions by the United States in management of federal reservoirs**: Congress directed Reclamation to operate all federal infrastructure, including federal reservoirs, consistently with the 1922 Colorado River Compact, and Section 602(a) of the Colorado River Basin Project Act directs the Secretary to manage Upper Basin federal reservoirs to prioritize releases for Compact compliance, second only to releases to satisfy the Treaty obligation to Mexico. The 1970 Long Range Operating Criteria provide for minimum annual releases of 8.23 maf to meet these priorities. Given this, it is reasonably foreseeable the United States will comply with these and other related elements of the Law of the River in operating the reservoirs.
- **Actions needed in advance of a Compact Call**: In addition to releasing water from Upper Basin reservoirs in response to a Compact Call, we expect that the United States will take actions necessary to release water from those reservoirs in advance of a Compact Call. Recognizing that the existing environmental compliance, or even physical capacity, of the reservoirs may not permit single-year releases on the scale

[56] *See Save the Colorado v. U.S. Army Corps of Eng'rs*, No. 18-cv-03258, 2024 WL 4519201, at *14 n.24, 2024 U.S. Dist. LEXIS 189322 (D. Colo. Oct. 16, 2024) (Court, in concluding that the agency violated NEPA for other reasons, stated that given the "last few decades of severe aridity . . . it is perplexing . . . that the Corps dismissed the possibility of a [1922 Colorado River] compact call in its analysis of a proposed water management project.").

necessary to satisfy a Compact Call, the United States should prepare by moving water through the reservoirs in advance, to satisfy any potential, near-term Compact Call. These anticipatory measures will be particularly important considering the need to protect critical infrastructure.

III. Reclamation's Failure to Consider an Alternative that Addresses the Long-term Infrastructure Limitations from Glen Canyon Dam Violates NEPA

Reclamation identifies the first (and apparently most important in Reclamation's judgment) operational constraint "common to all alternatives" as follows: "Releases from Lake Powell may be less than the specified release at elevations below 3,490 feet **due to Glen Canyon Dam infrastructure limitations**."[57] Regarding "infrastructure limitations," the Alternatives Report further states under each action alternative that "[i]f Lake Powell is projected to fall below 3,490 feet after additional releases are made from CRSP Upper Initial Units…, Lake Powell releases would be reduced to protect 3,490 feet. If a monthly release is reduced to protect 3,490 feet, subsequent months' releases within the WY would be increased to make up the volume if possible."[58]

Elsewhere, Reclamation has explained the basis of the 3,490-elevation needed to address infrastructure limitations. Specifically, in April 2023 Reclamation conducted a "High Flow Experiment" ("HFE") release to rebuild beaches and sandbars in the Colorado River. Thereafter, Reclamation discovered damage in the Glen Canyon Dam "river outlet works" (also known as "bypass tubes").[59]

The river outlet works consist of four steel pipes that move water from Lake Powell directly downstream into the Colorado River, bypassing the hydropower generating units. Reclamation explained that the river outlet works are the "only means for releasing water below elevation 3,490 ft" because "[w]ater cannot be released from the spillways below elevation 3,648 ft, nor through the penstocks below elevation 3,490 ft. Water can theoretically be released from the outlet works down to elevation **3,370 ft**, which is the intake invert and dead pool elevation."[60]

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[57] Alternatives Report § 7.2, at 12 (emphasis added).

[58] *Id*. § 7.4.2.2, at 19.

[59] Reclamation Press Release, "Glen Canyon Dam begins relining project as part of the President's Investing in America agenda" (Sept. 3, 2024).

[60] Reclamation, "Technical Decision Memorandum: Establishment of Interim Operating Guidance for Glen Canyon Dam during Low Reservoir Levels at Lake Powell," at 3-4 (Mar. 26, 2024) (emphasis added) ("Technical Decision Memorandum"), available here.

On March 26, 2024, Reclamation released a "Technical Decision Memorandum," explaining that the April 2023 release and other HFE releases in 1996, 2004, 2008, 2012, 2013, 2014, 2016, 2018, and 2023 from the river outlet works, combined with flood control releases in 1984-1987 had over time damaged the original coal tar enamel lining as a result of "cavitation."[61]

Reclamation further explained in the Technical Decision Memorandum that it planned to replace the original coal tar enamel lining with a "solvent borne epoxy" at a cost of $8.9 million from the Bipartisan Infrastructure Law.[62] Importantly, Reclamation explained that the removal and replacement of the lining of the river outlet works was a short-term fix, not a long-term solution for ensuring "continuous long-term operation" of Glen Canyon Dam:

> "[T]here is concern with using the outlet works to provide long-term releases, particularly at high flows…. In order to achieve a high level of confidence for continuous long-term operation of the outlet works, a **major overhaul or replacement of the hollow-jet valves should be considered**…. A value planning study is currently planned to inform whether to refurbish or replace the hollow-jet valve hydraulic operating system."[63]

On September 3, 2024, Reclamation reiterated in a press release that the relining project will not address the risks to Glen Canyon Dam from cavitation: "While relining the outlets won't prevent the risk of additional cavitation when operating at low reservoir levels, Reclamation is working on reducing that risk through the recent development of interim operating guidance for the outlets and additional analyses."[64]

Reclamation's approach to addressing the Glen Canyon Dam infrastructure limitations caused by damage to the river outlet works is inconsistent with NEPA's requirements for the following reasons:

First, Reclamation does not include addressing the Glen Canyon Dam infrastructure limitations in the statement of "Purpose and Need" contained in both the October 2023 Scoping Report and January 2025 Alternatives Report.[65] However, the Alternatives Report

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[61] *Id.* at 6.

[62] *Id.* at 4; Reclamation Press Release, *supra* note 59.

[63] *Id.* at 7 & n. 4 (emphasis added).

[64] Reclamation Press Release, *supra* note 59.

[65] *See Scoping Report for the Post-2026 Colorado River Reservoir Operations* § 5.2, at 60-61 (Oct. 2023); Alternatives Report § 5, at 6-7. Perhaps not coincidentally, because Reclamation's

elevates to the highest de facto purpose of the proposed action maintaining the Lake Powell elevation above 3,490 feet "**due to Glen Canyon Dam infrastructure limitations**."[66] Reclamation imposes this constraint in all the action alternatives without including any alternative which provides a long-term design, reparation, or other solution to allow long-term use of the river outlet works at below the 3,490 ft elevation in order to deliver water to the Lower Basin "under a wide range of potential future system conditions due to a changing climate."[67] By not including an action alternative that resolves Glen Canyon infrastructure limitations, Reclamation impermissibly limits the range of reasonable alternatives.[68]

Second, Reclamation is currently considering alternatives to eliminating the infrastructure limitations in a "value planning study" outside the NEPA process to ensure a "high level of confidence for continuous long-term operation of the outlet works" by overhauling or replacing the hollow-jet valves and other possible solutions (which may also include reengineering the dam or routing water through bypass tunnels).[69] A central purpose of the Post-2026 Operational Guidelines analysis is to evaluate "additional mechanisms for the … delivery of water supplies in Colorado River reservoirs," including use of "different operational approaches," and to "inform the public about "operational challenges" and "water

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Purpose and Need descriptions fail to include addressing Glen Canyon Dam infrastructure limitations through mechanical alterations, they also fail to include all other reasonable actions that might address those limitations including, without limitation, conservation in the Upper Basin, curtailment in the Upper Basin, and revised operation of upstream reservoirs.

[66] Alternatives Report § 7.2, at 12 (emphasis added). The de facto elevation of maintaining Lake Powell elevation above 3,490 feet – which is also the minimum elevation to operate the hydropower ("power pool") – also appears inconsistent with governing law and Reclamation's duty to operate "regulatory structures controlled by the United States and from releasing water controlled by the United States other than in accordance with the following order of priority: (1) For river regulation, improvement of navigation, and flood control; (2) For irrigation and domestic uses, including the satisfaction of present perfected rights; and (3) For power." *See Arizona v. California*, 547 U.S. 150, 154–56 (2006); *see also* 43 U.S.C. § 1501(a) (per the "Congressional declaration of purpose and policy…, the generation and sale of electrical power [is] an incident of the … purposes" of the management of the "Colorado River Basin Project" to provide "adequate water supplies" to water users).

[67] Alternatives Report § 4.0, at 4.

[68] *See, e.g., Env't Def. Ctr. v. Bureau of Ocean Energy Mgmt.*, 36 F.4th 850, 877 (9th Cir. 2022) (agencies fail to meet their NEPA obligations when they do not "give full and meaningful consideration to all reasonable alternatives," including the reasonable alternatives presented by stakeholders).

[69] *See* Reclamation, Technical Decision Memorandum, *supra* note 60, at 7.

management mechanisms … within any operational framework."[70] Reclamation purports to evaluate "better operational protection for Lake Powell … and associated infrastructure,"[71] yet fails to address measures to resolve the infrastructure limitations caused by river outlet works damage. Addressing the infrastructure limitations may be the one long-term measure that would best achieve operation and management improvements to the Glen Canyon Dam. Accordingly, Reclamation in this NEPA process must evaluate the impacts of infrastructure repairs, modifications and enhancements at Glen Canyon Dam, including overhauling or replacing the hollow-jet valves and other possible solutions, which Reclamation acknowledges are feasible.[72]

Third, it is unclear whether Reclamation is relying on a NEPA categorical exclusion to separately evaluate long-term repairs, modifications and enhancements to the Glen Canyon Dam.[73] Even if it is, separately evaluating infrastructure repairs, modifications and enhancements in a separate planning process (i.e., the "value planning study") contravenes the requirement that "[t]he agency shall evaluate, in a single review, proposals or parts of proposals that are related closely enough to be, in effect, a single course of action."[74] Evaluating Glen Canyon Dam infrastructure limitations fixes to allow more water deliveries to the Lower Basin States during low Lake Powell elevations cannot be teased out of the "course of action" establishing rules for coordinated operation of Lakes Powell and Mead. Moreover, it is difficult to envision how significant changes to Glen Canyon Dam resulting from the uncorrected infrastructure limitations that directly impacts how much water is released to the Lower Basin States during low-flow conditions does not constitute a "major federal action"

[70] Alternatives Report §§ 5, 6, and 7, at 6-8, 17.

[71] *Id*. § 7.7, at 29.

[72] NEPA's 2023 Amendments direct agencies to discuss in an EIS "a reasonable range of alternatives to the proposed action … that are technically and economically feasible, and meet the purpose and need of the proposal." NEPA § 102(2)(C)(iii), 42 U.S.C. § 4332(2)(C)(iii).

[73] Reclamation has a legal obligation to maintain federal water delivery infrastructure in good repair and operation, and no categorical exclusion permits Reclamation to ignore NEPA compliance with respect to the evaluation and implementation of major reparations of federal infrastructure that have significant consequences to downstream users. *See* Department of the Interior, 516 Department Manual Chap. 14, § 14.5 (Reclamation Categorical Exclusions) (Dec. 2020).

[74] 40 C.F.R. § 1501.3(b) (2024) (subject to rescission); 43 C.F.R. §§ 46.430(b) ("The environmental analyses for these related permits, licenses, and approvals should be integrated and performed concurrently.").

subject to preparation of an EIS.[75] Accordingly, the failure to consider the Glen Canyon Dam infrastructure limitations and potential reparations of the same as part of the alternatives analysis in any Post-2026 Operational Guidelines Final EIS would violate NEPA.

CONCLUSION

As detailed above, if Reclamation proceeds on the course set in its Alternatives Report and does not carry forward a detailed analysis of the complete Lower Basin Alternative in the Post-2026 Operations EIS, it will render the EIS legally deficient. Without a detailed analysis of the Lower Basin Alternative, the EIS will not have considered a reasonable range of alternatives, and will leave unevaluated a viable alternative that meets the project's purpose and need and is distinguishable from the other alternatives that Reclamation has carried forward for detailed analysis. Reclamation must comply with NEPA in this process and must revise its alternatives accordingly.

The Lower Basin States have demonstrated here that Reclamation's range of alternatives in the ongoing NEPA process is improperly constrained by Reclamation's required assumption to protect elevation 3,490 ft in Lake Powell for every action alternative included for detailed consideration to date. Reclamation's own admissions show that options to protect Glen Canyon Dam infrastructure other than a hard-protect elevation of 3,490 ft for Lake Powell may exist but are impermissibly under consideration outside the NEPA process. Reclamation's unsupported assumption to protect Glen Canyon Dam infrastructure in only one way impermissibly elevates a narrow, artificially constrained infrastructure protection priority over the congressional purposes for project operation and the requirements of the Compact and 1944 Treaty with Mexico to supply water. Reclamation's failure to identify and consider options for the Glen Canyon Dam infrastructure situation in its DEIS will—if not corrected—render the resulting Final EIS and Record of Decision invalid.

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[75] NEPA § 102(2)(C)(A), 42 U.S.C. § 4332(2)(C)(iii); *See also San Luis & Delta-Mendota Water Auth. v. Jewell*, 747 F.3d 581, 646, 695 (9th Cir. 2014) ("[M]ajor federal actions significantly affecting the quality of the human environment" require an EIS, 42 U.S.C. § 4332(2)(C). Under applicable case law, when faced with operational or structural changes which "change the status quo" operation of an existing dam to reduce flows to downstream users "where there are substantial questions about whether [the changes] … may cause significant degradation of the human environment," NEPA requires that Reclamation consider such changes in an EIS) (remanding to Reclamation to prepare an EIS to evaluate changes in a dam's operation that "reduce the flow rate … in times of less precipitation"), *aff'g Delta Smelt Consol. Cases v. Salazar*, 686 F. Supp. 2d 1026, 1030, (E.D. Cal. 2009) (holding that "impact of coordinated operations of the Central Valley Project" in a manner that changed the "water delivery operations … to restrict project water flows … substantially alters the status quo in the Projects' operations" requiring Reclamation to consider such changes).

Further, Reclamation's alternatives analysis must include the effects of a Compact Call on each alternative and discuss why a Compact Call is reasonably foreseeable. Failure to consider a likely Compact Call on the Upper Basin States and their users not only violates NEPA's requirements to evaluate reasonably foreseeable effects, it does a disservice to all stakeholders who deserve to understand the real-world implications of a Compact Call likely to arise from a lack of consensus among the Seven Basin States regarding the requirements of the Law of the River. The serious process and analytical deficiencies documented here by the Lower Basin States are not mere technical or legal requirements that ultimately will result in Reclamation having to start over; rather, they reflect a deliberate, inadvisable departure from NEPA's fundamental twin purposes—to (1) evaluate the significant environmental impacts of Reclamation's actions and (2) give the public a voice regarding the consequences of Reclamation's action. Reclamation can and must do better.

The Lower Basin State Representatives look forward to discussing these items with the Secretary as soon as practicable, and to working with Reclamation, the Upper Basin States, the Colorado River Tribes, and other stakeholders to ensure an EIS process that conforms with NEPA and can help support the development of a consensus approach for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead.

EXHIBIT 2

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Reclamation

BOULDER CANYON PROJECT
Arizona-California-Nevada

CONTRACT FOR DELIVERY OF WATER

THIS CONTRACT made this 9th day of February, 1944, pursuant to the Act of Congress approved June 17, 1902 (32 Stat. 388), and acts amendatory thereof or supplemental thereto, all of which acts are commonly known and referred to as the Reclamation Law, and particularly pursuant to the Act of Congress approved December 21, 1928 (45 Stat. 1057), designated the Boulder Canyon Project Act, and acts amendatory thereof or supplementary thereto, between THE UNITED STATES OF AMERICA, hereinafter referred to as "United States," acting for this purpose by Harold L. Ickes, Secretary of the Interior, hereinafter referred to as the "Secretary," and the STATE OF ARIZONA, hereinafter referred to as "Arizona," acting for this purpose by the Colorado River Commission of Arizona, pursuant to Chapter 46 of the 1939 Session Laws of Arizona,

WITNESSETH THAT:

EXPLANATORY RECITALS

2. WHEREAS, for the purpose of controlling floods, improving navigation, regulating the flow of the Colorado River,

providing for storage and for the delivery of stored waters for the reclamation of public lands and other beneficial uses exclusively within the United States, the Secretary acting under and in pursuance of the provisions of the Colorado River Compact and Boulder Canyon Project Act, and acts amendatory thereof or supplementary thereto, has constructed and is now operating and maintaining in the main stream of the Colorado River at Black Canyon that certain structure known as and designated Boulder Dam and incidental works, creating thereby a reservoir designated Lake Mead of a capacity of about thirty-two million (32,000,000) acre-feet, and

3. WHEREAS, said Boulder Canyon Project Act provides that the Secretary under such general rules and regulations, as he may prescribe, may contract for the storage of water in the reservoir created by Boulder Dam, and for the delivery of such water at such points on the river as may be agreed upon, for irrigation and domestic uses, and provides further that no person shall have or be entitled to have the use for any purpose of the water stored, as aforesaid, except by contract made as stated in said Act, and

4. WHEREAS, it is the desire of the parties to this contract to contract for the storage of water and the delivery thereof for irrigation of lands and domestic uses within Arizona, and

5. WHEREAS, nothing in this contract shall be construed as affecting the obligations of the United States to Indian tribes,

6. NOW, THEREFORE, in consideration of the mutual covenants

herein contained, the parties hereto agree as follows, to wit:

DELIVERY OF WATER

7. (a) Subject to the availability thereof for use in Arizona under the provisions of the Colorado River Compact and the Boulder Canyon Project Act, the United States shall deliver and Arizona, or agencies or water users therein, will accept under this contract each calendar year from storage in Lake Mead, at a point or points of diversion on the Colorado River approved by the Secretary, so much water as may be necessary for the beneficial consumptive use for irrigation and domestic uses in Arizona of a maximum of 2,800,000 acre-feet.

(b) The United States also shall deliver from storage in Lake Mead for use in Arizona, at a point or points of diversion on the Colorado River approved by the Secretary, for the uses set forth in subdivision (a) of this Article, one-half of any excess or surplus waters unapportioned by the Colorado River Compact to the extent such water is available for use in Arizona under said compact and said act, less such excess or surplus water unapportioned by said compact as may be used in Nevada, New Mexico, and Utah in accordance with the rights of said states as stated in subdivisions (f) and (g) of this Article.

(c) This contract is subject to the condition that Boulder Dam and Lake Mead shall be used: First, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses and satisfaction of perfected rights in pursuance of Article VIII of the Colorado River Compact; and third, for power. This contract is made upon the express condition and with the express covenant that the United States and Arizona, and agencies and water users therein, shall observe and be subject to and controlled by said Colorado River Compact and the Boulder Canyon Project Act in the construction, management, and operation of Boulder Dam, Lake Mead, canals and other works, and the storage, diversion, delivery and use of water for the generation of power, irrigation and other uses.

(d) The obligation to deliver water at or below Boulder Dam shall be diminished to the extent that consumptive uses now or hereafter existing in Arizona above Lake Mead diminish the flow into Lake Mead, and such obligation shall be subject to such reduction on account of evaporation, reservoir and river losses, as may be required to render this contract in conformity with said compact and said act.

(e) This contract is for permanent service, subject to the conditions stated in subdivision (c) of this Article, but as to the one-half of the waters of the Colorado River system unapportioned by paragraphs (a), (b), and (c) of Article III of the Colorado River Compact, such water is subject to further equitable apportionment at any time after October 1, 1963,

as provided in Article III (f) and Article III (g) of the Colorado River Compact.

(f) Arizona recognizes the right of the United States and the State of Nevada to contract for the delivery from storage in Lake Mead for annual beneficial consumptive use within Nevada for agricultural and domestic uses of 300,000 acre-feet of the water apportioned to the Lower Basin by the Colorado River Compact, and in addition thereto to make contract for like use of 1/25 (one twenty-fifth) of any excess or surplus waters available in the Lower Basin and unapportioned by the Colorado River Compact, which waters are subject to further equitable apportionment after October 1, 1963 as provided in Article III (f) and Article III (g) of the Colorado River Compact.

(g) Arizona recognizes the rights of New Mexico and Utah to equitable shares of the water apportioned by the Colorado River Compact to the Lower Basin and also water unapportioned by such compact, and nothing contained in this contract shall prejudice such rights.

(h) Arizona recognizes the right of the United States and agencies of the State of California to contract for storage and delivery of water from Lake Mead for beneficial consumptive use in California, provided that the aggregate of all such deliveries and uses in California from the Colorado River shall not exceed the limitation of such uses in that State required by the provisions of the Boulder Canyon Project Act and agreed to by the State of California by an act of its Legislature (Chapter

16, Statutes of California of 1929) upon which limitation the State of Arizona expressly relies.

(i) Nothing in this contract shall preclude the parties hereto from contracting for storage and delivery above Lake Mead of water herein contracted for, when and if authorized by law.

(j) As far as reasonable diligence will permit, the water provided for in this contract shall be delivered as ordered and as reasonably required for domestic and irrigation uses within Arizona. The United States reserves the right to discontinue or temporarily reduce the amount of water to be delivered, for the purpose of investigation and inspection, maintenance, repairs, replacements or installation of equipment or machinery at Boulder Dam, or other dams heretofore or hereafter to be constructed, but so far as feasible will give reasonable notice in advance of such temporary discontinuance or reduction.

(k) The United States, its officers, agents and employees shall not be liable for damages when for any reason whatsoever suspensions or reductions in the delivery of water occur.

(l) Deliveries of water hereunder shall be made for use within Arizona to such individuals, irrigation districts, corporations or political subdivisions therein of Arizona as may contract therefor with the Secretary, and as may qualify under the Reclamation Law or other federal statutes or to lands of

the United States within Arizona. All consumptive uses of water by users in Arizona, of water diverted from Lake Mead or from the main stream of the Colorado River below Boulder Dam, whether made under this contract or not, shall be deemed, when made, a discharge pro tanto of the obligation of this contract. Present perfected rights to the beneficial use of waters of the Colorado River system are unimpaired by this contract.

(m) Rights-of-way across public lands necessary or convenient for canals to facilitate the full utilization in Arizona of the water herein agreed to be delivered will be granted by the Secretary subject to applicable federal statutes.

POINTS OF DIVERSION: MEASUREMENTS OF WATER

8. The water to be delivered under this contract shall be measured at the points of diversion, or elsewhere as the Secretary may designate (with suitable adjustment for losses between said points of diversion and measurement), by measuring and controlling devices or automatic gauges approved by the Secretary, which devices, however, shall be furnished, installed, and maintained by Arizona, or the users of water therein in manner satisfactory to the Secretary; said measuring and controlling devices or automatic gauges shall be subject to the inspection of the United States, whose authorized representatives may at all times have access to them, and any deficiencies found shall be promptly corrected by the users thereof. The United States shall be under obligation to deliver

water only at diversion points where measuring and controlling devices or automatic gauges are maintained, in accordance with this contract, but in the event diversions are made at points where such devices are not maintained, the Secretary shall estimate the quantity of such diversions and his determination thereof shall be final.

CHARGES FOR STORAGE AND DELIVERY OF WATER

9. No charge shall be made for the storage or delivery of water at diversion points as herein provided necessary to supply present perfected rights in Arizona. A charge of 50¢ per acre-foot shall be made for all water actually diverted directly from Lake Mead during the Boulder Dam cost repayment period, which said charge shall be paid by the users of such water, subject to reduction by the Secretary in the amount of the charge if it is concluded by him at any time during said cost-repayment period that such charge is too high. After expiration of the cost-repayment period, charges shall be on such basis as may hereafter be prescribed by Congress. Charges for the storage or delivery of water diverted at a point or points below Boulder Dam, for users, other than those specified above, shall be as agreed upon between the Secretary and such users at the time of execution of contracts therefor, and shall be paid by such users; provided such charges shall, in no event, exceed 25¢ per acre-foot.

RESERVATIONS

10. Neither Article 7, nor any other provision of this contract, shall impair the right of Arizona

and other states and the users of water therein to maintain, prosecute or defend any action respecting, and is without prejudice to, any of the respective contentions of said states and water users as to (1) the intent, effect, meaning and interpretation of said compact and said act; (2) what part, if any, of the water used or contracted for by any of them falls within Article III (a) of the Colorado River Compact; (3) what part, if any, is within Article III (b) thereof; (4) what part, if any, is excess or surplus waters unapportioned by said Compact; and (5) what limitations on use, rights of use and relative priorities exist as to the waters of the Colorado River system; provided, however, that by these reservations there is no intent to disturb the apportionment made by Article III (a) of the Colorado River Compact between the Upper Basin and the Lower Basin.

DISPUTES AND DISAGREEMENTS

11. Whenever a controversy arises out of this contract, and if the parties hereto then agree to submit the matter to arbitration, Arizona shall name one arbitrator and the Secretary shall name one arbitrator and the two arbitrators thus chosen shall meet within ten days after their selection and shall elect one other arbitrator within fifteen days after their first meeting, but in the event of their failure to name the third arbitrator within thirty days after their first meeting, such arbitrator not so selected shall be named by the Senior Judge of the United States Circuit Court of Appeals for the

Tenth Circuit. The decision of any two of the three arbitrators thus chosen shall be a valid and binding award.

RULES AND REGULATIONS

12. The Secretary may prescribe and enforce rules and regulations governing the delivery and diversion of waters hereunder, but such rules and regulations shall be promulgated, modified, revised or extended from time to time only after notice to the State of Arizona and opportunity is given to it to be heard. Arizona agrees for itself, its agencies and water users that in the operation and maintenance of the works for diversion and use of the water to be delivered hereunder, all such rules and regulations will be fully adhered to.

AGREEMENT SUBJECT TO COLORADO RIVER COMPACT

13. This contract is made upon the express condition and with the express covenant that all rights of Arizona, its agencies and water users, to waters of the Colorado River and its tributaries; and the use of the same, shall be subject to and controlled by the Colorado River Compact signed at Santa Fe, New Mexico, November 24, 1922, pursuant to the Act of Congress approved August 19, 1921 (42 Stat. 171), as approved by the Boulder Canyon Project Act.

EFFECTIVE DATE OF CONTRACT

14. This contract shall be of no effect unless it is unconditionally ratified by an Act of the Legislature of Arizona, within three years from the date hereof, and further, unless within three years from the date hereof the Colorado River

Compact is unconditionally ratified by Arizona. When both ratifications are effective, this contract shall be effective.

INTEREST IN CONTRACT NOT TRANSFERABLE

15. No interest in or under this contract, except as provided by Article 7 (1), shall be transferable by either party without the written consent of the other

APPROPRIATION CLAUSE

16. The performance of this contract by the United States is contingent upon Congress making the necessary appropriations for expenditures for the completion and the operation and maintenance of any dams, power plants or other works necessary to the carrying out of this contract, or upon the necessary allotments being made therefor by any authorized federal agency. No liability shall accrue against the United States, its officers, agents or employees by reason of the failure of Congress to make any such appropriations or of any federal agency to make such allotments.

MEMBER OF CONGRESS CLAUSE

17. No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this contract or to any benefit that may arise herefrom, but this restriction shall not be construed to extend to this contract if made with a corporation or company for its general benefit.

DEFINITIONS

18. Wherever terms used herein are defined in Article II of the Colorado River Compact or in Section 12 of the

Boulder Canyon Project Act, such definitions shall apply in construing this contract.

19. IN WITNESS WHEREOF, the parties hereto have caused this contract to be executed the day and year first above written.

THE UNITED STATES OF AMERICA

By Harold L. Ickes
Secretary of the Interior

Approved this 9th day of Feb, 1944

Sidney P. Osborn
Governor of the State of Arizona

STATE OF ARIZONA, acting by and through its COLORADO RIVER COMMISSION

By Henry Ashurst
Chairman

By Nellie T. Bush
Secretary

EXHIBIT 3

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

DUPLICATE-ORIGINAL

Contract No. 14-06-W-245
Amendment No. 1
B.C. Draft 11/28/88

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONTRACT BETWEEN THE UNITED STATES AND THE CENTRAL ARIZONA WATER CONSERVATION DISTRICT FOR DELIVERY OF WATER AND REPAYMENT OF COSTS OF THE CENTRAL ARIZONA PROJECT

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONTRACT BETWEEN THE UNITED STATES AND THE CENTRL ARIZONA WATER CONSERVATION DISTRICT FOR DELIVERY OF WATER AND REPAYMENT OF COSTS OF THE CENTRAL ARIZONA PROJECT

1. PARTIES

The parties to this contract, executed as of this first day of December, 1988, are the United States of America, acting through the Department of the Interior, and the Central Arizona Water Conservation District, a multi-county water conservation district organized under the laws of Arizona, with its principal place of business in Phoenix, Arizona.

2. AUTHORITIES

This contract is made pursuant to the:

2.1 Act of June 17, 1902, 32 Stat. 388, and acts amendatory thereof and supplementary thereto.

2.2 Boulder Canyon Project Act, approved December 21, 1928, 45 Stat. 1057, a supplement to the Federal Reclamation Laws.

2.3 Reclamation Project Act of 1939, approved August 4, 1939, 53 Stat. 1187, as amended.

2.4 Colorado River Basin Project Act, approved September 30, 1968, 82 Stat. 885, as amended, a supplement to the Federal Reclamation Laws.

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2.5 Arizona Revised Statutes, Section 48-3701 et seq.

3. RECITALS

3.1 The Colorado River Basin Project Act provides, among other things, that for the purposes of furnishing irrigation water and municipal and industrial water supplies to water-deficient areas in Arizona and western New Mexico through direct diversion or exchange of water, control of floods, conservation and development of fish and wildlife resources, enhancement of recreation opportunities, and for other purposes, the Secretary of the Interior shall construct, operate, and maintain the Central Arizona Project, consisting of the principal works hereinafter described in Article 6.3.

3.2 Pursuant to the provisions of Arizona Revised Statutes, Section 48-3701 et seq., the Central Arizona Water Conservation District has been organized with the power to enter into a contract or contracts with the Secretary of the Interior to accomplish the purposes of Arizona Revised Statutes, Section 48-3701 et seq.

3.3 On December 15, 1972, the United States and the Contractor entered into a contract entitled "Contract Between the United States and the Central Arizona Water Conservation District for Delivery of Water and Repayment of Costs of the Central Arizona Project" (Contract No. 14-06-W-245), whereby, among other things, the United States agreed to construct the Central Arizona Project and the Contractor agreed to repay the costs of the project properly allocable to the Contractor.

3.4 Subarticle 9.3(b) of said contract provides that the Contractor's repayment obligation shall not exceed $1.2 billion.

3.5 Subarticle 9.3(b) of said contract also provides that if the

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Contractor's repayment obligation will exceed $1.2 billion, the Contracting Officer shall consult with the Contractor and continuation of construction will be contingent upon the execution of an amendatory contract to cover the increased repayment obligation.

3.6 Both parties acknowledge that the Contractor's repayment obligation will exceed $1.2 billion, and have agreed to increase the Contractor's repayment ceiling to a level sufficient to facilitate completion of the project.

4. ARTICLES OF AGREEMENT

NOW, THEREFORE, in consideration of the mutual and dependent stipulations and covenants herein contained, it is agreed by and between the parties hereto as follows:

5. DEFINITIONS

When used herein, unless otherwise distinctly expressed, or manifestly incompatible with the intent hereof, the terms:

5.1 "Federal Reclamation Laws" or "Reclamation Laws" shall mean the Act of June 17, 1902, 32 Stat. 388, and all acts amendatory thereof or supplementary thereto.

5.2 "Basin Project Act" shall mean the Colorado River Basin Project Act, 82 Stat. 885, dated September 30, 1968, as amended, which is a supplement to the Federal Reclamation Laws.

5.3 "Secretary" shall mean the Secretary of the Interior of the United States or his duly authorized representative.

5.4 "Contracting Officer" shall mean the Secretary or his authorized designee acting in his behalf.

5.5 "Contractor" shall mean the Central Arizona Water

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Conservation District, organized pursuant to Arizona Revised Statutes, Section 48-3701 et seq.

5.6 "Service area" shall mean the area now included within the Central Arizona Water Conservation District, consisting of Maricopa, Pinal, and Pima Counties of Arizona and such other counties as may hereafter become part of the District, exclusive of any Indian reservation land lying wholly or partly within said Counties.

5.7 "Subcontractor" shall mean any irrigation district, municipality, individual, or any entity which enters into a water service subcontract with the United States and the Contractor in furtherance of the provisions of the Basin Project Act.

5.8 "Central Arizona Project" or "project" shall mean the project and works authorized by Section 301(a) of the Basin Project Act and constructed by the United States pursuant to the provisions of said Act and this contract.

5.9 "Project works" shall mean the principal works described in Section 301(a) of the Basin Project Act, and appurtenances thereto, or as modified pursuant to Article 6.4 hereof, together with lands, interests in lands, and rights-of-way for such works and appurtenances.

5.10 "Water supply system" shall mean the Navajo Project, Havasu Pumping Plant, the Granite Reef, Salt Gila and Tucson aqueducts and associated pumping plants and appurtenant works, but not including Tucson Terminal Storage or any distribution works.

5.11 "Distribution works" shall mean those facilities constructed or financed by the United States under the authorization in Section 309(b) of the Basin Project Act for the primary purpose of

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distributing the project water supply within the service area after said project water supply has been transported or delivered through the water supply system.

5.12 "Agricultural water" or "irrigation water" shall mean project water used primarily in the commercial production of agricultural crops or livestock, including domestic use incidental thereto, on tracts of land operated in units of more than 5 acres.

5.13 "Miscellaneous water" shall mean water delivered from the project, or by exchange for project water, for recreational and fish and wildlife purposes at other than project facilities and shall have a lesser priority of use than agricultural water.

5.14 "Municipal and industrial water," herein referred to as "M&I water," shall mean project water other than agricultural or miscellaneous water delivered by means of the project works.

5.15 "Lands not having a recent irrigation history" shall mean, except where otherwise determined by the Secretary for efficiency of subcontractor's operation, lands which the Secretary determines were not irrigated during the period September 30, 1958, to September 30, 1968.

5.16 "OM&R" shall mean the care, operation, maintenance, and replacement of project works.

5.17 "Exchange water" shall mean Colorado River water made available in exchange for or in replacement of existing supplies from surface sources other than the mainstream of the Colorado River.

5.18 "Transferred works" shall mean such facilities of the water supply system or of other construction stages as to which OM&R

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responsibility is transferred from the United States to the Operating Agency.

5.19 "Operating Agency" shall mean the entity or entities authorized to assume OM&R responsibility of transferred works and approved for that purpose by the Contracting Officer.

5.20 "Transfer notice" shall mean a written notice or notices, numbered consecutively, which the Contracting Officer transmits to the Operating Agency and which shall designate:

(a) the transferred works;

(b) items of equipment and supplies transferred to the Operating Agency; and

(c) the date upon which such transfer will be effected.

5.21 "Gila River system waters" shall mean waters of the Gila River and tributaries thereof east of the Yuma-Maricopa County line.

5.22 "Notice of completion" shall mean the notice which the Contracting Officer issues to Contractor to announce the substantial completion of a construction stage. Each such notice of completion shall include the estimated amount of the repayment obligation for the construction stage to which the notice pertains, the date of initiation of repayment for the construction stage and indicate the amount and due date for the first payment for the construction stage.

5.23 "Development Fund" shall mean the separate fund, known as the Lower Colorado River Basin Development Fund, established in the Treasury of the United States pursuant to Section 403(a) of the Basin Project Act.

5.24 "Year" shall mean the period January 1 through the next

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succeeding December 31.

5.25 "Contractor's Construction Cost Repayment Obligation," hereinafter referred to as "repayment obligation," shall mean the total amount of all construction costs including related construction claims and interest thereon, OM&R costs during construction, and interest on costs allocated to the M&I water and power functions during construction, of the Central Arizona Project, incurred therefor and as determined by the United States and further described in Article 6.2 hereof, excluding reimbursable costs allocated to fish and wildlife and recreation, and costs associated with the delivery of water to entities other than the Contractor or subcontractors, and which is determined by the Secretary, after consultation with the Contractor, to be allocable to and repayable by the Contractor in accordance with the provisions of the Basin Project Act and this contract.

5.26 "Return flow" shall mean all agricultural, M&I, and miscellaneous waste water, seepage, and ground water which originates or results from water contracted for from the Central Arizona Project, but shall not include any water delivered through the project works for ground water recharge purposes.

5.27 "Project water" shall mean (a) all water allocated by the Secretary for project purposes by Federal Register notice dated March 24, 1983, and any subsequent reallocation by the Secretary as contemplated in paragraph 6 of said Federal Register notice, which water is available pursuant to contracts with the Secretary from: (1) the Colorado River; (2) Central Arizona Project dams and reservoirs; and (3) return flows captured by the Secretary for project use; (b) any water

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delivered to entities in Arizona, through the project works, as a replacement supply for Cliff Dam; (c) water delivered to water users in Arizona, through the project works, in exchange for water delivered to users in New Mexico from or by means of the project works; and (d) any additional water not included in (a) above, that is required to be delivered by the Secretary through the project, pursuant to the Ak-Chin Water Rights Settlement Act of 1978 (Public Law 95-328), as amended on October 19, 1984 (Public Law 98-530); the Southern Arizona Water Rights Settlement Act of October 12, 1982 (Title III of Public Law 97-293); and, subject to the execution of a settlement agreement by the Contractor providing for the settlement of the water rights claims of the Salt River Pima-Maricopa Indian Community and to the Salt River Pima-Maricopa Indian Community Water Rights Settlement Act of 1988 (Public Law 100-512), up to 22,000 acre-feet annually of Colorado River water to be delivered through the project works in accordance with said settlement agreement and legislation.

5.28 "Indian lands" shall mean the lands within any Indian reservation for which an allocation of project water has or will be made by the Secretary for delivery through project works.

5.29 "Navajo Project" shall mean the interests of the United States in the Navajo Generating Station and the Transmission System, or any replacement thereof, as authorized by Section 303 of the Basin Project Act and as described in contracts entered into pursuant to that Act.

5.30 "Construction stage" shall mean any one of the following: (1) the water supply system; (2) New Waddell and Modified Roosevelt Dams; (3) replacement features or programs for Cliff Dam; (4) Tucson terminal storage; (5) Hooker Dam or suitable alternative; and (6) Buttes Dam.

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5.31 "Plan 6" shall mean Plan 6 for the Regulatory Storage Division of the Central Arizona Project as approved by Record of Decision of the Secretary dated April 3, 1984 as amended and supplemented by Records of Decision of the Secretary dated May 20, 1986 (Supplement One) and June 17, 1988 (Supplement Two).

5.32 "Allocable cost" shall mean (a) with respect to the project, the total project cost less (1) the cost of non-Indian distribution works, (2) the cost of the safety of dams component of Plan 6, (3) the cost of Indian distribution systems, (4) the cost of the Colorado River Division and the New Mexico fish hatchery, (5) the cost of cultural resources studies, (6) the contributions provided by the States of Arizona and New Mexico prior to execution of the Plan 6 Funding Agreement, (7) the costs of Charleston Dam and San Pedro Aqueduct, (8) the cost of 500 cubic feet per second of incremental capacity in the Granite Reef Aqueduct and related costs in the Navajo Project, and (9) such other costs as determined appropriate by the Contracting Officer; and (b) with respect to each construction stage, the total cost of such stage less that portion of the following costs associated with such stage: (1) the cost of the safety of dams component of Plan 6, (2) the cost of cultural resources studies, (3) the contributions provided by the States of Arizona and New Mexico prior to execution of the Plan 6 Funding Agreement, (4) the cost of 500 cubic feet per second of incremental capacity in the Granite Reef Aqueduct and related costs in the Navajo Project, and (5) such other costs as determined appropriate by the Contracting Officer.

5.33 "OM&R Transfer Contract" shall mean the August 5, 1987, contract entitled "Contract Between the United States of America and the

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Central Arizona Water Conservation District for the Transfer of Operation and Maintenance of Facilities" (Contract No. 7-07-30-W0167), and any amendment or revision thereof.

5.34 "Overall repayment period" shall mean the period of time beginning with initiation of repayment of the first construction stage and ending with final payment of the last construction stage.

5.35 "Plan 6 Funding Agreement" shall mean the April 15, 1986, agreement entitled "Agreement Among the United States, the Central Arizona Water Conservation District, the Flood Control District of Maricopa County, the Salt River Agricultural Improvement and Power District and Salt River Valley Water Users' Association, the Arizona Cities of Chandler, Glendale, Mesa, Phoenix, Scottsdale, and Tempe, the State of Arizona, and the City of Tucson for Funding of Plan Six Facilities of the Central Arizona Project, Arizona, and for other Purposes," as it may be supplemented or amended.

5.36 "Permanent service" shall mean that water supply service commencing in the year following substantial completion of the water supply system and continuing in perpetuity.

5.37 "Ground water recharge" shall mean the recharge of water pursuant to title 45, chapter 2, article 13, Arizona Revised Statutes, or the underground storage and recovery of water pursuant to title 45, chapter 3, Arizona Revised Statutes, or as said statutes may hereafter be amended or revised.

5.38 "Project power" shall mean the United States' entitlement to capacity and energy from the Navajo Project.

6. PROJECT CONSTRUCTION

6.1 Agreement of the United States. Subject to the terms and

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conditions of this contract and within the limits of the funds made available therefor by Congress, the United States will expend toward the construction of the project, exclusive of interest costs during construction, $832,180,000 based on 1967 cost estimates, plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering cost indices applicable to the types of construction involved therein, or so much of such amount, as in the opinion of the Secretary, is necessary to construct said project, whichever amount is the lesser. The aforementioned amount includes the United States' costs of participation in the Navajo Project.

6.2 Costs of Project.

(a) The estimated construction cost of $832,180,000 for the project, based upon 1967 prices, has been determined as follows:

	$ 1,000's
Main System	
Granite Reef Division	407,740
Orme Division	42,340
Salt-Gila Division	47,170
Tucson Aqueduct (Colorado River source)	46,300
Buttes Dam	35,240
Navajo Project	106,000
Subtotal	684,790
Other Separate Features	
Hooker Dam or suitable alternative	31,730
Charleston Dam and San Pedro Aqueduct (San Pedro River source)	36,420
Subtotal	68,150
Miscellaneous Features	
*Gila River Division	5,250
Indian Distribution System	19,970
Colorado River Division	42,450
Drainage System	11,570
Subtotal	79,240
Total Project	$832,180

*Note: Fish hatchery costs, some of which may be located on the Colorado River.

Provided, however, That (i) the adjustment provisions of Article 6.1 apply

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to the total construction costs of the project and not to the costs of the individual line items set out in this Subarticle 6.2(a), and (ii) in accordance with provisions of Article 6.4 herein, the references to the individual line items set out in this Subarticle 6.2(a) are not to be deemed a determination that each of the features referred to in the individual line items will be constructed or that costs will be incurred for each of said individual line items based upon a percentage which the estimated costs for each individual line item bears to the project's total estimated construction costs.

(b) The Central Arizona Project costs incurred by the United States which are to be repaid by Contractor shall include the share allocated to the Contractor of (i) construction costs of the project, (ii) all expenses of whatsoever kind or nature heretofore or hereafter incurred by the United States in connection with, growing out of, or resulting from the construction, and (iii) the OM&R during construction of project works. The aforementioned share of allocated costs shall also include, but shall not be limited to, interest during construction on costs allocated to the M&I water and power functions, the cost of labor, materials, equipment, engineering, legal services, surveys, investigations, property, superintendence, administration, overhead, general expenses, special services, damages of all kinds and character, inspection, repair, and protection of project works and water supply, and the costs of all lands, interests in lands, and rights-of-way acquired by the United States for the project, all as determined by the Secretary.

6.3 Principal Works of the Project. The works and facilities to be constructed under this contract shall consist of the following principal

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works:

(a) A system of main conduits and canals, including the Havasu Pumping Plant and a main canal and pumping plants (Granite Reef Aqueduct and pumping plants), for diverting and carrying water from Lake Havasu to the confluence of the Salt and Verde Rivers, which system will have a capacity of 3,000 cubic feet per second;

(b) Salt-Gila Aqueduct and pumping plant;

(c) Tucson Aqueduct and pumping plants;

(d) New Waddell and Modified Roosevelt Dams;

(e) replacement features or programs for Cliff Dam;

(f) Tucson Terminal Storage (if approved by the Secretary);

(g) Buttes Dam and Reservoir;

(h) Hooker Dam and Reservoir or suitable alternative which shall be constructed in such manner as to give effect to the provisions of Section 304(f) of the Basin Project Act;

(i) Charleston Dam and Reservoir and the San Pedro Aqueduct;

(j) related canals, regulating facilities, and electric transmission facilities required for the operation of said principal works;

(k) related water distribution and drainage works; and

(l) appurtenant works.

No works or facilities for the treatment of water are included in the project works to be constructed by the United States. Nothing contained herein shall be construed to indicate the order in which the aforedescribed works will be constructed.

6.4 Changes in Project Works. Should the Secretary, either before or during construction, determine it to be in the best interests of

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the project, he may, upon the completion of the studies currently being made or to be made, including land classifications, hydrological, engineering, geological, sedimentation, water supply, and repayment ability, and after consultation with the Contractor, change the location, size, or capacity of any of the project works, or may eliminate works, or add works to those described above, and the Secretary's decision on such changes, eliminations, and additions shall be conclusive.

6.5 Construction Conditions. The United States shall be under no obligation to commence or, having commenced, to continue construction of project works until transfer from the State of Arizona of such State-owned lands or interests therein, in a form acceptable to the Attorney General of the United States, as the Secretary determines is necessary in the construction, operation, or maintenance of the project.

6.6 Annual Work Program. During construction of the project works the Contracting Officer will consult with the Contractor and/or with any subcontractor through or within whose service area project works are to be constructed to achieve maximum coordination between such construction program and the annual programs of any affected subcontractor. Within 30 days following the enactment by Congress and Presidential approval of annual or supplementary appropriation acts and the allotment of funds thereunder for continued construction of the project, the United States will furnish the Contractor with a notice and statement showing the proposed construction program for the balance of the current fiscal year and for the following fiscal year or years. If so requested in writing by the Contractor within 30 days of its receipt of such notice, the Secretary will consult with the Contractor and/or the affected subcontractor with respect

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to the proposed program. The action of the Contracting Officer concerning the program after such consultation shall be final.

6.7 Inability of the United States to Complete Project on Basis of Cost Estimates. If construction of the project works shall have been commenced but, prior to completion, the Secretary determines that the cost of constructing the project will exceed the maximum amount to be expended therefor by the United States as provided for in Article 6.1 hereof, the Secretary may after consultation with the Contractor terminate construction and declare the obligations of the United States hereunder with regard to completion of construction of the project to have been fulfilled. If appropriations for the continuance and/or completion of construction in amounts sufficient in the opinion of the Secretary to complete said construction are authorized by Congress and are available, the Secretary shall consult with the Contractor and shall make continuation of construction contingent upon the execution of an amendatory contract with the Contractor wherein the Contractor's maximum repayment obligation is increased so as to cover the increased reimbursable costs as determined by the Secretary; Provided, however, That the Contractor shall not utilize any part of the completed or unfinished project facilities in the absence of written agreement with the Secretary for reimbursement therefor.

7. PROJECT OPERATION, MAINTENANCE, AND REPLACEMENT

7.1 Operation and Maintenance and Water Deliveries by the United States Prior to Completion of Construction. Except as provided in the OM&R Transfer Contract, prior to completion of project works by the United States, as determined and announced to the Contractor in writing by the Secretary, the United States will operate and maintain said project

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facilities. The cost of said OM&R allocated to the Contractor shall be included in the Contractor's repayment obligation; Provided, however, That said OM&R cost shall not be included with the project cost ceiling set out in Article 6.1 hereof. During the aforesaid period, project water, if available, may be disposed of by the Secretary at charges which the Secretary determines to be appropriate; Provided, however, That to the extent deemed feasible by the Secretary, preference will be given to subcontractors and Indian lands. Payment for water shall be made in advance by the water user. The places of measurement and delivery of said water shall be established by the Secretary after consultation with the Contractor. Except as provided in the OM&R Transfer Contract, the proceeds accruing from the disposal of such water shall be credited to the Development Fund and applied toward the costs of the project as determined by the Secretary.

7.2 Operation and Maintenance and Water Deliveries after Completion of Construction. Except as provided in the OM&R Transfer Contract and any future agreements for the transfer of OM&R of the project works or portions thereof, upon completion of construction of a construction stage or upon completion of construction of the project, the United States shall operate and maintain such construction stage or the project and shall make project water available to project water users.

8. DELIVERY OF WATER

8.1 Obligation of United States. Subject to the terms, conditions, and provisions set forth herein, the United States will deliver project water to Contractor and, during such periods as it operates and maintains the water supply system, the United States will also transport and

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deliver said water to the subcontractors. After transfer of OM&R the United States will make deliveries of Colorado River water to the Operating Agency; deliveries of other project waters will be made pursuant to determinations made by the Secretary.

8.2 Term of Contract. Subject to the terms, conditions, and provisions set forth herein, this contract is for permanent service.

8.3 Conditions Relating to Delivery.

(a) The obligation of the United States to deliver water under this contract is subject to:

(i) The availability of such water for use in Arizona under the provisions of the Colorado River Compact, executed November 24, 1922; the Boulder Canyon Project Act, 45 Stat. 1057, dated December 21, 1928; the Colorado River Basin Project Act, dated September 30, 1968, 82 Stat. 885; the contract between the United States and the State of Arizona, dated February 9, 1944; the Opinion of the Supreme Court of the United States in the case of Arizona v. California et al., 373 U.S. 546, rendered June 3, 1963; and the March 9, 1964, Decree of that Court in said case, 376 U.S. 340, as amended on February 28, 1966, at 383 U.S. 268, and supplemented on January 9, 1979, at 439 U.S. 419, as now issued or hereafter modified.

(ii) Executive A, Seventy-eighth Congress, Second Session, a treaty between the United States of

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America and the United Mexican States, signed at Washington on February 3, 1944, relating to the utilization of the water of the Colorado River and Tijuana River and of the Rio Grande from Fort Quitman, Texas, to the Gulf of Mexico, and Executive H, Seventy-eighth Congress, Second Session, a protocol signed at Washington on November 14, 1944, supplementary to the Treaty.

(iii) The express understanding and agreement by the Contractor that this contract is subject to the condition that Hoover Dam and Lake Mead shall be used: first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses and satisfaction of present perfected rights in pursuance of Article VIII of the Colorado River Compact approved by Section 13(a) of the Boulder Canyon Project Act; and third, for power; and furthermore, that this contract is made upon the express condition and with the express covenant that all rights hereunder shall be subject to and controlled by the Colorado River Compact and that the United States and the Contractor shall observe and be subject to and controlled by said Colorado River Compact and Boulder Canyon Project Act in the construction, management, and operation of Hoover Dam,

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Lake Mead, canals and other works, and the storage, diversion, delivery, and use of water to be delivered to Contractor hereunder.

(iv) The right of the United States temporarily to discontinue or reduce the amount of water to be delivered hereunder whenever such discontinuance or reduction is made necessary for purposes of investigations, inspections, replacements, maintenance, or repairs to any works whatsoever affecting, utilized or, in the opinion of the Secretary, necessary for delivery of water hereunder, it being understood that so far as feasible the United States will (1) do so during periods of low water demands and (2) give reasonable notice in advance of such temporary discontinuance or reduction.

(b) Delivery of Colorado River water by the United States under this contract shall be charged to the State of Arizona's apportionment under the aforementioned Supreme Court Decree of March 9, 1964, in Arizona v. California and will discharge to that extent the obligation of the United States to deliver water under the aforementioned contract between the United States and the State of Arizona, dated February 9, 1944.

8.4 Delivery Points. Colorado River water to be furnished to the Contractor pursuant to this contract will be delivered by the United States in the Colorado River at the point of diversion from Lake Havasu where the intake structures of the Havasu Pumping Plant are

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constructed. Agua Fria and Upper Gila River system waters will be delivered to the Contractor at New Waddell and Buttes Dams, respectively. Delivery points for other project water supplies and for return flows will be determined by the Contracting Officer after consultation with the Contractor and/or the affected subcontractor therefor.

8.5 Measurement.

(a) The quantity of Colorado River water pumped from Lake Havasu for the project shall be measured by means of measuring devices to be installed as part of the project works. If, for any reason, in the opinion of the Secretary, said measuring devices shall fail to operate satisfactorily, the Secretary will, from the best information available, estimate the amount of water delivered to the Contractor.

(b) Deliveries of project water to the various subcontractors shall be measured by means of measuring devices to be installed as part of the project works at the points along the various aqueducts at which such water may be diverted for each of said subcontractors, and/or at the points in the various reservoirs formed by the dams constructed as part of the project works at which such water may be diverted for subcontractors and/or at the points where return flow may be delivered. These points of measurement will be established by the Secretary after consultation with Contractor and the affected subcontractor. If, for any reason, in the opinion of the Secretary, said measuring devices shall fail to operate satisfactorily, the Secretary will, from the best information available and after consultation with the Contractor and the affected subcontractor, estimate the amount of water delivered to each such subcontractor. The Secretary shall at all times have access over any lands

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and rights-of-way of a subcontractor for the purpose of inspecting and checking said measuring devices.

8.6 Responsibility for Distribution of Water after Leaving Water Supply System. Whether or not the United States operates and maintains the project facilities, the United States shall not be responsible for the control, carriage, handling, use, disposal, or distribution of water after said water has been diverted from the water supply system. At such time as the Operating Agency assumes responsibility for the OM&R of project works, the responsibility for diversion, carriage, and transportation of the water through the water supply system shall be the sole responsibility of the Operating Agency. Responsibility for distribution of water beyond the water supply system shall be that of the subcontractors to whom said water is delivered from the water supply system. The United States, its officers, agents, and employees, shall not be liable for damage or claim of damage of any nature whatsoever for which there is legal responsibility arising out of or connected with the control, carriage, handling, use, disposal, or distribution of such water, and each subcontractor shall hold the United States, its officers, agents, and employees, harmless from any and all such claims.

8.7 Quantity of Water to be Delivered.

(a) The Secretary reserves the right to determine that quantity of Colorado River water to be released each year from Lake Mead for use by the Central Arizona Project pursuant to applicable law, which shall include the quantity of water which may be allocated by the Secretary for use on Indian lands.

(b) The quantity of Colorado River water available under

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this contract for project purposes shall not exceed the quantity of water available to Arizona under the aforementioned Supreme Court Decree in Arizona v. California and in Arizona's water delivery contract with the United States after first providing for satisfaction of:

(i) present perfected rights and perfected rights described in Article II(D) of the Decree and the rights of other Federal reservations established prior to September 30, 1968; Provided, however, That the quantities of Colorado River water reserved to satisfy the aforesaid rights shall not, except as provided in said Decree, be reduced under any circumstances or for any reason whatsoever including, without limitation, a temporary use permitted by the Secretary by other water users in Arizona, California, or Nevada, of water reserved pursuant to the foregoing but not needed during any calendar year; And provided further, That no rights to the recurrent use of such water shall accrue by reason of said temporary use; and

(ii) the quantities of water provided for in all water delivery contracts between the United States and water users in Arizona as of September 30, 1968.

(c) The quantity of Colorado River water available under this contract for project purposes, including water for use on Indian lands

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shall have the same priority as to delivery as the quantities of Colorado River water delivered pursuant to water delivery contracts, Federal reservations of water, and other arrangements between the United States and water users in Arizona entered into subsequent to September 30, 1968, for use of Colorado River water on Federal, State or privately owned lands in Arizona in total quantities not to exceed 164,652 acre-feet of diversions per year; Provided, however, That the Contractor shall hold the United States, its officers, agents, employees, and successors or assigns, harmless as to any and all claims for damages to persons or to property direct or indirect and of whatever nature, arising out of or which may in any manner be connected with the operation and/or effect of this Subarticle.

(d) The limitation on contracting in Subarticle 8.7(c) above shall not apply to contracts with holders of present perfected rights to Colorado River water in Arizona or to the Secretary's order of November 24, 1982, reserving Colorado River water for the Cibola National Wildlife Refuge. Nothing in Subarticle 8.7(c) shall restrict the right of the Secretary under water service contracts referred to in said Subarticle to terminate and/or reduce any entity's entitlement to Colorado River water and to make that entitlement available to other water users in Arizona.

(e) During any year when the subcontractors cannot use any portion of their entitlement to project water, and such water cannot be resold or exchanged in accordance with the terms and conditions of the water service subcontracts, the Contractor shall have the right in its discretion to resell any or all of such water or to use any or all of such water for ground water recharge purposes, including the subsequent recovery and resale

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of such water, subject to Federal law, including but not limited to the Reclamation Reform Act of 1982, State of Arizona law, and such rules and regulations as the Secretary may deem appropriate. Subject to the terms and conditions of water service subcontracts, the water orders of all subcontractors shall be met before any project water is made available to the Contractor under this provision.

8.8 Subcontracts.

(a) The United States shall be a party to subcontracts.

(b) The Secretary and the Contractor shall require in each subcontract that:

(i) unless and until otherwise provided by Congress, water from the Central Arizona Project shall not be made available directly or indirectly for the irrigation of lands not having a recent irrigation history, as determined by the Secretary, except in the case of Indian lands, national wildlife refuges, and, with the approval of the Secretary, State-administered wildlife management areas;

(ii) there be in effect measures, adequate in the judgment of the Secretary and the Contractor, to control expansion of irrigation from aquifers affected by irrigation in the Contractor's service area and to reduce pumping of ground water in the agricultural subcontractors' service areas by the amount of project water received by said agricultural subcontractors;

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(iii) the canals and distribution systems through which water is conveyed after its delivery to the subcontractors shall be provided and maintained with linings adequate in the Secretary's judgment to prevent excessive conveyance losses;

(iv) neither the Secretary, the Contractor nor any subcontractor shall pump or permit others to pump ground water from within the exterior boundaries of the service area of a subcontractor receiving water from the Central Arizona Project for any use outside of said subcontractor's service area unless the Secretary, the Contractor, and such subcontractor shall agree, or shall have previously agreed, that a surplus of ground water exists and that drainage is or was required;

(v) except as otherwise agreed by the Contracting Officer, neither the Contractor nor any subcontractor shall sell or otherwise dispose of or permit the sale or other disposition of any project water, including return flows, for use outside the Contractor's service area;

(vi) irrigation water made available thereunder may be made available by the Secretary for M&I purposes if and to the extent that such water is no longer required by the subcontractor for irrigation purposes and shall be made available in all cases

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where lands receiving project water have been converted to municipal and industrial use; Provided, however, That subcontracts effectuating such transfers are subject to the approval of the Secretary and the Contractor, which approval shall not be withheld unreasonably; And provided further, That it shall be deemed unreasonable for the Secretary or the Contractor to withhold such approval on the basis that the right to convert from irrigation to M&I use for a specific development could better be exercised in some other subcontractor's service area. The water so converted from irrigation to M&I purposes will be delivered with the same priority and at the same rate per acre-foot as other M&I water. Likewise, subcontracts for furnishing water for M&I purposes, including, but not limited to, ground water recharge to the extent ground water recharge is consistent with Arizona law, shall provide that, if water to be delivered thereunder is not presently required for such purposes, such water may be made available by the Secretary to other users; Provided, further, That the subcontractor shall be relieved of its payment obligation under its subcontract only to the extent of the amount paid by such other users;

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(vii) the acreage limitation provisions of Reclamation Laws shall apply solely to agricultural water service;

(viii) except as specifically provided therein, it shall be the provisions of this contract which shall be controlling in the event of any inconsistency between this contract and any subcontract;

(ix) the subcontractor shall levy all necessary assessments, tolls, and other charges and shall use all of the authority and resources available to the subcontractor to collect the same in order that the subcontractor may meet its obligations thereunder to make in full all payments required under said subcontract on or before the date such payments become due and to meet other obligations under the subcontracts;

(x) the subcontractor establish, maintain, and provide the United States and the Contractor with land, water use, and crop census records.

8.9 Shortages. As provided in Section 301(b) of the Basin Project Act, Article II(B)(3) of the Decree of the Supreme Court of the United States in Arizona v. California, 376 U.S. 340, dated March 9, 1964, shall be so administered that in any year in which, as determined by the Secretary, there is insufficient mainstream Colorado River water available for release to satisfy the annual consumptive use of 7,500,000 acre-feet in Arizona, California, and Nevada, diversions from the mainstream of the

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Colorado River for the Central Arizona Project and for other uses in Arizona under contracts or other agreements with the United States executed subsequent to September 30, 1968, shall be so limited as to assure the availability of water in quantities sufficient to provide for the aggregate annual consumptive use by holders of present perfected rights, by other users in the State of California served under contracts existing as of September 30, 1968, with the United States by diversion works heretofore constructed, and by other Federal reservations in California of 4,400,000 acre-feet of Colorado River water, and by users of the same character in Arizona and Nevada. Water users in the State of Nevada shall not be required to bear shortages in any proportion greater than would have been imposed in the absence of said Section 301(b), nor shall said Section affect the relative priorities, among themselves, of water users in Arizona, California, and Nevada which are senior to diversions for the Central Arizona Project, or amend any provisions of said Decree. The aforesaid limitation stated in Section 301(b) shall not apply so long as the Secretary shall determine and proclaim that means are available and in operation which augment the water supply of the Colorado River system in such quantity as to make sufficient Colorado River mainstream water available for release to satisfy annual consumptive use of 7,500,000 acre-feet in Arizona, California, and Nevada.

8.10 Rate of Diversions of Colorado River Water. Subject to (a) the first proviso in Section 301(a) of the Basin Project Act, (b) the provisions of Subarticle 10.6(b) hereof, and (c) the provisions of Subarticle 8.7(a) hereof, any capacity in the Granite Reef Aqueduct in excess of 2,500 cubic feet per second may be utilized in the operations of

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the project so as to maximize project benefits; Provided, however, That the use of such capacity shall not result in the annual diversion of a quantity of water in excess of the project's legal entitlement under the Basin Project Act.

8.11 Priority in Case of Shortage.

(a) Subject to the provisions of Section 304(e) of the Basin Project Act and the Secretary's allocation decisions published in the Federal Register on December 10, 1980, and March 24, 1983, any project water as defined in Subarticle 5.27(a) hereof, furnished through project facilities shall, in the event of shortages thereof, be reduced pro rata until exhausted, first for miscellaneous uses and next for agricultural uses, before such project water furnished for M&I uses is reduced. Thereafter, such project water for M&I uses will be reduced pro rata among all M&I water users. Each subcontract or other water delivery arrangement entered into pursuant to this contract shall so provide. This article shall not apply to Indian uses; Provided, however, That the relative priorities between Indian and non-Indian uses shall be as determined by the Secretary. Notwithstanding the provisions of this Subarticle, project water made available as a result of construction and operation of modifications to Roosevelt Dam as part of Plan 6 shall be distributed as provided in the Plan 6 Funding Agreement, and shall not be subject to reduction in the event of shortages of other project water supplies.

(b) Any project water, as defined in Subarticles 5.27(b), (c) and (d) hereof, shall retain its priority relative to project water as defined in Subarticle 5.27(a) hereof.

8.12 No Guarantee of Availability of Water. The United States

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assumes no responsibility with respect to the quantity of water available for delivery pursuant to this contract. In no event shall the United States, its officers, agents, or employees, be liable for any damages, direct or indirect, of whatsoever nature, arising out of or in any way connected with any suspension or reduction in the delivery of water pursuant to this contract or with any shortage in the quantity of water available for delivery hereunder or to any subcontractor for any cause whatsoever including, but not limited to, drought, delay in the construction of the Navajo Project, the failure of the Navajo Project to be completed, or the lack of power for pumping.

8.13 Secretarial Control of Return Flow.

(a) The Secretary reserves the right to capture all return flow flowing from the exterior boundaries of the Contractor as a source of supply and for distribution to and use of the Central Arizona Project to the fullest extent practicable. The Secretary also reserves the right to capture for project use return flows within the boundaries of Contractor if in his judgment such return flow is not being put to a beneficial use. Any subcontractor may sell its return flow; Provided, however, That except as otherwise agreed by the Contracting Officer, such return flow may not be sold for use outside the Contractor's exterior boundaries; And provided further, That if the price received for such return flow is higher than the price paid for such project water, the amount of the excess price shall be paid by such subcontractor to the Contractor for application against the Contractor's repayment obligation to the United States.

(b) Any return flow captured by the United States and determined by the Secretary to be suitable and available for use on lands

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within the service area and/or by any subcontractor therein may be delivered by the United States to a subcontractor as a part of the water supply for which the subcontractor contracts hereunder and such water shall be accounted and paid for pursuant to the provisions hereof.

8.14 Water and Air Pollution Control. The Contractor, in carrying out this contract, shall comply with all applicable water and air pollution laws and regulations of the United States and the State of Arizona, and shall obtain all required permits or licenses from the appropriate Federal, State, or local authorities.

8.15 Quality of Water. The operation and maintenance of project facilities shall be performed in such manner as is practicable to maintain the quality of project water made available through such facilities at the highest level reasonably attainable as determined by the Contracting Officer or the Operating Agency. Neither the United States nor the Operating Agency warrants the quality of water and are under no obligation to construct or furnish water treatment facilities to maintain or better the quality of water.

8.16 Exchange Water. Where the Secretary determines that a subcontractor is physically able to receive Colorado River mainstream water in exchange for or in replacement of existing supplies of surface water from sources other than the Colorado River to provide water supplies for users upstream from New Waddell, Modified Roosevelt and Buttes Dams, the Secretary may require that said subcontractor agree to accept said mainstream water in exchange for or in replacement of said existing supplies pursuant to the provisions of Section 304(d) of the Basin Project Act.

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8.17 Rights Reserved to the United States to Have Water Carried by Project Facilities. As a condition to the construction of project facilities and the delivery of water hereunder, the Contractor agrees that all project facilities will be available for the diversion, transportation, and carriage of water for Indian and non-Indian uses pursuant to arrangements or contracts therefor entered into on their behalf with the Secretary. In the event the responsibility for the OM&R of project facilities is transferred to and assumed by the Operating Agency, such transfer shall be subject to the condition that the Operating Agency shall divert, transport, and carry such water for such uses pursuant to the provisions of the aforesaid arrangements or contracts; Provided, however, That the aforesaid arrangements or contracts will include provisions for the payment of applicable construction costs and OM&R costs in accordance with Articles 9.3 and 9.6 of this contract.

8.18 Wheeling Non-Project Water. After taking into consideration the water delivery requirements of contracts for project water service and subject to availability of project capacity, non-project water may be wheeled through project facilities pursuant to wheeling agreements between the Contractor and the entity desiring to use project facilities for wheeling purposes. All such agreements shall be subject to the approval of the Contracting Officer who shall consider, among other things, the impact that the wheeling of such non-project water will have on the quality of project water. The Contractor and the Contracting Officer shall jointly develop a standard form of wheeling agreement including the rate structure for wheeling non-project water. All wheeling charges shall be paid to the Contractor by the entity contracting for the wheeling of non-project water.

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The Contractor shall be entitled to retain revenues from wheeling charges sufficient to cover all OM&R costs associated with wheeling such non-project water, plus an administrative charge to be jointly determined by the Contractor and the Contracting Officer. All revenues from wheeling charges in excess of the OM&R costs and administrative charges shall be remitted by the Contractor to the Contracting Officer and deposited into the Development Fund.

8.19 Use of Project Power to Wheel Non-Project Water. If the energy requirements necessary for the pumping of project water are met and subject to the requirements of the Navajo Power Marketing Plan published in the Federal Register on December 21, 1987, project power may be used to wheel non-project water through project facilities under such conditions of use, including amounts, times of use, losses, costs, and other conditions as are established by the Contractor and approved by the Contracting Officer.

9. PAYMENT OF PROJECT COSTS ALLOCATED TO CONTRACTOR

9.1 Allocation of Construction Costs.

(a) Upon completion of each construction stage, the Contracting Officer will allocate costs to the various project purposes using the separable costs-remaining benefits procedure.

(b) For repayment purposes the reimbursable cost allocated to irrigation and M&I water by the separable costs-remaining benefits procedure will be combined and will hereinafter be termed the "water supply allocation." Upon completion of each construction stage, and at the periodic intervals specified in Subarticle 9.3(d), suballocation of the water supply allocation will be made to the irrigation and M&I water functions proportional to the water estimated to be used for each purpose

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during the repayment period of each construction stage. The cost thus suballocated to the irrigation function will hereinafter be termed the "interest-free allocation." The cost thus suballocated to the M&I water function shall be added to the cost allocated to the commercial power function, plus interest during construction for both, and the sum will hereinafter be termed the "interest-bearing allocation."

(c) During construction, simple interest at the rate of 3.342 percent per annum shall be charged on costs allocated to the interest-bearing function as adjusted by the Secretary (i.e., net disbursements reduced by contract holdbacks, revenues applied to construction cost, and nonreimbursable expenses financed from construction funds). The total amount of all interest thus accumulated through the construction period prior to the date of completion of each construction stage shall be added to and become part of the actual construction cost of each construction stage. Interest during construction shall not accrue during any period in which construction is deferred or postponed by the United States as a result of a national emergency, as determined by the Secretary, if authority to forego such interest exists or is made available to the Secretary.

9.2 Repayment Concepts.

(a) Costs suballocated to non-Indian irrigation water will be paid by the subcontractors to the Contractor on the basis of their ability to pay as determined by the Secretary.

(b) Costs allocated to commercial power and costs suballocated to M&I water use shall be combined and repaid with interest at a rate of 3.342 percent per annum on the unpaid balance.

(c) Reimbursable costs allocated to recreation and fish

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and wildlife are anticipated to be covered by a separate contract and repaid by the beneficiaries thereof.

(d) Repayment of costs allocated to irrigation of Indian lands shall be governed by the provisions of Section 402 of the Basin Project Act.

(e) Repayment of the project will occur by construction stages, with each stage having a separate 50-year repayment schedule. Upon completion of each cost allocation study referred to in Subarticle 9.1(a), subsequent to the initial study associated with the first construction stage, the Contractor's repayment obligation and the obligation allocated to each construction stage will be adjusted based on the latest cost allocation study, and the Contractor will be provided with a revised repayment schedule for the project and each construction stage. The Contracting Officer will adjust previous principal and interest payments made by the Contractor to reflect the new repayment schedule. For each year where an adjustment in payments is necessary, there will be an over or underpayment which will accrue with interest at the rate of 3.342 percent per annum (compounded annually) to the adjustment date. If the adjustment indicates that the Contractor overpaid principal and interest, the Contractor shall be entitled to a credit against its next payments to the United States. Conversely, if the Contractor owes additional principal and interest to the United States, such amount shall be paid to the United States by the Contractor within 12 months of receipt of a statement therefor from the Contracting Officer. The Contractor may use the repayment reserve fund under Subarticle 10.3(b) hereof for any payment to the United States required as a result of the above adjustment.

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9.3 Contractor's Construction Cost Repayment Obligation.

(a) The Contractor's repayment obligation shall consist of the total cost allocated to the water supply and power functions plus OM&R during construction and interest during construction on costs allocated to the M&I water and power functions, but shall not include costs allocated to fish and wildlife and recreation, and costs associated with the delivery of water to entities other than the Contractor or subcontractors. Such entities shall include but not be limited to Indian tribes and councils in central Arizona receiving project water and the New Mexico recipients of water service from Hooker Dam or suitable alternative. The costs to be excluded shall be calculated as follows:

(i) Costs excluded from the Contractor's repayment obligation for New Mexico water service shall be determined by multiplying the project costs allocated to the water supply function by the ratio developed by dividing the quantity of project water projected to be delivered throughout the overall repayment period to water users in Arizona in exchange for water delivered to users in New Mexico from or by means of project works, by the total quantity of Colorado River water projected to be delivered by the project throughout the overall repayment period.

(ii) The amount of other project costs which shall be excluded from the Contractor's repayment obligation shall be determined by multiplying the

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project costs allocated to the water supply function by a ratio developed by dividing the quantity of project water projected to be delivered throughout the overall repayment period to entities other than the Contractor, the subcontractors, and those users in New Mexico to whom water has been made available through the construction of Hooker Dam or suitable alternative by the total quantity of project water projected to be delivered throughout the overall repayment period; Provided, That project water projected to be delivered to such users will be computed based on an assumption of full development not later than the year 2005.

(b) The costs determined under Subarticles 9.3(a)(i) and (ii) above shall be subtracted from the water supply costs obtained from the separable costs-remaining benefits procedure to determine the Contractor's water supply costs. The Contracting Officer shall suballocate the Contractor's water supply costs to each of the construction stages based on the ratios obtained by dividing the allocable cost of the construction stage by the allocable cost of the project (see Operation 1, Exhibit "A"). The water supply costs assigned to each construction stage are then further suballocated between irrigation and M&I water use in proportion to projected total water deliveries to each function over the 50-year repayment period of each construction stage (Operation 2, Exhibit "A"). The summarization of the suballocations to each construction stage determines the total water

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supply cost to be assigned to irrigation and M&I water use (Operation 3, Exhibit "A"). To determine the Contractor's repayment obligation, the Contractor's water supply suballocation to irrigation and M&I water uses, and the power allocation from the separable costs-remaining benefits procedure, shall each be adjusted for any revenues received by the United States prior to the notice(s) of completion and for any contributions received by the United States under the Plan 6 Funding Agreement for the features constructed in that stage, and for the 500 cubic feet per second of incremental capacity in the Granite Reef Aqueduct and pumping plants (see Article 9.7) to determine the net amount of each function assigned to the Contractor (Operation 4, Exhibit "A"). The Contractor's repayment obligation shall be the summation of the net amount for each function.

(c) Once the Contractor's estimated or final repayment obligation has been determined by the Contracting Officer, the obligation shall be allocated to each construction stage based on the ratio obtained by dividing the allocable cost of each construction stage by the allocable cost of the project. Each construction stage will have a separate 50-year repayment period. The repayment obligation for each stage will be divided into interest-bearing and interest-free components. The interest-free component shall be the amount allocable to irrigation purposes for the stage. The interest-bearing component will be the amount obtained by subtracting the irrigation allocation for the stage from the obligation for the stage. The principal payments for each stage shall be determined by applying the percentages in Subarticle 9.3(f) to the repayment obligation for each stage. The total payment for each stage for any year shall be equal to the principal payment plus interest at the rate of 3.342 percent

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per annum on the unpaid interest-bearing component of the repayment obligation for each stage. For the water supply system, the portion of each principal payment which is made by the Contractor from irrigation revenues received by the Contractor each year will be used by the United States to reduce the interest-free obligation. The remaining portion of the principal payments made by the Contractor each year for the water supply system will be used by the United States to reduce the interest-bearing obligation, and once the interest-bearing obligation has been retired, the entire principal payment made by the Contractor will be applied by the United States toward the interest-free obligation. For the other construction stages, the entire principal payment made by the Contractor each year for such stages will be applied by the United States to reduce the interest-bearing obligation first, and once such obligation has been retired, to reduce the interest-free obligation.

(d) At 7-year intervals following the determination of the Contractor's repayment obligation for the water supply system, or at more frequent intervals if it becomes apparent to the Contracting Officer that a significant change in water use has or will occur, until such time as the interest-bearing obligation for each construction stage has been repaid, the Contracting Officer will re-estimate the proportions of total water deliveries to irrigation and M&I water use over the 50-year repayment period for each stage. At such intervals, the Contracting Officer will adjust the original interest-bearing and interest-free allocation for each stage based on the new estimates and recalculate all preceding interest payments. Differences between amounts owed and amounts paid by the Contractor shall be adjusted by the Contracting Officer, who shall apply a credit against the

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Contractor's next payment due or notify the Contractor of the additional amount due, as the case may be. All such adjustments shall include interest at the rate of 3.342 percent per annum (compounded annually). Any additional payments required from the Contractor shall be made within 12 months of the Contractor's receipt of a statement from the Contracting Officer therefor. The Contractor may use the repayment reserve fund under Subarticle 10.3(b) hereof for any payment to the United States required as a result of the above adjustment.

(e) The Contracting Officer will notify the Contractor of (i) its estimated repayment obligation when construction of the first construction stage is substantially complete and upon completion of each subsequent construction stage, and (ii) the actual repayment obligation when the final construction stage has been completed, as determined by the Contracting Officer. In the event that the project ultimately consists only of the water supply system, New Waddell Dam, and Modified Roosevelt Dam, the Contractor's actual repayment obligation shall be limited to $2.0 billion. If prior to completion of construction of such features the Contracting Officer determines that the Contractor's repayment obligation for such features will exceed $2.0 billion, the Contracting Officer shall consult with the Contractor and continuation of construction will be contingent upon the execution of an amendatory contract to cover the increased repayment obligation. If construction of any other construction stage will result in an increase in the Contractor's repayment obligation by an amount equal to or less than the respective amount identified in Exhibit "B," which is attached hereto and made part of this contract, the Contractor's repayment ceiling may, after consultation with the Contractor, be increased by the

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Contracting Officer by an amount equal to or less than the respective amount identified in Exhibit "B" by written notice thereof from the Contracting Officer to the Contractor. If construction of such other construction stage will result in an increase in the Contractor's repayment obligation by an amount greater than the respective amount identified in Exhibit "B," the Contracting Officer shall consult with the Contractor and the Contractor and the Contracting Officer shall agree upon one of the following courses of action prior to initiation of construction of such construction stage: (1) that additional repayment ceiling be made available from other construction stages, in which event the Contractor's repayment ceiling will be increased to the agreed-to amount by written notice from the Contracting Officer to the Contractor; or (2) that this contract be renegotiated to increase the Contractor's repayment ceiling; Provided, That these courses of action shall also apply in the event that, prior to completion of construction of such stage, the Contracting Officer determines that the construction of such stage will result in an increase in the Contractor's repayment obligation by an amount greater than the respective amount identified in Exhibit "B."

(f) Annual percentages of the repayment obligation for each construction stage shall be those set out in the following schedule or any revision thereof mutually agreed upon:

Repayment Year	Percent of Repayment Obligation (Annual)
1-7	1.0
8-14	1.3
15-21	1.6
22-28	2.0
29-35	2.6
36-42	2.7
43-49	2.7
50	2.7

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(g) In the event that the Secretary contracts for delivery of non-project water under the provisions of Article 10.1, capital charges associated with such delivery shall be calculated, charged, and utilized in the same manner as capital charges deposited in the Development Fund pursuant to Article 8.18.

9.4 Payment of Contractor's Construction Cost Repayment Obligation.

(a) The Contractor shall make annual payments to the United States, to be credited to the Development Fund, which shall be sufficient, when combined with accruals from the other sources described in Section 403(f) of the Basin Project Act, the Hoover Power Plant Act of 1984, and other miscellaneous revenues, including but not limited to net wheeling charges, to effect repayment of the repayment obligation for each construction stage within a period of not more than 50 years beginning with the year following substantial completion of each construction stage. The Contractor's first payment shall be due on or before January 15 of the year following the year in which the Secretary announces the substantial completion of each construction stage. Annual payments thereafter shall be due on or before January 15 of each following year.

(b) The Contractor agrees to make annual payments calculated by the Secretary as follows:

(i) Calculate the annual principal payments required by the schedule in Subarticle 9.3(f) or any revision thereof for each construction stage.

(ii) Add to (i) the annual interest, at 3.342 percent, on the unpaid balance of the interest-bearing

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allocation for each construction stage.

(iii) Determine the total amount of all interest and principal payments due for all construction stages.

(iv) Subtract therefrom the revenues estimated to be available from the Development Fund anticipating a zero balance at the end of each year in the Development Fund.

(v) Make adjustments for differences between estimated and actual revenues for the preceding year.

(c) On or before each December 15, beginning with December 15 of the year in which the Secretary notifies the Contractor of the substantial completion of the first construction stage, the Secretary will notify the Contractor of the amount of the annual payment due on the following January 15, which has been determined by the Secretary on the basis of the aforesaid calculation.

(d) The Contractor may make additional payments on the repayment obligation at any time subject to such terms and conditions as may be agreed upon by the Contractor and the Contracting Officer; Provided, however, That all interest due is paid at the same time, whereupon appropriate adjustments in the schedule of future payments will be made by the Secretary, who shall as promptly as possible give the Contractor written notice of the adjusted repayment schedule.

(e) It is understood and agreed that the Contractor shall be obligated for the payments set forth in Subarticle 9.4(a) hereof and that regardless of the delinquency or default in payment of any charges

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due to the Contractor from any subcontractor, or a diminution in the water supply available to the Contractor, or regardless of any other reason, the Contractor shall complete repayment of each construction stage within a 50-year period beginning in the year following the announcement by the Secretary of substantial completion of such construction stage.

9.5 Commercial Power Rates. The Secretary will, consistent with applicable law, periodically review and provide for appropriate adjustments in the rates established for the sales of power and energy, revenues from which contribute to the Development Fund.

9.6 Other Costs Borne by the Contractor.

(a) In addition to the payments provided for in Article 9.4 hereof, and subject to the provisions of Subarticle 9.6(d) hereof, during such periods as the United States operates and maintains completed construction stages, the Contractor shall make advance payments for OM&R costs incurred by the United States. The United States will furnish the Contractor with an estimate in writing at least 6 months prior to substantial completion of construction of the water supply system, of the OM&R cost due from the Contractor to the end of the then current year, together with an estimate of such cost for the calendar year immediately following. Within a reasonable time of the receipt of said estimates, as determined by the Contracting Officer, the Contractor shall advance to the United States the payments for the estimated OM&R cost to the end of the then current year and without further notice or demand shall on December 15 of the then current year and on June 15 of the following year advance to the United States in equal semiannual installments the Contractor's share of the estimated cost, including supervision and

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administrative expense for the OM&R of the water supply system. Advance payments shall be made in subsequent years by the Contractor to the United States on the basis of estimates to be furnished by the United States on or before November 15 preceding said subsequent year and the advances of said payments shall be due and payable in equal semiannual payments on the following December 15 and June 15. Said OM&R costs are the total annual OM&R costs of completed construction stages which are allocated to the irrigation and M&I water supply functions less (i) the costs described in Subarticle 9.6(c) hereof, and (ii) an amount determined by multiplying the total of said annual costs by the ratio obtained by dividing the estimated amount of project water projected to be delivered in the subsequent year to entities other than the Contractor, the subcontractors, and those entities in New Mexico to which project water will be made available from Hooker Dam or suitable alternative, by the total amount of project water estimated to be delivered for use in that year.

(b) Differences between actual OM&R costs and the estimated costs shall be determined by the Contracting Officer and shall be adjusted in next succeeding estimates; Provided, however, That if in the opinion of the Contracting Officer the amounts advanced by the Contractor for any year are likely to be insufficient to pay the above-mentioned OM&R costs during such year, additional and sufficient sums of money shall be paid forthwith by the Contractor to the United States upon notice thereof and demand therefor by the Contracting Officer; Provided, further, That the United States will give Contractor reasonable notice in advance of any such deficiency.

(c) The Contractor's obligation to pay said OM&R costs

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of completed construction stages will be reduced to the extent that project water is made available for use in New Mexico following completion of Hooker Dam or suitable alternative. Said reduction will be in the proportion which the quantity of project water projected to be delivered to water users in Arizona, in exchange for Gila River system waters delivered to water users in New Mexico from or by means of project works, bears to the total quantity of Colorado River water projected to be delivered to the project that year.

(d) In the event that responsibility for OM&R of project facilities is transferred to and assumed by the Contractor, the Contractor shall be relieved of the obligation to make OM&R payments associated with such facilities under Subarticle 9.6(a) of this contract. In that event, the United States shall pay or provide for payment of OM&R costs associated with delivery of water to entities other than the Contractor and the subcontractors. Such costs shall be computed in accordance with Subarticle 9.6(a) of this contract. If the Contractor does not receive payment in advance for such costs, the Contractor shall have no obligation to deliver such water.

(e) During the Hoover Dam cost-repayment period, the Contractor shall pay to the United States the sum of $0.25 for each acre-foot of water pumped from Lake Havasu for miscellaneous and M&I water purposes as determined by the Contracting Officer. The quantity of water pumped for such purposes will be determined by the Contracting Officer at the end of each calendar year and the Contractor notified of the amount due by March 1 of each subsequent year. Payment shall be due on May 1 following notification. Said payment shall be credited to the Colorado River Dam Fund

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established by Section 2 of the Boulder Canyon Project Act.

9.7 Repayment of Costs of Excess Capacity in Granite Reef Aqueduct. The costs of providing any capacity in the Granite Reef Aqueduct and pumping plants in excess of 2,500 cubic feet per second shall be repaid by Contractor from funds available to Arizona pursuant to the provisions of Section 403(f) of the Basin Project Act, or by funds from sources other than the Development Fund.

9.8 Ad Valorem Taxes, Assessments, Tolls, and Other Charges. Within the legal limits available to it, the Contractor shall levy ad valorem taxes upon the taxable property within the service area of the Contractor at rates determined necessary by the Contractor to raise funds which, together with the revenues from the sale of water and such financial assistance from the Development Fund as the Secretary determines is available therefor, are sufficient to meet the obligations of the Contractor to make in full all payments to the United States on or before the date such payments become due and to meet its other obligations under this contract.

9.9 Continuation of Payments After Project Payout. Following payment to the United States of the Contractor's final payment for the last construction stage, the Contractor shall continue to make annual payments to the United States to be credited to the Development Fund in amounts equal to the average annual principal payment for the project during the overall repayment period. In the event that no augmentation project, as contemplated in the Basin Project Act, has been authorized or is under active consideration by the Congress at the time project construction costs have been repaid in full, payments under this formula will be not required; Provided, however, That payments will commence after repayment of the

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project costs pursuant to the formula, or any adjustment thereof agreed to by the parties, at such time as an augmentation project is authorized by Congress and the costs thereof allocated to the Contractor are determined by the Secretary.

9.10 Defaults.

(a) The Contractor shall pay a penalty on payments, installments or charges which become delinquent, computed at the rate of 1 percent per month on the amount of such delinquent payments, installments, or charges from and after the date when the same become due until paid.

(b) No water shall be furnished to the Contractor during any period in which the Contractor may be in arrears more than 12 months in the payments to the United States required by Article 9.4 hereof.

(c) All rights of action for breach of this contract are reserved to the United States as provided by Federal law.

10. GENERAL PROVISIONS

10.1 Other Contracts. The Secretary reserves the right to contract directly with other water using entities concerning water supply through project facilities. In the event this occurs, the provisions of Article 8.17 hereof shall be applicable.

10.2 Title to Project Works. Title to all water supply system works and all project facilities constructed pursuant to the Basin Project Act and this contract shall be and remain in the United States until otherwise provided by Congress.

10.3 Reserve Funds.

(a) (i) Commencing with notice of transfer of OM&R for the Granite Reef Aqueduct, including the Havasu Pumping Plant, the Contractor

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shall accumulate and maintain an emergency OM&R reserve fund, which the Contractor shall keep available to meet costs incurred during periods of interruption of water service.

(ii) The Contractor shall accumulate the reserve fund with annual deposits, including interest and dividends accruing to fund balances or holdings, of not less than $400,000 in any year in which the fund balance is less than $4,000,000. The fund shall be invested in a Federally insured interest- or dividend-bearing account, or in securities guaranteed by the Federal Government; Provided, That money in the reserve fund shall be available within a reasonable time to meet expenses for such purposes as those identified in Subarticle 10.3(a)(iv) hereof. Such annual deposits and the accumulation of interest and dividends to the reserve fund shall continue until $4,000,000 is accumulated. Interest and dividends accruing to fund balances shall be added to the fund in any year when the fund balance is greater than $4,000,000; Provided, That in no event shall the fund be increased to an amount greater than the actual amount of fixed OM&R costs for the preceding year as mutually determined by the Contractor and the Contracting Officer. Any balance in the fund in excess of the amount of fixed OM&R costs for the previous year shall be considered to be the general funds of the Contractor and available for use as such.

(iii) Upon mutual agreement between the Contractor and the Contracting Officer, the amount to be accumulated and maintained in the reserve fund provided for in this Subarticle may be adjusted in consideration of the risk and uncertainty stemming from the size and complexity of the project, the size of the annual OM&R budget, additions to, deletions from, or changes in project works, or OM&R costs not

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contemplated when this contract was executed.

(iv) The Contractor may make expenditures from such reserve fund only for meeting unforeseen and extraordinary operation and maintenance costs, unusual or extraordinary repair or replacement costs, and betterment costs (in situations where recurrence of severe operation and maintenance problems can be avoided or eliminated). Proposed expenditures from the fund shall be submitted to the Contracting Officer in writing for review and written approval prior to disbursement.

(v) During any period in which any of the project works are operated and maintained by the United States, the reserve fund shall be available for like use by the United States.

(vi) On or before February 1 of each year, the Contractor shall provide to the Contracting Officer an annual statement indicating the principal and accumulated interest in the emergency OM&R reserve fund as of December 31 of the preceding year.

(b) (i) No later than 1 year following the Contractor's last construction advance under the Plan 6 Funding Agreement, the Contractor shall accumulate and maintain a repayment reserve fund to help assure payments to the United States under this contract.

(ii) The Contractor shall accumulate such reserve fund with annual deposits, including interest and dividends accruing to fund balances or holdings, of not less than $4,000,000 in any year in which the fund balance is less than $40,000,000. The fund shall be invested in a Federally insured interest- or dividend-bearing account, or in securities guaranteed by the Federal Government; Provided, That money in the reserve fund shall be available within a reasonable time to meet expenses for the

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purpose for which it was established. Such annual deposits and the accumulation of interest to the reserve fund shall continue until $40,000,000 is accumulated. Any balance in the fund in excess of $40,000,000 shall be considered to be the general funds of the Contractor and available for use as such.

(iii) Upon mutual agreement between the Contractor and the Contracting Officer, the amount to be accumulated and maintained in the reserve fund provided for in this Subarticle may be adjusted.

(iv) Proposed expenditures from the fund shall be submitted to the Contracting Officer in writing for review and written approval prior to disbursement.

(v) On or before February 1 of each year, the Contractor shall provide to the Contracting Officer an annual statement of the principal and accumulated interest in the repayment reserve fund as of December 31 of the preceding year.

10.4 Recreational Use of Water Facilities.

(a) The enhancement of recreational opportunities in connection with the project works authorized pursuant to Title III of the Basin Project Act shall be in accordance with the provisions of the Federal Water Project Recreation Act, 79 Stat. 213, dated July 9, 1965, except as provided in Subarticle 10.4(b) hereof.

(b) Recreational development at Orme Dam and Reservoir shall be governed by the provisions of Section 302(d) of the Basin Project Act.

10.5 Confirmation of Contract.

(a) The Contractor, after the execution of this contract,

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shall promptly seek to secure a decree of a court of competent jurisdiction of the State of Arizona confirming the execution of this contract. The Contractor shall furnish the United States a certified copy of the final decree, the validation proceedings, and all pertinent supporting records of the court approving and confirming this contract, and decreeing and adjudging it to be lawful, valid, and binding on the Contractor. This contract shall not be binding on the United States or the Contractor until such final decree has been entered.

(b) This contract shall be indivisible for purposes of validation and shall not be binding on the United States or the Contractor unless validated pursuant to the provisions of Subarticle 10.5(a) hereof in each and all of its terms and conditions.

10.6 Rules, Regulations, and Determinations.

(a) The parties agree that the delivery of water or the use of Federal facilities pursuant to this contract is subject to Reclamation Law, as amended and supplemented, and the rules and regulations promulgated by the Secretary of the Interior under Reclamation Law.

(b) The Contracting Officer, after an opportunity has been offered to the Contractor for consultation, shall have the right to make rules, regulations, and determinations consistent with the provisions of this contract, the laws of the United States and the State of Arizona, including, without limitation, rules, regulations, and determinations relative to maximizing project benefits from pumping from Lake Havasu, the rate and schedule of pumping therefrom and the rate and schedule of pumping at the Granite Reef pumping plants, to add to or modify said rules, regulations, and determinations as may be deemed proper and necessary to

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carry out this contract, and to supply necessary details of its administration which are not covered by express provisions of this contract. The Contractor and each subcontractor shall observe such rules, regulations, and determinations and each subcontract shall so provide.

(c) Where the terms of this contract provide for action to be based upon the opinion or determination of either party to this contract, whether or not stated to be conclusive, said terms shall not be construed as permitting such action to be predicated upon arbitrary, capricious, or unreasonable opinions or determinations. In the event that the Contractor questions any factual determination made by the Contracting Officer, the findings as to the facts shall be made by the Secretary only after consultation with the Contractor and shall be conclusive upon the parties.

10.7 Books, Records, and Reports. The Contractor shall establish and maintain accounts and other books and records pertaining to administration of the terms and conditions of this contract, including: the Contractor's financial transactions, water supply data, project operation, maintenance and replacement logs, project land and right-of-way use agreements, and other matters specifically relating to this contract that the Contracting Officer may require. Reports thereon shall be furnished to the Contracting Officer in such form and on such date or dates as the Contracting Officer may require. Subject to applicable Federal laws and regulations, each party to this contract shall have the right during office hours to examine and make copies of the other party's books and records relating to matters covered by this contract.

10.8 Notices. Any notice, demand, or request authorized or

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required by this contract shall be deemed to have been given, on behalf of the Contractor, when mailed, postage prepaid, or delivered to the Regional Director, Lower Colorado Region, Bureau of Reclamation, P.O. Box 61470, Boulder City, Nevada 89006, and on behalf of the United States, when mailed, postage prepaid, or delivered to the General Manager of the Contractor, 23636 North 7th Street, Phoenix, Arizona 85024. The designation of the addressee or the address may be changed by notice given in the same manner as provided in this article for other notices.

10.9 Contingent on Appropriation or Allotment of Funds. The expenditure or advance of any money or the performance of any obligation by the United States under this contract shall be contingent upon appropriation or allotment of funds. Absence of appropriation or allotment of funds shall not relieve the Contractor from any obligations under this contract. No liability shall accrue to the United States in case funds are not appropriated or allotted.

10.10 Changes in Contractor's Organization. While this contract is in effect, no change shall be made in the Contractor's organization, by exclusion of lands, by dissolution, consolidation, merger or otherwise, except upon the Contracting Officer's written consent; Provided, however, That approval is hereby given to the inclusion of other counties as part of Contractor's service area, except, however, that the United States shall not be required, under this contract, to construct project facilities to serve lands within said additional counties.

10.11 Assignment Limited--Successors and Assigns Obligated. The provisions of this contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this

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contract or any part or interest therein shall be valid until approved in writing by the Contracting Officer.

10.12 Judicial Remedies Not Foreclosed. Nothing herein shall be construed (a) as depriving either party from pursuing and prosecuting any remedy in any appropriate court of the United States or the State of Arizona which would otherwise be available to such parties even though provisions herein may declare that determinations or decisions of the Secretary or other persons are conclusive or (b) as depriving either party of any defense thereto which would otherwise be available.

10.13 Equal Opportunity. During the performance of this contract, the Contractor agrees as follows:

(a) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this Equal Opportunity clause.

(b) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment

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without regard to race, color, religion, sex, or national origin.

(c) The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(e) The Contractor shall furnish all information and reports required by said amended Executive Order and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Contracting Officer and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(f) In the event of the Contractor's noncompliance with the Equal Opportunity clause of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in said amended Executive Order, and such other sanctions may be imposed and remedies invoked as provided in said amended Executive Order, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

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(g) The Contractor will include the provisions of paragraphs (a) through (g) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of said amended Executive Order, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Contracting Officer may direct as a means of enforcing such provisions, including sanctions for noncompliance; Provided, however, That in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Contracting Officer, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

10.14 Compliance With Civil Rights Laws and Regulations.

(a) The Contractor shall comply with Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d), Section 504 of the Rehabilitation Act of 1975 (Public Law 93-112, as amended), the Age Discrimination Act of 1975 (42 U.S.C. 6101, et seq.) and any other applicable civil rights laws, as well as with their respective implementing regulations and guidelines imposed by the U.S. Department of the Interior and/or Bureau of Reclamation.

(b) These statutes require that no person in the United States shall, on the grounds of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving financial assistance from the Bureau of Reclamation. By executing this contract, the Contractor agrees to immediately take any measures

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necessary to implement this obligation, including permitting officials of the United States to inspect premises, programs, and documents.

(c) The Contractor makes this agreement in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property discounts or other Federal financial assistance extended after the date hereof to the Contractor by the Bureau of Reclamation, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Contractor recognizes and agrees that such Federal assistance will be extended in reliance on the representations and agreements made in this article, and that the United States reserves the right to seek judicial enforcement thereof.

10.15 Officials Not to Benefit. No Member of or Delegate to Congress, Resident Commissioner or official of the Contractor shall benefit from this contract other than as a water user or landowner in the same manner as other water users or landowners.

11. STATUS OF DECEMBER 15, 1972 CONTRACT

Upon judicial confirmation of this contract, the December 15, 1972 contract entitled "Contract Between the United States and the Central Arizona Water Conservation District For Delivery of Water and Repayment of Costs of the Central Arizona Project" (Contract No. 14-06-W-245), shall be superseded and replaced by this contract.

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IN WITNESS WHEREOF, the parties hereto have caused this contract to be executed the day and year first above written.

THE UNITED STATES OF AMERICA

By _____
Assistant Secretary-Water and Science
Department of the Interior

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

ATTEST:

Marilyn N. Rustad
Secretary

By _____
President

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EXHIBIT "A"
DETERMINATION OF CAWCD WATER SUPPLY COST BY STAGE
EXAMPLE ONLY

OPERATION 1 SUBALLOCATION OF CONTRACTOR'S WATER SUPPLY COSTS TO CONSTRUCTION STAGES:

Construction Stage	Allocable Cost ($M)	Percentage	Water Supply Cost ($M)
Water Supply System	1,500	71%	1,280
New Waddell	300	14%	256
Cliff Alternative	100	5%	85
Tucson Term. Storage	60	3%	51
Hooker Alternative	50	2%	43
Buttes	100	5%	85
Total	2,110	100%	1,800

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EXHIBIT "A"
DETERMINATION OF CAWCD WATER SUPPLY COST BY STAGE
EXAMPLE ONLY

OPERATION 2 SUBALLOCATION OF WATER SUPPLY COST:

Construction Stage	Allocable Cost ($M) Construction	IDC	Water Distribution (%) Irrigation	M&I
Water Supply System	1,280	200	58%	42%
New Waddell	256	40	54%	46%
Cliff Alternative	85	10	54%	46%
Tucson Term. Storage	51	10	53%	47%
Hooker Alternative	43	10	50%	50%
Buttes	85	10	50%	50%
Total	1,800	280	100%	

	Construction Cost Distribution ($M) Irrigation	M&I	IDC Cost Distribution ($M) Irrigation	M&I
Water Supply System	742	538	116	84
New Waddell	138	118	22	18
Cliff Alternative	46	39	5	5
Tucson Term. Storage	27	24	5	5
Hooker Alternative	21	21	5	5
Buttes	43	43	5	5
Total	1,017	783	158	122

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EXHIBIT "A"
DETERMINATION OF CAWCD WATER SUPPLY COST BY STAGE
EXAMPLE ONLY

OPERATION 3 DETERMINATION OF TOTAL WATER SUPPLY COST:

	Total Cost Distribution ($M)		
	Irrigation	M&I	Total
Water Supply System	742	622	1,364
New Waddell	138	136	274
Cliff Alternative	46	44	90
Tucson Term. Storage	27	29	56
Hooker Alternative	21	26	47
Buttes	43	48	91
Total	1,017	905	1,922

Irrigation = Irrigation construction cost
M&I = M&I construction cost + M&I IDC

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EXHIBIT "A"
DETERMINATION OF CAWCD WATER SUPPLY COST BY STAGE
EXAMPLE ONLY

OPERATION 4 ADJUSTMENTS TO ALLOCATED COST:

	Irrigation Cost ($M)	Interim Operations ($M)	Local Funding ($M)	500 CFS Granite Reef ($M)	M&I ($M)	Interim Operations ($M)	Local Funding ($M)	500 CFS Granite Reef ($M)
Water Supply System	742	-4		33	622	10		32
New Waddell	138		-45		136		-135	
Cliff Alternative	46				44		-30	
Tucson Term. Storage	27				29			
Hooker Alternative	21				26			
Buttes	43				48			
Total	1,017	-4	-45	33	905	10	-165	32

	Power Cost ($M)	Interim Operations ($M)	Total ($M)
Water Supply System	328	-100	1,663
New Waddell	61		155
Cliff Alternative	20		80
Tucson Term. Storage	12		68
Hooker Alternative	9		56
Buttes	19		110
Total	449	-100	2,132

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EXHIBIT "B"

CENTRAL ARIZONA WATER CONSERVATION DISTRICT (CAWCD) REPAYMENT CEILING (Billions of Dollars)

		Remaining Potential Stages				
	Water Supply System, New Waddell, and modified Roosevelt Dams	Tucson Terminal Storage	Cliff Dam Alternative	Hooker Dam Alternative	Buttes Dam	Total
Amount allocable to CAWCD repayment ceiling based on October 1988 prices.	$1.681	$.058	$.060	$.035	$.100	$.253
Inflation (4%) on features remaining to be completed, plus an amount for unforeseen contingencies (.82 of the inflation component)[1]	.100	.032	.035	.047	.133	$.247
Additional costs which could be allocated to CAWCD if the Gila River Indian Community does not take CAP water	.259	----	----	----	----	----
	----	----	----	----	----	----
Total	$2.040	$.090	$.095	$.082	$.233	$.500
Rounded	$2.000					$.500

[1] Inflation calculations based on the assumption that Tucson terminal storage and the Cliff Dam alternative are completed in 1995, and that the Hooker Dam alternative and Buttes Dam are completed in 2002.

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EXHIBIT 4

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

Final Execution Version
October 21, 2005

EXHIBIT 8.2

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY

AMENDED CENTRAL ARIZONA PROJECT WATER DELIVERY CONTRACT BETWEEN THE UNITED STATES AND THE GILA RIVER INDIAN COMMUNITY

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Final Execution Version – October 21, 2005

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY

AMENDED CENTRAL ARIZONA PROJECT WATER DELIVERY CONTRACT BETWEEN THE UNITED STATES AND THE GILA RIVER INDIAN COMMUNITY

1 PREAMBLE: THIS AMENDED CONTRACT, is made this 15th day of May 2006, between the UNITED STATES OF AMERICA, acting through the Bureau of Reclamation for and on behalf of the Secretary of the Interior, and the GILA RIVER INDIAN COMMUNITY, pursuant to the Reclamation Act of June 17, 1902 (32 Stat. 388), and acts amendatory thereof or supplementary thereto, including but not limited to the Boulder Canyon Project Act of December 21, 1928 (45 Stat. 1057), the Reclamation Project Act of August 4, 1939 (53 Stat. 1187), as amended, the Colorado River Basin Project Act of September 30, 1968 (82 Stat. 885, 43 U.S.C. § 1501), as amended, the Arizona Water Settlements Act (118 Stat. 3478) (hereinafter referred to as "Settlements Act") the various authorities and responsibilities of the Secretary of the Interior, hereinafter referred to as the "Secretary", in relation to Indians and Indian tribes as contained in Title 25 U.S.C. and 43 U.S.C. § 1457, and the "Gila River Indian Community Water Rights Settlement Agreement" as approved by the Settlements Act.

WITNESSETH, THAT:

2 EXPLANATORY RECITALS:

2.1 WHEREAS, the Parties entered into Contract No. 3-07-30-W0284, dated October 22, 1992, hereinafter referred to as the "1992 Contract," pursuant to which the United States agreed to deliver Project Water in an amount not in excess of 173,100 acre-feet each Year, for a term of 50 Years, subject to renewal;

2.2 WHEREAS, section 205(a)of the Settlements Act and paragraph 8.2 of the Settlement Agreement require that certain terms and conditions of the 1992 Contract be amended;

2.3 WHEREAS, the Parties desire to amend the 1992 Contract as provided for in the Settlement Acts and the Settlement Agreement; and

2.4 WHEREAS, in order to facilitate contract administration, the Parties also desire to supercede and replace the 1992 Contract with this Amended Contract;

NOW, THEREFORE, in consideration of the mutual covenants contained in this and other pertinent agreements between the Parties, it is agreed as follows:

3 STATUS OF THE 1992 CONTRACT: The 1992 Contract is superceded and replaced by this Amended Contract when it becomes effective pursuant to section 11.1.

4 DEFINITIONS: When used herein, unless otherwise distinctly expressed or manifestly incompatible with the intent hereof, the terms:

4.1 "Agricultural Water" or "Irrigation Water" shall mean Project Water used primarily in the commercial production of agricultural crops or livestock, including domestic use incidental thereto.

4.2 "Allottees" shall mean persons who hold a beneficial real property interest in an Indian allotment that is: (A) located within the Reservation; and (B) held in trust by the United States.

4.3 "Available CAP Supply" shall mean for any given Year all Fourth Priority Water available for delivery through the CAP System, water available from CAP dams and reservoirs other than modified Roosevelt Dam, and return flows captured by the Secretary for CAP use.

4.4 "Basin Project Act" shall mean the Colorado River Basin Project Act of September 30, 1968 (82 Stat. 885), as amended.

4.5 "CAP Contract" shall mean a long-term contract, as that term is used in the CAP Repayment Stipulation, between any person or entity and the United States for delivery of water through the CAP System.

4.6 "CAP Contractor" shall mean a person or entity that has entered into a long-term contract (as that term is used in the CAP Repayment Stipulation) with the United States for delivery of water through the CAP System.

4.7 "CAP Fixed OM&R Charge" shall mean Fixed OM&R Charge as that term is defined in the CAP Repayment Stipulation.

4.8 "CAP Indian Priority Water" shall mean that water having an Indian delivery priority as described in section 5.7 of this Amended Contract.

4.9 "CAP Repayment Contract" shall mean the contract dated December 1, 1988 (Contract No. 14-06-W-245, Amendment No. 1) between the United States and the Central Arizona Water Conservation District for Delivery of Water and Repayment of Costs of the Central Arizona Project. The term "CAP Repayment Contract" includes all amendments to and revisions of that contract. This is the same contract referred to in the Settlement Act as Contract No. 14-0906-09W-09245, Amendment No. 1.

4.10 "CAP M&I Priority Water" shall mean that water having a municipal and industrial delivery priority as described in section 5.7 of this Amended Contract.

4.11 "CAP NIA Priority Water" shall mean that water having a non-Indian agricultural delivery priority as described in section 5.7 of this Amended Contract.

4.12 "CAP Operating Agency" shall mean the entity or entities authorized to assume responsibility for the care, operation, maintenance and replacement of the CAP System. As of December 31, 2002, CAWCD is the CAP Operating Agency.

4.13 "CAP Pumping Energy Charge" shall mean Pumping Energy Charge as that term is defined in the CAP Repayment Stipulation.

4.14 "CAP Repayment Stipulation" shall mean the Revised Stipulation Regarding a Stay of Litigation, Resolution of Issues During the Stay and for Ultimate Judgment Upon the Satisfaction of Conditions, filed in *Central Arizona Water Conservation District v. United States, et al.*, No. CIV 95-625-TUC-WDB (EHC), No. CIV 95-1720-PHX-EHC (Consolidated Action), United States District Court for the District of Arizona, and the Order dated April 28, 2003, entered therein, and any amendment or revision thereof. This is the same case referred to in the Settlements Act as No. CIV 95-09625-09TUC-09WDB (EHC), No. CIV 95-091720-PHX-EHC (Consolidated Action).

4.15 "CAP Subcontract" shall mean a long-term subcontract, as that term is used in the CAP Repayment Stipulation, among any person or entity, the United States, and CAWCD for the delivery of water through the CAP System.

4.16 "CAP Subcontractor" or "Subcontractor" shall mean a person or entity that has entered into a long-term subcontract (as that term is used in the CAP Repayment Stipulation) with the United States and the Central Arizona Water Conservation District for the delivery of water through the CAP System.

4.17 "CAP System" shall mean (A) the Mark Wilmer Pumping Plant, (B) the Hayden-Rhodes Aqueduct, (C) the Fannin-McFarland Aqueduct, (D) the Tucson Aqueduct, (E) the pumping plants and appurtenant works of the Central Arizona Project aqueduct system that are described in (A) through (D); and (F) any extensions of, additions to, or replacements for the features described in (A) through (E).

4.18 "CAWCD" shall mean the political subdivision of the State that is the contractor under the CAP Repayment Contract.

4.19 "Central Arizona Project" or "Project" or "CAP" shall mean the reclamation project authorized and constructed by the United States in accordance with Title III of the Colorado River Basin Project Act (43 U.S.C. §§ 1521 et seq.).

4.20 "Community's CAP Service Area" shall mean the Reservation, other lands held in trust by the United States for the benefit of the Community within the State, or lands leased or owned in fee by the Community within the State, where CAP water is put to use.

4.21 "Community's CAP Indian Priority Water" shall mean that portion of the Community's CAP Water that is CAP Indian Priority Water.

4.22 "Community CAP Water" or "Community's CAP Water" shall mean water to which the Community is entitled pursuant to this Amended Contract.

4.23 "Community Repayment Contract" shall mean Contract No. 6-07-03-W0345 between the United States and the Community dated July 20, 1998, providing for the construction of water delivery facilities on the Reservation. The term "Community Repayment Contract" includes any amendments to such contract. This is the same contract referred to in the Settlements Act as Contract No. 6-0907-0903-09W0345.

4.24 "Contracting Officer" shall mean the Secretary or his or her authorized designee acting on his or her behalf.

4.25 "Delivery Point(s)" shall mean the turnout(s) constructed or to be constructed by the United States at such point(s) on the Main System as may be agreed upon in writing by the Contracting Officer and the Community, or in the event they are unable to agree, as selected by the Secretary.

4.26 "Distribution Works" shall mean those facilities constructed or financed by the United States for the primary purpose of distributing Community CAP Water to the Reservation after said Community CAP Water has been transported or delivered through the CAP System.

4.27 "Enforceability Date" shall be the date on which the Secretary publishes in the Federal Register the statement of findings described in Section 207(c) of the Act.

4.28 "Excess CAP Water" shall mean Excess Water as that term is defined in the CAP Repayment Stipulation.

4.29 "Excess CAP Water Contract" shall mean a contract between any person or entity and CAWCD for the delivery of Excess CAP Water.

4.30 "Excess CAP Water Contractor" or "Excess CAP Water Contractors" shall mean one or more persons or entities having an Excess CAP Water Contract.

4.31 "Fourth Priority Water" shall mean Colorado River water available for delivery within the State for satisfaction of entitlements: (i) pursuant to contracts, Secretarial reservations, perfected rights, and other arrangements between the United States and water users in the State entered into or established subsequent to September 30, 1968, for use on Federal, State, or privately owned lands in the State (for a total quantity of not to exceed 164,652 acre-feet of diversions annually); and (ii), after first providing for the delivery of water under 43 U.S.C. § 1524(e), pursuant to the CAP Repayment Contract for the delivery of Colorado River water for the Central Arizona Project, including use of Colorado River water on Indian lands.

4.32 "Gila River Adjudication Proceedings" shall mean that action pending in the Superior Court of the State of Arizona in and for the County of Maricopa styled *In Re the General Adjudication of All Rights To Use Water In The Gila River System and Source, W-1 (Salt), W-2 (Verde), W-3 (Upper Gila), W-4 (San Pedro) (Consolidated).* This is the same case referred to in the Settlements Act as *In Re the General Adjudication of All Rights To Use Water In The Gila River System and Source, W-091 (Salt), W-092 (Verde), W-093 (Upper Gila), W-094 (San Pedro) (Consolidated).*

4.33 "Gila River Indian Community" or "Community" shall mean the government composed of members of the Pima Tribe and the Maricopa Tribe, which is organized under Section 16 of the Act of June 18, 1934 (25 U.S.C. § 476).

4.34 "Gila River Indian Reservation" or "Reservation" shall mean, land located within the exterior boundaries of the reservation created under sections 3 and 4 of the Act of February 28, 1859 (11 Stat. 401, Chapter LXVI), and Executive Orders of August 31, 1876, June 14, 1879, May 5, 1882, November 15, 1883, July 31, 1911, June 2, 1913, August 27, 1914, and July 19, 1915. The term "Gila River Indian Reservation" or "Reservation" includes those lands located in Sections 16 and 36, Township 4 South, Range 4 East, Gila and Salt River Base and Meridian.

4.35 "Harquahala Valley Irrigation District" shall mean the entity of that name that is a political subdivision of the State organized under the laws of the State.

4.36 "Hohokam Agreement" shall mean the Agreement Among the United States, the Central Arizona Water Conservation District, the Hohokam Irrigation and Drainage District, and the Arizona Cities of Chandler, Mesa, Phoenix and Scottsdale, dated December 21, 1993.

4.37 "Hohokam Irrigation and Drainage District" shall mean the entity of that name that is a political subdivision of the State and an irrigation district organized under the laws of the State.

4.38 "Main System" shall mean those principal works of the Project listed as follows: Mark Wilmer Pumping Plant, the Hayden-Rhodes Aqueduct, the Fannin-McFarland Aqueduct; the Tucson Aqueduct, Buttes Dam, and Navajo Power Project, together with all appurtenances thereto and all lands, interests in lands, and rights-of-way for such works and appurtenances.

4.39 "Member" or "Members" shall mean any person or persons, duly enrolled as members of the Gila River Indian Community.

4.40 "OM&R" shall mean the care, operation, maintenance, and replacement of the Main System, or any part thereof.

4.41 "Party" shall mean either the Community or the United States, and "Parties" shall refer to both the Community and the United States collectively.

4.42 "Project Water" shall mean "Project Water" as that term is defined in the CAP Repayment Stipulation.

4.43 "Return Flow" shall mean waste water, seepage, and groundwater which originates or results from water contracted for from CAP pursuant to this Amended Contract.

4.44 "Roosevelt Water Conservation District" shall mean the entity of that name that is a political subdivision of the State and an irrigation district organized under the law of the State.

4.45 "San Tan Irrigation District" shall mean the entity of that name that is a political subdivision of the State and an irrigation district organized under the laws of the State.

4.46 "Secretary" shall mean the Secretary of the United States Department of the Interior.

4.47 "Settlements Act" shall mean the Arizona Water Settlements Act (118 Stat. 3478).

4.48 "Settlement Agreement" shall mean that amended and restated agreement entered into among the United States, the Community and other parties as approved by the Settlement Act.

4.49 "State" shall mean the State of Arizona.

4.50 "Supreme Court Decree" shall mean the Decree of the Supreme Court of the United States in the case of *Arizona v. California, et al.*, entered March 9, 1964 (376 U.S. 340), including the Court's Supplemental Decrees entered January 9, 1979 (439 U.S. 419), April 16, 1984 (466 U.S. 144), and October 10, 2000, or as it may be further modified.

4.51 "Tohono O'odham Nation" or "TON" shall mean the Tohono O'odham Nation (formerly known as the Papago Tribe) organized under a constitution approved in accordance with section 16 of the Act of June 18, 1934 (25 U.S.C. 476).

4.52 "TON CAP Water Delivery Contract shall mean the contract for delivery of Project Water entered into by the United States and the Tohono O'odham Nation on December 11, 1980, as amended.

4.53 "Year" shall mean a calendar year.

The first letters of defined terms are capitalized herein.

5 DELIVERY OF WATER:

5.1 Obligations of the United States. Subject to the terms, conditions, and provisions set forth in this Amended Contract, during such periods as it operates and maintains the Project, the United States will deliver up to 311,800 acre-feet of Community CAP Water each Year to the Community. The United States will use reasonable diligence to make available to the Community the quantities of water specified in the schedule submitted by the Community pursuant to section 5.5 herein and shall make deliveries of Community CAP Water to the Community to meet the Community's water requirements within the constraints of and in accordance with section 5.5 herein. After the United States has transferred responsibility for the care, operation, maintenance and replacement of the CAP System to the CAP Operating Agency, the United States will make deliveries of Community CAP Water to the CAP Operating Agency for subsequent delivery to the Community as provided herein.

5.2 Term of Amended Contract. This Amended Contract is for permanent service, as that term is used in section 5 of the Boulder Canyon Project Act of 1928, 43 U.S.C. § 617d, and is without limit as to term.

5.3 Conditions Relating to Delivery. The Community hereby agrees that:

5.3.1 The obligation of the United States to deliver water under this Amended Contract is subject to:

5.3.1.1 The availability of such water for use in Arizona under the provisions of the Colorado River Compact, executed November 24, 1922; the Boulder Canyon Project Act of December 21, 1928 (45 Stat. 1057); the Colorado River Basin Project Act of September 30, 1968 (82 Stat. 885); the contract between the United States and the State of Arizona dated February 9, 1944; the Opinion of the Supreme Court of the United States in the case of *Arizona* v. *California, et al.*, 373 U.S. 546, rendered June 3, 1963; and the Supreme Court Decree.

5.3.1.2 Executive A, Seventy-eighth Congress, Second Session, a treaty between the United States of America and the United Mexican States, signed at Washington, D.C., on February 3, 1944, relating to the utilization of the waters of the Colorado and Tijuana Rivers and of the Rio Grande River from Fort Quitman, Texas, to the Gulf of Mexico, and Executive H, Seventy-eighth Congress, Second Session, a protocol signed at Washington, DC, on November 14, 1944, supplementary to the treaty.

5.3.1.3 The express understanding and agreement by the Community that this Amended Contract is subject to the condition that Hoover Dam and Lake Mead shall be used: first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses and satisfaction of perfected rights in pursuance of Article VIII of the Colorado River Compact approved by section 13(a) of the Boulder Canyon Project Act; and third, for power; and furthermore, that this Amended Contract is made upon the express condition and with the express covenant that all rights hereunder shall be subject to and controlled by the Colorado River Compact and the Supreme Court Decree and that the Parties hereto shall observe and be subject to and controlled by said Colorado River Compact, Boulder

Canyon Project Act, and the Supreme Court Decree in the construction, management, and operation of Hoover Dam, Lake Mead, canals, and other works, and the storage, diversion, delivery, and use of water to be delivered to the Community hereunder.

5.3.1.4 The right of the United States or the CAP Operating Agency temporarily to discontinue or reduce the amount of water to be delivered hereunder whenever such discontinuance or reduction is made necessary for purposes of investigations, inspections, replacements, maintenance, or repairs to any works whatsoever affecting, utilized or, in the opinion of the Secretary, necessary for delivery of water hereunder, it being understood that so far as feasible the United States or the CAP Operating Agency will give thirty (30) days notice in advance of such temporary discontinuance or reduction, except in case of emergency, in which case no notice need be given. Neither the United States, its officers, agents, employees, successors, or assigns, nor the CAP Operating Agency, its officers, agents, employees, successors, or assigns shall be liable for damages when, for any reason whatsoever, any such temporary discontinuance or reduction in delivery of water occurs. If any such discontinuance or temporary reduction results in deliveries to the Community of less water than what has been paid for in advance by the Community, the Community shall be given credit toward the next payment of OM&R charges, pursuant to section 7 hereof.

5.3.2 Measures shall be in effect, adequate in the judgment of the Secretary, to provide for the internally integrated management and control of surface and groundwater within the Community's CAP Service Area to the end that groundwater withdrawals are managed on a responsible basis.

5.3.3 The Distribution Works must be maintained with linings adequate in the Secretary's judgment to prevent excessive conveyance losses.

5.3.4 The Community shall not pump nor permit others to pump groundwater from within the exterior boundaries of the Community's CAP Service Area for use outside the Community's CAP Service Area unless the Secretary and the Community agree, or shall have previously agreed, that a surplus of groundwater exists and drainage is required.

5.3.5 [Intentionally not used].

5.3.6 The Community may, with the approval of the Secretary, including approval as to the Secretary's authority under section 7 of the Act of February 8, 1887 (25 U.S.C. 381):

5.3.6.1 enter into contracts or options to lease (for a term not to exceed 100 years) or contracts or options to exchange Community CAP Water within Maricopa, Pinal, Pima, La Paz, Yavapai, Gila, Graham, Greenlee, Santa Cruz or Coconino Counties, Arizona, providing for the temporary delivery to others of any portion of the Community's CAP Water. Contracts to exchange or options to exchange shall be for the term provided for in each such contract or option.

5.3.6.2 renegotiate any lease at any time during the term of the lease, so long as the term of the renegotiated lease does not exceed 100 years.

5.3.7 The Community, and not the United States, shall be entitled to all consideration due to the Community under any leases or options to lease and exchanges or options to exchange Community CAP Water entered into by the Community.

5.3.7.1 The United States shall have no trust obligation or other obligation to monitor, administer, or account for: (i) any funds received by the Community as consideration under any such leases or options to lease or exchanges or options to exchange; or (ii) the expenditure of such funds.

5.3.8 None of the Community CAP Water shall be leased, exchanged, forborne or otherwise transferred in any way by the Community for use directly or indirectly outside of the State.

5.3.9 Community CAP Water scheduled for delivery in any Year under this Amended Contract that the Community does not use may be made available by the Contracting Officer to other users, or the Contracting Officer may request that the CAP Operating Agency make such water available to other users; *provided, however*, that the Community shall first have an opportunity to enter in contracts to lease, options to lease, contracts to exchange or options to exchange or resell such water as provided in section 5.3.6. If such Community CAP Water is made available to others by the Contracting Officer or the CAP Operating Agency, the Community shall be relieved of its payment obligations hereunder but only to the extent of the amount paid to the Contracting Officer or the CAP Operating Agency by such other users, up to the amount the Community is obligated to pay under this Amended Contract for said water. In the event the Community or the Contracting Officer and the CAP Operating Agency are unable to sell any portion of the Community's CAP Water scheduled for delivery and not used by the Community, the Community shall be relieved of the CAP Pumping Energy Charges associated with the undelivered water.

5.3.10 None of the Community's CAP Water may be permanently alienated.

5.3.11 The Community may use Community CAP Water on or off the Reservation for Community purposes.

5.3.12 The Secretary shall deliver or cause to be delivered Community CAP Water in accordance with water delivery schedules provided by the Community to the Secretary and the CAP Operating Agency pursuant to section 5.5 of this Amended Contract, or pursuant to lease or exchange agreements approved by the Secretary.

5.3.13 If Community CAP Water is to be delivered for use outside the boundaries of the Reservation, neither the Secretary nor the CAP Operating Agency shall be obligated to make such deliveries if, in the judgment of the CAP Operating Agency or of the Secretary, delivery or schedule of deliveries for such off-Reservation use would limit deliveries of CAP water to other CAP Contractors, CAP Subcontractors, or Excess CAP Water Contractors to a degree greater than would delivery of Community CAP Water to the Reservation; *provided, however*, that Excess CAP Water Contracts that are first entered into after the off-Reservation delivery of Community CAP Water has been established shall not limit such delivery. For purposes of the preceding sentence, an Excess CAP Water Contract for delivery of water within a given reach of the CAP System shall be considered as "first entered into" if the Excess CAP Water Contractor did not hold an Excess CAP Water Contract for the delivery of water within the same reach of the CAP System in any prior Year.

5.3.14 The Community shall schedule delivery of Community CAP Water in accordance with this Amended Contract. If the combined delivery requests for all CAP Contractors, CAP Subcontractors, and Excess CAP Water Contractors similarly located on the CAP System exceed the delivery capacity of the CAP System, then the CAP Operating Agency will consult with all affected CAP Contractors, CAP Subcontractors and Excess CAP Water Contractors and shall coordinate any necessary schedule reductions until all schedules can be satisfied. Neither the Secretary nor the CAP Operating Agency may reduce the Community's delivery schedule for any month unless and until the requested monthly delivery schedules for all similarly located CAP Contractors, CAP Subcontractors and Excess CAP Water Contractors have been reduced to the same percentage of their annual CAP delivery schedules that the Community requested in that month, or in the case of the Ak-Chin Indian Community by the maximum amount allowed by law. Thereafter, if further reductions are needed because of

limitations on the delivery capacity of the CAP System, the Community's requested monthly delivery schedule will not be reduced unless and until the requested monthly delivery schedules for all similarly located CAP Contractors, CAP Subcontractors, and Excess CAP Water Contractors have been reduced to the same percentage of their annual CAP delivery schedules as the Community, or in the case of the Ak-Chin Indian Community by the maximum amount allowed by law. A CAP Contractor, CAP Subcontractor, or Excess CAP Water Contractor shall be considered "similarly located" for purposes of this section if the CAP delivery schedule requested by that CAP Contractor, CAP Subcontractor, or Excess CAP Water Contractor will affect the quantity of Community CAP Water available for delivery to the Community.

5.3.15 All Community CAP Water shall be delivered through the CAP System. If the delivery capacity of the CAP System is significantly reduced or anticipated to be significantly reduced for an extended period of time, the Community shall have the same CAP delivery rights as other CAP Contractors and CAP Subcontractors, if such CAP Contractors and CAP Subcontractors are allowed to take delivery of water other than through the CAP System.

5.4 Delivery of Community CAP Water.

5.4.1 Subject to the terms and conditions of this Amended Contract, and in addition to any water delivered to the Community pursuant to section 304(d) or (f) of the Basin Project Act, the United States or the CAP Operating Agency shall deliver to the Community annually, up to:

5.4.1.1 173,100 acre-feet of CAP Indian Priority Water that was allocated to the Community in accordance with the Secretarial notice published in the Federal Register on March 24, 1983, and subsequently contracted to the Community for delivery in the 1992 Contract;

5.4.1.2 102,000 acre-feet of CAP NIA Priority Water that was previously allocated to non-Indian agricultural entities and that has been reallocated by the Secretary to the Community pursuant to the Settlement Act;

5.4.1.3 18,600 acre-feet of CAP NIA Priority Water that was previously allocated and contracted to the Roosevelt Water Conservation District and subsequently relinquished by that entity and reallocated by the Secretary to the Community pursuant to the Settlement Act; and

5.4.1.4 18,100 acre-feet of CAP Indian Priority Water that was acquired by the Secretary through the permanent relinquishment of the Harquahala Valley Irrigation District CAP Subcontract entitlement in accordance with Contract No. 3-07-30-W0290 among CAWCD, the Harquahala Valley Irrigation District, and the United States, and converted from CAP NIA Priority Water to CAP Indian Priority Water pursuant to the Fort McDowell Indian Community Water Rights Settlement Act of 1990, P.L. 101-628, Title IV, 104 Stat. 4468, 4480, and reallocated by the Secretary to the Community, pursuant to the Settlement Act.

5.5 Procedure for Ordering Water.

5.5.1 The Community will, in accordance with the procedures hereinafter set out, submit written schedules to the Contracting Officer showing the quantities of water requested for delivery.

5.5.1.1 On or before October 1 of each Year, the Community shall submit in writing to the Contracting Officer a water delivery schedule indicating the amount of Community CAP Water desired by the Community during each month of the following Year along with a preliminary schedule of water desired for the succeeding two (2) Years.

5.5.1.2 Upon receipt of the schedule, the Contracting Officer shall review it and, after consultation with the CAP Operating Agency and the Community, shall make

only such modifications in it as are necessary to ensure that the amounts, times and rates of delivery to the Community will be consistent with the provisions of sections 5.3.1 and 5.3.12. On or before December 1 of each Year, the Contracting Officer shall determine and furnish to the Community the water delivery schedule for the next succeeding Year which shall show the amounts of water to be delivered to the Community during each month of that Year.

5.5.2 A water delivery schedule may be amended by the Contracting Officer upon the Community's written request. Proposed amendments shall be submitted by the Community to the Contracting Officer within a reasonable time before the desired change is to become effective, and shall be subject to review and modification by the Contracting Officer in like manner as the schedule itself.

5.5.3 The Community shall hold the United States, its officers, agents, and employees, harmless on account of damage or claim of damage of any nature arising out of or connected with the actions of the United States regarding water delivery schedules furnished to the Community.

5.5.4 In lieu of the Community submitting water delivery schedules to the Contracting Officer for approval, the Contracting Officer reserves the right to direct the Community to submit such schedules to the CAP Operating Agency under such criteria as the Contracting Officer determines to be appropriate, after consultation with the Community and the CAP Operating Agency and so long as the Community's rights to require the delivery of Community CAP Water are not thereby adversely impacted or diminished.

5.6 Points of Delivery - Measurement and Responsibility for Distribution of Water.

5.6.1 The Community CAP Water to be furnished to the Community pursuant to this Amended Contract will be delivered at (i) the turnout(s) from the CAP System to the Distribution Works as agreed upon in writing by the Contracting Officer and the Community, or

in the event they are unable to agree, as selected by the Secretary and at (ii) such other points as may otherwise be agreed upon or approved by the Secretary.

5.6.2 All water delivered to the Community shall be measured with equipment furnished and installed by the United States and operated and maintained by the United States or the CAP Operating Agency. Upon request of the Community, the accuracy of such measurements will be investigated by the Contracting Officer or the CAP Operating Agency and the Community, and any errors appearing therein adjusted; *provided*, that in the event the Parties cannot agree on the required adjustment, the Contracting Officer's determination shall be conclusive.

5.6.3 Neither the United States nor the CAP Operating Agency shall be responsible for the control, carriage, handling, use, disposal, or distribution of water beyond the turnout point(s) from the CAP System. The Community shall hold the United States and the CAP Operating Agency harmless on account of damage or claim of damage of any nature whatsoever for which there is legal responsibility, including property damage, personal injury, or death arising out of or connected with the Community's control, carriage, handling, use, disposal, or distribution of such water beyond said turnout point(s).

5.7 Priority.

5.7.1 In time of shortage the Available CAP Supply shall be distributed as described in this section 5.7.

5.7.2 For purposes of administering this Amended Contract, a time of shortage shall be a Year when:

5.7.2.1 Prior to January 1, 2044, any Year in which the Available CAP Supply for that Year is insufficient to satisfy all of the entitlements to (i) three hundred forty-three thousand seventy-nine (343,079) acre-feet of CAP Indian Priority Water; (ii) six hundred

thirty-eight thousand eight hundred twenty-three (638,823) acre-feet of CAP M&I Priority Water; and (iii) up to one hundred eighteen (118) acre-feet of CAP M&I Priority Water converted from CAP NIA Priority Water under the San Tan Irrigation District's CAP Subcontract.

5.7.2.2 On or after January 1, 2044, any Year in which the Available CAP Supply for that Year is insufficient to satisfy all of the entitlements to (i) three hundred forty-three thousand seventy-nine (343,079) acre-feet of CAP Indian Priority water; (ii) six hundred thirty-eight thousand eight hundred twenty-three (638,823) acre-feet of CAP M&I Priority Water; (iii) up to forty-seven thousand three hundred three (47,303) acre-feet of CAP M&I Priority Water converted from CAP NIA Priority Water pursuant to the Hohokam Agreement; and (iv) up to one hundred eighteen (118) acre-feet of CAP M&I Priority Water converted from CAP NIA Priority Water under the San Tan Irrigation District's CAP Subcontract.

5.7.3 In time of shortage the initial distribution of water shall be determined in the following manner:

5.7.3.1 If the Available CAP Supply is equal to or less than eight hundred fifty-three thousand seventy-nine (853,079) acre-feet, then 36.37518 percent of the Available CAP Supply shall be available for delivery as CAP Indian Priority Water and the remainder shall be available for delivery as CAP M&I Priority Water.

5.7.3.2 If the Available CAP Supply is greater than eight hundred fifty-three thousand seventy-nine (853,079) acre-feet, then the quantity of water available for delivery as CAP Indian Priority Water shall be determined in accordance with the following equation and the remainder shall be available for delivery as CAP M&I Priority Water:

$$I = \{[32,770 \div (E - 853,079)] \times W\} + (343,079 - \{[32,770 \div (E - 853,079)] \times E\})$$

where:

I = the quantity of water available for delivery as CAP Indian Priority Water;

E = the sum of the entitlements to CAP Indian Priority Water and CAP M&I Priority Water as described in section 5.7.2.1 or 5.7.2.2, whichever is applicable; and

W = the Available CAP Supply.

Examples:

A. If, before January 1, 2044, the sum of the entitlements to CAP Indian Priority Water and CAP M&I Priority Water as described in section 5.7.2.1 is nine hundred eighty-one thousand nine hundred two (981,902) acre-feet (343,079 + 638,823), then the quantity of water available for delivery as CAP Indian Priority Water would be ninety-three thousand three hundred three (93,303) acre-feet plus 25.43800 percent of the Available CAP Supply.

B. If, after January 1, 2044, the sum of the entitlements to CAP Indian Priority Water and CAP M&I Priority Water as described in section 5.7.2.2 is one million twenty-nine thousand three hundred twenty-three (1,029,323) acre-feet (343,079 + 638,823 + 47,303 + 118), then the quantity of water available for delivery as CAP Indian Priority Water would be one hundred fifty-one thousand six hundred ninety-one (151,691) acre-feet plus 18.59354 percent of the Available CAP Supply.

5.7.4 In a time of shortage unscheduled CAP Water shall be redistributed in the following manner:

5.7.4.1 Distribution of CAP Indian Priority Water among those entities with contracts for the delivery of CAP Indian Priority Water shall be as provided in section 5.7.5. Any water available for delivery as CAP Indian Priority Water that is not scheduled for delivery

pursuant to contracts, leases, or exchange agreements for the delivery of CAP Indian Priority Water shall become available for delivery as CAP M&I Priority Water.

5.7.4.2 Distribution of CAP M&I Priority Water among those entities with contracts for the delivery of CAP M&I Priority Water shall be determined by the Secretary and the CAP Operating Agency in consultation with users of CAP M&I Priority Water to fulfill all delivery requests to the greatest extent possible. Any water available for delivery as CAP M&I Priority Water that is not scheduled for delivery pursuant to contracts, leases, or exchange agreements for the delivery of CAP M&I Priority Water shall become available for delivery as CAP Indian Priority Water.

5.7.4.2.1 In consideration of the Community's agreement to incur additional shortages beyond those that it would have incurred under the approach described in Exhibit A hereto, the Secretary shall first make available to the Community any water made available for delivery as CAP Indian Priority Water under section 5.7.4.2, to the extent necessary in any Year, to offset the additional shortages borne by the Community. After the additional shortages borne by the Community have been fully offset, the Secretary shall then make any remaining water available in accordance with CAP Contracts and CAP Subcontracts for the delivery of CAP Indian Priority Water, including this Amended Contract, in proportion to the contractual entitlements to CAP Indian Priority Water.

5.7.4.3 Any water remaining after all requests for delivery of CAP Indian Priority Water and CAP M&I Priority Water have been satisfied shall become available for delivery as CAP NIA Priority Water.

5.7.4.4 Nothing in section 5.7.4 shall be construed to allow or authorize any CAP Contractor or CAP Subcontractor to receive, pursuant to such contracts, CAP water in amounts greater than such contractor's entitlement.

5.7.5 The distribution of CAP Indian Priority Water among CAP Indian Priority Water users shall be accomplished as follows:

5.7.5.1 If the Available CAP Supply is greater than eight hundred fifty-three thousand seventy-nine (853,079) acre-feet but less than the sum of the entitlements described in section 5.7.2.1 or 5.7.2.2, as applicable, then the Tohono O'odham Nation shall incur the portion of such shortage of CAP Indian Priority Water determined under the formula set forth in exhibit 5.3.4.1 to the TON CAP Water Delivery Contract and the Community shall incur all remaining shortages of CAP Indian Priority Water to the extent that sufficient quantities of CAP water, including all CAP M&I Priority Water available for delivery as CAP Indian Priority Water in accordance with section 5.7.4.2.1, are not available to meet orders for CAP Indian Priority Water.

5.7.5.2 If the Available CAP Supply is greater than eight hundred one thousand five hundred seventy-four (801,574) acre-feet but less than eight hundred fifty-three thousand seventy-nine (853,079) acre-feet, up to fifty one thousand five hundred five (51,505)acre-feet of shortages to the Indian sector will be shared among the Community, the Ak-Chin Indian Community, the Salt River Pima-Maricopa Indian Community, the Tohono O'odham Nation, and the San Carlos Apache Tribe. Notwithstanding the provisions of this section 5.7.5.2, during a time of shortage, the CAP Indian Priority Water available to the other four (4) tribes referenced above shall be determined in accordance with the provisions of their respective CAP water delivery contracts and any amendments thereto, which amendments shall be consistent with sections 5.7.4.2.1 and 5.7.5.

5.7.5.3 In the event that the Available CAP Supply is less than eight hundred one thousand five hundred seventy-four (801,574) acre-feet, the available CAP Indian Priority Water determined under section 5.7.3.1 shall be distributed to the Community by the

Secretary based on the ratio of the amount of water delivered pursuant to this Amended Contract in the latest non-shortage Year relative to the total quantity of water delivered to all CAP Contractors for CAP Indian Priority Water in that same Year. However, if during the last non-shortage Year the Community had not completed construction of the distribution system necessary to take and use its CAP entitlement, the Secretary will impute in the calculation the quantity of CAP water that the Community would have been expected to take had the distribution system, as it exists at the time of the shortage, been in place during such non-shortage Year. For example, if the Secretary determines that (i) in the last non-shortage Year the Community used only one hundred thirty thousand (130,000) acre-feet of its entitlement because the Distribution Works were only partially completed and would permit the delivery of only one hundred thirty thousand (130,000) acre-feet, and (ii) as of the then current Year, additional construction of the Distribution Works has been completed, and (iii) the Community can take and use, and has ordered for delivery, one hundred sixty-five thousand (165,000) acre-feet of CAP water, then the Secretary will use an imputed quantity of one hundred sixty-five thousand (165,000) acre-feet for the Community when pro-rating the available water supply among the CAP Contractors for CAP Indian Priority Water.

5.7.5.4 If any Indian tribe or nation, other than the Community, enters into a new contract or amends the term or quantity of water in an existing contract for the delivery or exchange of CAP water, then the Secretary shall require such tribe or nation to include in such new contract or amendment, a provision to share, on a proportional[1] basis with the Community and the TON, the additional shortage that the Community and TON are bearing pursuant to sections 5.7.5.1 and 5.7.5.2 of this Amended Contract. In that event, the Community

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[1] The proportion shall be based on a ratio with the numerator being the amount of such tribe's entitlement to CAP Indian Irrigation Water and the denominator being the sum of the amounts of all tribes' entitlement to CAP Indian Irrigation Water.

and the Secretary shall modify this Amended Contract to reflect such sharing of shortages by the other Indian tribe(s) or nation(s); provided, however, that any such shortage shared by the other tribe(s) or nation(s) shall not be greater than would have been incurred by the tribe(s) or nation(s) under their existing CAP Water Delivery Contracts at an Available CAP Water Supply of 801,574 acre-feet. The Secretary shall divide any water made available to the Community pursuant to Subparagraph 5.7.4.2.1 among the Community and those contractors whose contracts have been so amended, on the same proportional basis as shortages were shared. Such amendments shall not require the Community to incur any greater shortage of CAP Indian priority Water than is required under this Amended Contract.

5.7.6 In the event that there is any dispute regarding the amount of CAP water available to the Community during a time or shortage, or dispute regarding the operation of section 5.7 the Secretary shall make a final determination after consulting with the Community, which decision shall be subject to such challenge or appeal processes as are available or applicable.

5.7.7 If the Available CAP Supply is insufficient to meet the CAP Contracts or CAP Subcontracts for the delivery of CAP NIA Priority Water, then the Secretary and the CAP Operating Agency shall pro-rate the CAP NIA Priority Water to the CAP Contractors and CAP Subcontractors holding such entitlements on the basis of the quantity of CAP NIA Priority Water used by each such Contractor or Subcontractor in the last Year in which the Available CAP Supply was sufficient to fill all orders for CAP NIA Priority Water. However, if during the last such Year the Community had not completed construction of the distribution system necessary to take and use its entire entitlement to CAP NIA Priority Water, the Secretary shall impute in the calculation the quantity of CAP NIA Priority Water that the Community would have been expected to take had the distribution system, as it exists in the then current Year, been in place

during the last Year in which sufficient CAP NIA Priority Water was available to fill all orders for CAP NIA Priority Water. For example, if the Secretary determines that (i) in the last Year in which sufficient CAP NIA Priority Water was available to fill all orders for CAP NIA Priority Water, the Community used only ninety thousand (90,000) acre-feet of its entitlement to the delivery of CAP NIA Priority Water because the Distribution Works were only partially completed and would permit the delivery of only ninety thousand (90,000) acre-feet, and (ii) as of the then current Year, additional construction of the Distribution Works has been completed, and (iii) the Community can take and use, and has ordered for delivery, one hundred ten thousand (110,000) acre-feet of CAP NIA Priority Water, then the Secretary will use an imputed quantity of one hundred ten thousand (110,000) acre-feet for the Community when pro-rating the CAP NIA Priority Water.

5.8 The shortage sharing criteria in section 5.7 shall not apply to water acquired from the Yuma-Mesa Division of the Gila Project pursuant to the Ak-Chin Indian Community Water Rights Settlement Act, Pub. L. 98-530, or water acquired from the Wellton-Mohawk Irrigation and Drainage District pursuant to the Salt River Pima-Maricopa Indian Community Water Rights Settlement Act, Pub. L. 100-512, both of which have a higher priority than Fourth Priority Water.

5.9 Secretarial Control of Return Flow. The Secretary reserves the right to capture all Return Flow flowing from the exterior boundaries of the Community's CAP Service Area as a source of supply and for distribution to and use of CAP to the fullest extent practicable. The Community may recapture and reuse or sell Return Flow within the exterior boundaries of the Community's CAP Service Area; *provided, however*, that such Return Flow captured within the Community's CAP Service Area may not be sold for use outside the Community's CAP Service Area unless the Secretary has given prior written approval.

5.10 Exchange Water.

5.10.1 In order to permit the Secretary to contract for water service with users in the State of New Mexico in accordance with section 304(f) of the Basin Project Act, the Community agrees to accept Project Water in exchange for existing supplies available to the Community from the Gila River system.

5.10.2 In addition to any exchange required under section ~~5.9.1~~ 5.10.1, if the Contracting Officer determines that the Community is physically able to receive Project Water in exchange for or in replacement of existing supplies of water from surface sources other than the Colorado River, the Contracting Officer may require that the Community accept Project Water in exchange for or in replacement of said existing supplies pursuant to the provisions of section 304(d) of the Basin Project Act.

5.10.3 All exchanges and replacements required of the Community under this section 5.10 by the Secretary must be accomplished without economic injury or cost to the Community. Prior to implementing any such exchange, the United States shall conduct or cause to be conducted a study to document that the exchange can be accomplished without economic injury or cost to the Community.

5.10.4 If, in the event of shortages, the Community has yielded water from other surface water sources in exchange for Project Water, the Community shall have first priority against other users supplied with Project Water that have not yielded water from other surface water sources, but only in quantities adequate to replace the water so yielded by the Community.

5.10.5 The Community shall have the opportunity to participate in exchange agreement negotiations, and the Secretary shall include necessary terms and conditions in any exchange agreement which operate to protect the interests of the Community. Notwithstanding the Community's participation in the exchange agreement negotiations, the Contracting Officer

shall make the final decision regarding any exchange agreement. Within thirty (30) days of receipt of the Contracting Officer's decision, the Community may appeal the Contracting Officer's decision to the Secretary for review, in accordance with the appeal procedures set forth in 43 CFR 4.700, *et seq.*, subpart G. The decision of the Secretary shall be final for the Department of the Interior, and thereafter the Community may seek review of the Secretary's decision in Federal court pursuant to any applicable law under the procedures provided in the Administrative Procedures Act.

5.11 Nothing in this Amended Contract precludes the Community from contracting for the delivery of any other water available for delivery through the CAP System, and no such delivery shall affect any rights under this Amended Contract.

6 OTHER WATER:

Nothing in this Amended Contract shall be construed to require that the Community's CAP Water entitlement be reduced or diminished as a result of the Community's receipt of water from other sources.

7 PAYMENTS:

7.1 Pursuant to section 205(a)(7) of the Settlements Act, the cost associated with the Main System allocable to the Community:

7.1.1 shall be nonreimbursable; and

7.1.2 shall be excluded from any repayment obligation of the Community.

7.2 Pursuant to section 205(a)(8) of the Settlement Act, no CAP water service capital charges shall be due or payable for Community CAP Water, whether CAP water is delivered for use by the Community or is delivered under any leases of or options to lease, exchanges or options to exchange Community CAP Water entered into by the Community.

7.3 Except as provided in sections 7.3.5 and 7.3.6, the Community shall be responsible for the payment of the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge associated with the delivery of Community CAP Water.

7.3.1 Community CAP Water shall not be delivered to the Community unless the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge associated with the delivery of such water are paid in advance of water delivery pursuant to bills for collection from the United States, or the CAP Operating Agency if the Community is directed by the Contracting Officer to pay such charges to the CAP Operating Agency.

7.3.2 Unless otherwise directed by the Contracting Officer, the annual CAP Fixed OM&R Charge and the CAP Pumping Energy Charge associated with the delivery of Community CAP Water shall be paid in twelve (12) equal monthly installments and shall be paid on or before the first day of each month in order for the Community to receive water deliveries in the succeeding month.

7.3.3 Unless otherwise agreed, differences between the estimated and actual CAP Fixed OM&R Charge and the estimated and actual CAP Pumping Energy Charge shall be determined by the Contracting Officer and shall be adjusted in the next succeeding annual CAP Fixed OM&R Charge and CAP Pumping Energy Charge; *provided, however*, that if in the opinion of the Contracting Officer the amount of funds advanced by the Community is likely to be insufficient to cover the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge during the Year, the Contracting Officer may increase the annual estimate of the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge associated with the deliver of Community CAP Water by written notice thereof to the Community, and the Community shall forthwith increase its remaining monthly payments in such Year by the amount necessary to cover the insufficiency; *provided further,* that, unless otherwise agreed, if in the opinion of the Contracting

Officer the amount of funds advanced by the Community is likely to be greater than what is required to cover the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge associated with the deliver of Community CAP Water during the Year, the Contracting Officer shall reduce the remaining monthly payments on a pro rata basis to adjust the total payment for the Year to the revised estimate. The Community agrees to make all advances or payments required under this section.

7.3.4 Pursuant to 25 U.S.C. 385 and regulations promulgated pursuant thereto (25 CFR Part 171), the Secretary may adjust the amount of the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge for which the Community is responsible.

7.3.5 Notwithstanding section 7.3 and except as provided in section ~~7.3.7~~ 7.3.6, the United States shall pay the CAP Operating Agency the CAP Fixed OM&R Charge for Community CAP Water scheduled for delivery in any Year under this Amended Contract if monies are available for such purpose pursuant to section 403(f) of the Basin Project Act .

7.3.6 The Community and the United States shall not be obligated to pay the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge associated with the delivery of Community CAP Water, or any other charges, payments or fees with respect to Community CAP Water delivered or required to be delivered to entities other than the Community pursuant to leases or options to lease. The Community shall require its lessees to pay the CAP Operating Agency any such charges in any contracts, leases, options to lease, or other agreements providing for the temporary delivery to, or use by, such lessees of any portion of the Community's CAP Water.

7.4 In the event the Community fails or refuses to accept delivery at the Delivery Point(s) of the quantities of water available for delivery to and required to be accepted by it pursuant to this Amended Contract, or in the event the Community fails in any Year to submit a

schedule for delivery as provided in section 5.5, said failure or refusal shall not relieve the Community of its obligation to make the payments required in this section 7. The Community agrees to make payment therefor in the same manner as if said water had been delivered to and accepted by it in accordance with this Amended Contract except as provided in sections 5.3.7 and section 7.5; *provided*, that the Community shall be relieved from such obligation to pay if Distribution Works are not in place to receive water because the United States has not made funds available to the Community to construct Distribution Works or the United States has not constructed Distribution Works for the Community.

7.5 The Community shall have no right to delivery of water from Project facilities during any period in which the Community may be in arrears in the payment of any charges due the Contracting Officer or the CAP Operating Agency. The Contracting Officer may sell to another entity any water determined to be available under the Community's entitlement for which payment is in arrears or the Contracting Officer may request that the CAP Operating Agency sell such water; *provided, however*, that the Community may regain the right to use any unsold portion of the water determined to be available under the original entitlement upon payment of all delinquent charges plus any difference between the contractual obligation and the price received in the sale of the water by the Contracting Officer or the CAP Operating Agency and payment of charges for the current period.

7.6 The Community shall be subject to interest, administrative, and penalty charges on any delinquent payments for the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge associated with the delivery of Community CAP Water.

7.6.1 When a payment is not received by the due date, the Community shall pay an interest charge for each day the payment is delinquent beyond the due date. The interest charge rate shall be the greater of the rate prescribed quarterly in the Federal Register by the

Department of the Treasury for application to overdue payments, or the interest rate of 0.5 percent per month prescribed by section 6 of the Reclamation Project Act of 1939 (Public Law 76-260). The interest charge rate shall be determined as of the due date and remain fixed for the duration of the delinquent period.

7.6.2 When a payment becomes 60 days delinquent, the Community shall pay an administrative charge to cover additional costs of billing and processing the delinquent payment.

7.6.3 When a payment is delinquent 90 days or more, the Community shall pay an additional penalty charge of 6 percent per Year calculated on a daily basis for each day the payment is delinquent beyond the due date.

7.6.4 The Community shall pay any fees incurred for debt collection services associated with a delinquent payment.

7.6.5 When a partial payment on a delinquent account is received, the amount received shall be applied, first to the penalty, second to the administrative charges, third to the accrued interest, and finally to the overdue payment for the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge associated with the delivery of Community CAP Water.

7.7 The obligation of the Community to pay the CAP Fixed OM&R Charge and the CAP Pumping Energy Charge associated with the delivery of Community CAP Water to the Contracting Officer, or the CAP Operating Agency as provided in this Amended Contract, is a general obligation of the Community notwithstanding the manner in which the obligation may be distributed among the Community's water users and notwithstanding the default of individual water users in their obligations to the Community.

8 GENERAL PROVISIONS:

8.1 Water and Air Pollution Control. The Community, in carrying out this Amended Contract, shall comply with all applicable water and air pollution laws and regulations of the Community and the United States, and shall obtain all required permits or licenses from the appropriate Community and Federal authorities.

8.2 Quality of Water. The CAP System shall be operated in such manner as is practicable to maintain the quality of raw water made available through such facilities at the highest level reasonably attainable, as determined by the Contracting Officer. Neither the United States nor the CAP Operating Agency warrants the quality of water and is under no obligation to construct or furnish water treatment facilities to maintain or better the quality of water.

8.3 Compliance With Federal Reclamation Laws. The delivery of water or the use of Federal facilities pursuant to this Amended Contract is subject to applicable Federal Reclamation laws.

8.4 Books, Records, and Reports. The Community shall establish and maintain accounts and other books and records pertaining to administration of the terms and conditions of this Amended Contract. Reports thereon shall be furnished to the Contracting Officer in such form and on such date or dates as the Contracting Officer may require. Subject to applicable Federal laws and regulations, each Party shall have the right during office hours to examine and make copies of the other Party's books and records relating to matters covered by this Amended Contract.

8.5 Notices. Any notice, demand, or request authorized or required by this Amended Contract shall be deemed to have been given, on behalf of the Community, when mailed, postage prepaid, or delivered to the Regional Director, Lower Colorado Region, Bureau of Reclamation, P.O. Box 61470, Boulder City, Nevada 89006-1470, and on behalf of the United States, when

mailed, postage prepaid, or delivered to the Governor, Gila River Indian Community, P.O. Box 97, Sacaton, Arizona 85247. The designation of the addressee or the address may be changed by notice given in the same manner as provided in this section for other notices.

8.6 Contingent on Appropriation or Allotment of Funds. The expenditure or advance of any money or the performance of any obligation by the United States under this Amended Contract shall be contingent upon appropriation or allotment of funds. Absence of appropriation or allotment of funds shall not relieve the Community from any obligations under this Amended Contract. No liability shall accrue to the United States in case funds are not appropriated or allocated.

8.7 Assignment Limited – Successors and Assigns Obligated. The provisions of this Amended Contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this Amended Contract or any part or interest therein shall be valid until approved in writing by the Contracting Officer.

8.8 Officials Not to Benefit. No Member of or Delegate to Congress, Resident Commissioner or official of the Community shall benefit from this Amended Contract other than as a water user or landowner in the same manner as other water users or landowners.

8.9 Equal Opportunity.

8.9.1 In accordance with the provisions of Title 42 U.S.C. 2000-e-2(i), the Community shall give preference in employment to Indian residents of the Reservation. The Bureau of Indian Affairs Office of Employment Assistance shall be notified of employment opportunities 48 hours before any positions are advertised to the general public.

8.9.2 Except as provided above, during the performance of this Amended Contract, the Community agrees as follows:

8.9.2.1 The Community will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Community will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Community agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

8.9.2.2 The Community will, in all solicitations or advertisements for employees placed by or on behalf of the Community, state that all qualified applicants will receive consideration for employment without discrimination because of race, color, religion, sex, or national origin.

8.9.2.3 The Community will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising said labor union or workers' representative of the Community's commitments under section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

8.9.2.4 The Community will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

8.9.2.5 The Community will furnish all information and reports required by said amended Executive Order and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Contracting Officer and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

8.9.2.6 In the event of the Community's noncompliance with the nondiscrimination clauses of this Amended Contract or with any such rules, regulations, or orders, this Amended Contract may be canceled, terminated, or suspended, in whole or in part, and the Community may be declared ineligible for further Government contracts in accordance with procedures authorized in said amended Executive Order, and such other sanctions may be imposed and remedies invoked as provided in said Executive Order, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

8.9.2.7 The Community will include the provisions of sections 8.9.2.1 through 8.9.2.7 in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of said amended Executive Order, so that such provisions will be binding upon each subcontractor or vendor. The Community will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance; *provided, however*, that in the event the Community becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Community may request the United States to enter into such litigation to protect the interests of the United States.

8.10 Compliance with Civil Rights Laws and Regulations.

8.10.1 The Community shall comply with Title VI of the Civil Rights Act of 1964 (42U.S.C. 2000d), section 504 of the Rehabilitation Act of 1975 (Public Law 93-112,as amended), the Age Discrimination Act of 1975 (42 U.S.C. 6101, *et seq.*) and any other applicable civil rights laws, as well as with their respective implementing regulations and guidelines imposed by the Department of the Interior and/or Bureau of Reclamation.

8.10.2 These statutes require that no person in the United States shall, on the grounds of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving financial assistance from the Bureau of Reclamation. By executing this Amended Contract, the Community agrees to immediately take any measures necessary to implement this obligation, including permitting officials of the United States to inspect premises, programs, and documents.

8.10.3 The Community makes this agreement in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property discounts or other Federal financial assistance extended after the date hereof to the Community by the Bureau of Reclamation, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Community recognizes and agrees that such Federal assistance will be extended in reliance on the representations and agreements made in this section, and that the United States reserves the right to seek judicial enforcement thereof.

9 EXCEPTIONS TO APPLICATION OF CIVIL RIGHTS AND OTHER ACTS:

The provisions of sections 8.9 and 8.10 apply except where they conflict with sections 701(b)(1) and 703(i) of Title VII of the Civil Rights Act of 1964 (73 Stat. 253-257), which pertain to Indian tribes and to preferential treatment given to Indians residing on or near a

reservation or other applicable laws which exclude applicability to Indians or Indian reservations.

10 ENVIRONMENTAL COMPLIANCE:

Notwithstanding any other provision of this Amended Contract, Community CAP Water shall not be delivered to the Community unless and until the Community obtains final environmental clearance from the Contracting Officer for construction of the Distribution Works and use of Community CAP Water. Based on the Community's plans to take and use Community CAP Water, Reclamation shall carry out any and all environmental reviews it considers necessary for construction of the Distribution Works and use of Community CAP Water. The environmental reviews will be tiered off of information in the Final Environmental Impact Statement--Water Allocations and Water Service Contracting (FES 82-7, filed March 19, 1982) and carried out according to the requirements of the National Environmental Policy Act of 1969 (83 Stat. 884). In addition, environmental clearance for this Amended Contract will not be final until the applicable provisions of the Endangered Species Act have been complied with. Any additional action(s) required on behalf of the Community in order to obtain final environmental clearance from the Contracting Officer will be identified to the Community by the Contracting Officer, and no Community CAP Water shall be delivered to the Community unless and until the Community has completed all such action(s) to the satisfaction of the Contracting Officer. The Parties understand that the Distribution Works will be constructed in phases, and that separate environmental clearance will be completed for each phase thereby permitting the construction of each phase and delivery of water through such phase prior to obtaining final environmental clearance for all phases.

11 OTHER PROVISIONS:

11.1 This Amended Contract shall become effective on the Enforceability Date.

11.2 Nothing in this Amended Contract shall be construed as a limitation on the Community's ability to enter into any agreement with the Arizona Water Banking Authority, or its successor agency or entity, in accordance with State law.

IN WITNESS WHEREOF, the Parties have executed this Amended Contract on the date written above.

THE UNITED STATES OF AMERICA

Legal Review and Approval

By: _____
Field Solicitor
Phoenix, Arizona

By: _____
Robert W. Johnson
Regional Director
Bureau of Reclamation

GILA RIVER INDIAN COMMUNITY

Legal Review and Approval

By: _____
General Counsel

By: _____
Richard Narcia
Governor

ATTEST:

By: _____
Secretary

By: _____

Exhibit A

Secretary's Approach for Determining
the Amount of Water Available to the Community
During a Time of Shortage Under the 1992 Contract

If the Available CAP Supply is insufficient to fill all orders for CAP water, the Secretary shall take the following steps, in succession, as necessary to match the available supply with orders for the delivery of CAP water in each of the categories described below:

1. First, miscellaneous uses of CAP water are reduced, pro rata. If, after eliminating all miscellaneous uses of CAP water, there is still insufficient available CAP water to meet outstanding orders for the delivery of CAP water, the Secretary shall take the following measure.

2. Uses of CAP NIA Priority Water are reduced, pro rata. If, after eliminating all uses of CAP NIA Priority Water, there is still insufficient available CAP water to meet outstanding orders for delivery of CAP water, then the Secretary shall take the following measure.

3. Uses of CAP M&I Priority Water in excess of 510,000 acre-feet are reduced, pro rata. If, after eliminating all uses of CAP M&I Priority Water in excess of 510,000 acre-feet, there is still insufficient available CAP water to meet outstanding orders for delivery of CAP water, then the Secretary shall take the following measure.

4. If the preceding reductions do not bring CAP water orders in line with the Available CAP Supply, uses of CAP Indian Priority Water in excess of 291,574 acre-feet are

reduced, in accordance with the Secretarial Decision published in the Federal Register on March 24, 1983.

5. If the preceding reductions do not bring CAP water orders in line with the Available CAP Supply, the available CAP water supply will be allocated between users of CAP Indian Priority Water and users of CAP M&I Priority water on a 36.37518 and 63.62482 percentage basis, respectively.

6. If step 5 is implemented, the amount of water available for the Community shall be determined by multiplying the amount of CAP Indian Priority Water by the ratio of the amount of water delivered pursuant to the Community's CAP Water Delivery Contract in the latest non-shortage Year relative to the total quantity of water delivered to all CAP Contracts for Indian Priority Water in that same Year.

EXHIBIT 5

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

CONTRACT NO. 14-06-400-7718

VERNAL UNIT

CENTRAL UTAH PROJECT, UTAH

CONTRACT

BETWEEN

UNITED STATES OF AMERICA

AND

UINTAH WATER CONSERVANCY DISTRICT

1958

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLORADO RIVER STORAGE PROJECT

CONTRACT BETWEEN THE UNITED STATES OF AMERICA
AND THE UINTAH WATER CONSERVANCY DISTRICT

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Contract No. 14-06-400-778

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLORADO RIVER STORAGE PROJECT

CONTRACT BETWEEN THE UNITED STATES OF AMERICA
and the
UINTAH WATER CONSERVANCY DISTRICT

THIS CONTRACT, made this 14th day of July, 1958, between THE UNITED STATES OF AMERICA, hereinafter called the United States, acting through the Secretary of the Interior, and pursuant to the Federal Reclamation Laws, and the UINTAH WATER CONSERVANCY DISTRICT, hereinafter called the District, organized and existing pursuant to the laws of the State of Utah, with its principal place of business and office at Vernal, Uintah County, Utah.

WITNESSETH, That:

WHEREAS, the following statements are made in explanation:

The Act of Congress approved April 11, 1956 (70 Stat. 105) authorized the construction, operation, and maintenance of the Central Utah Project, of which the Vernal Unit is a part thereof, which Unit is hereinafter called the Project and the United States has investigated, planned, and proposes to construct said Project for the diversion, storage, and distribution of water of Ashley Creek watershed for irrigation, municipal water, recreation, and fish and wildlife purposes.

The parties hereto desire to enter into a contract in accordance with and, subject to the provisions and conditions hereinafter set forth providing, among other things, for the delivery from project works to the District water for irrigation of irrigable land within the District, and for municipal purposes, and for the operation and the maintenance of project works to be utilized for the aforesaid purposes.

NOW, THEREFORE, in consideration of the mutual and dependent covenants herein contained, it is mutually agreed between the parties hereto as follows:

GENERAL DEFINITIONS

1. Where used in this contract:

a. "Secretary" or "Contracting Officer," or either of them, shall mean the Secretary of the United States Department of the Interior or his duly authorized representative.

b. "Federal Reclamation Laws" shall mean the Act of June 17, 1902 (32 Stat. 388) and all acts amendatory thereof or supplementary thereto.

c. "Project" shall mean the Vernal Unit of the Central Utah Project, Utah.

d. "Project Works" shall mean all works or facilities to be constructed under provisions of this contract, together with lands and rights-of-way for such works.

e. "Project Water" shall mean the water made available through the project works.

f. "Project Irrigation Water" shall mean that portion of the project water made available for irrigation purposes.

g. "Project Municipal Water" shall mean that portion of the project water made available for domestic, manufacturing, and industrial purposes.

h. "Transferred Works" shall mean those project works transferred to the District for care, operation, and maintenance.

i. "Irrigation Year" shall mean April 1 through October 31 of each calendar year, or such different period as may be established by mutual agreement in writing.

PROJECT WORKS

2. a. Subject to the terms and conditions of this contract, the United States will undertake construction of project works and provide equipment as in the opinion of the Secretary are necessary for project purposes, within the limit of funds made available by the Congress, hereinafter described:

(i) The Fort Thornburgh Diversion Dam four miles northwest of Vernal, Utah, located on Ashley Creek.

(ii) Stanaker Dam, a rolled earth-fill structure, at the mouth of Stanaker Draw about three and one-half miles north of Vernal, Utah, creating a reservoir with a capacity of about 37,560 acre-feet.

(iii) Stanaker Feeder Canal extending for approximately 3.1 miles in an easterly direction from the Fort Thornburgh Diversion Dam to the Stanaker Reservoir with a capacity of approximately 400 second-feet.

(iv) Stanaker Service Canal beginning at the outlet of Stanaker Dam and extending in a southerly direction about 11.8 miles, and will have an initial capacity of about 300 cubic feet per second, reducing to approximately 20 cubic feet at the terminus.

(v) Water-saving pipe lines beginning at an existing municipal chlorination structure approximately four miles northwest of Vernal City and will consist of

pipelines approximating 17.3 miles in length, having an initial capacity of approximately 289 gallons per minute reducing in capacity to approximately 40 gallons per minute.

(vi) Stanaker Canal laterals consisting of approximately 1.6 miles of earth canals varying in capacity from 10 to 40 cubic feet per second to provide conveyance of irrigation water from Stanaker Service Canal to existing private canal systems crossed by the Service Canal.

(vii) Project drainage works, as may be determined necessary by the Contracting Officer after consultation with the Board of Directors of the District. The cost of constructing such drainage works shall not exceed the sum of six hundred seventy-five thousand dollars ($675,000) of which sum, not to exceed one hundred thousand dollars ($100,000), may be expended for improvement of existing canals.

(viii) The purchase or transfer of equipment determined by the Contracting Officer to be required in the care, operation, and maintenance of project works above described at book value at the date of transfer but not to exceed $15,000.

b. In keeping with the purposes of the project, the Secretary may change the location or size of the project works, or may eliminate works from or add works to those described above, and the Secretary's decision on such changes, eliminations, or additions shall be conclusive. Nothing contained herein shall be construed to indicate

the order in which the works described in Article 2(a) will be constructed or acquired.

c. The United States shall have the right at any time after construction to increase the capacity of the project works or any unit or feature thereof for other than project purposes without cost to the District, provided that the District's use of project water shall not be impaired thereby. The right of use of such increased capacity is reserved to the United States.

CONDITIONS PRECEDENT TO CONSTRUCTION

3. The United States shall be under no obligation to commence, or having commenced, to continue construction of project works until:

a. Allotments of irrigation and municipal water are made and water disposal contracts are executed satisfactory to the Contracting Officer; and

b. The United States and the District make such contracts as the Contracting Officer deems necessary with Vernal City and Maeser town for use of their facilities, the Ashley Central Irrigation Company for the modification and replacement of the Ashley Central Canal, the Utah Power & Light Company for modification of its right to the use of the flow of Ashley Springs tributary to Ashley Creek for power generation, Ashley Valley Reservoir Company for use of its reservoirs and others for the use and exchange of water including direct flow and storage rights and for the use, necessary improvement or modification, and operation and maintenance of their irrigation systems.

PAYMENT OBLIGATION

4. a. The District hereby agrees to pay to the United States in the manner herin provided the sum of One Million Five Hundred Thousand Dollars ($1,500,000) herein designated the District Irrigation repayment obligation which is payable by the District, in fifty (50) successive equal annual installments, commencing December 31 of the calendar year next succeeding the end of the development period established in accordance with Article 5 of this contract, Provided, however, that in the event the District elects to make payments under the variable repayment plan as provided in Article 16 of this contract, the annual installments shall be increased or decreased in accordance with such plan, and be it further Provided, that if the District at any time determines that payments should be levied by land classes to the extent permitted by the Water Conservancy District Act, it is hereby agreed that such differential payments as are then agreed to may be required for completion of payments within the period provided under this contract and the water allotment contracts to be executed in conformance with Article 7(b) shall so provide. These payments shall be exclusive of operation, maintenance, and replacement costs which are to be paid as provided in Article 8.

b. The District hereby agrees to pay to the United States for the delivery of a municipal water supply of 1,600 acre-feet annually the amounts hereinafter set out. Such payments shall be made on or before January 1 of each year and shall commence with the year in which the Secretary notifies the District water is available from the works to be constructed under Article 2 of this contract. The

Secretary shall notify the District on or before July 1 of the year preceding the first year in which water shall be available. Payments shall be made in the following annual amounts:

Years 1 - 10, incl.	$23,900
Years 11 - 20, incl.	$27,700
Years 21 - 30, incl.	$31,500
Years 31 - 40, incl.	$35,470

Advance payment of the aforesaid amounts and of any charges to be made to the United States under Article 8 of this contract shall entitle the District during the period covered by such payments to the delivery of the municipal water specified above, Provided, that at the end of forty years the future delivery of municipal water shall be subject to a negotiated contract, pursuant to Section 9(c) of the Reclamation Project Act of 1939 (53 Stat. 1187).

DEVELOPMENT PERIOD

5. a. The development period for the irrigable lands of the project to be served is hereby fixed at three (3) years from and including the first year in which the project works are so far completed as to be available for use and the project irrigation water supply is available for delivery to substantially all of the Project irrigable lands as determined and announced by the Contracting Officer in a notice to the District.

b. The United States may operate and maintain the project works during the development period as provided in Article 8 hereof.

In such event the charge to the District during such period will be fixed with the object of collecting during the whole of said development period an amount equal to the total costs of such operation and maintenance by the United States. Charges will be determined and announced on or before July 1, immediately preceding the commencement of the development period and on or before July 1, each year in advance of the irrigation year for which they are announced, and if necessary supplemental notices may be issued as provided in Article 8 (f). The District shall pay such charges pursuant to the provisions of the announcement.

c. The amount by which the charges paid by the District pursuant to subsection (b) hereof are less than the actual costs of operation and maintenance of the project works incurred by the United States during the development period shall be paid to the United States by the District in the year immediately following the expiration of the development period in a manner prescribed by the Contracting Officer, and the amount by which the charges paid by the District during the development period pursuant to subsection (b) hereof are in excess of the actual costs of operation and maintenance of the project works of such period shall be credited to the District irrigation repayment obligation in a manner to be determined by the Contracting Officer.

d. During any period of time the United States is operating and maintaining the project works, the District shall pay operation and maintenance costs properly assignable to project municipal water at the time and in a manner to be provided in an appropriate notice to be issued by the Secretary.

DISPOSAL OF WATER DURING CONSTRUCTION

6. Any project water available during construction of the project works may be disposed of by the Contracting Officer at rental or other charges fixed by him to: (1) irrigation users until commencement of the development period and (2) municipal users until the Secretary notifies the District that water is available as provided in Article 4 b.

USE AND ALLOTMENT OF PROJECT WATER

7. a. Except as limited by Article 4(b) the district shall have the permanent right to use and dispose of the annual yield of water from project works. Project water in excess of that necessary to satisfy project water requirements in any year shall be retained in Stanaker Reservoir to the extent of the capacity available therefor, for use during succeeding years. There shall be no individual holdover rights in the Stanaker Reservoir beyond the commencement of the succeeding irrigation year.

b. The District shall make water allotments and contracts for the disposal of project water in accordance with the Utah Water Conservancy District Act. Such water allotments and contracts shall be upon terms satisfactory to the Contracting Officer, shall be approved by him in advance, and shall not be amended or otherwise affected without his written consent.

c. This agreement and all works or facilities constructed pursuant hereto shall be subject to and controlled by the Colorado River Compact dated November 24, 1922, and proclaimed by the President of the United States June 25, 1929, the Boulder Canyon Project Act approved December 21, 1928, the Boulder Canyon Project Adjustment Act of July 19,

1940, the Upper Colorado River Basin Compact dated October 11, 1948, and the Mexican Water Treaty of February 3, 1944, and no right or claim of right to the use of the waters of the Colorado River shall be aided or prejudiced thereby.

d. There is hereby reserved to the United States certain capacities in Stanaker Reservoir including the water filling such capacity as follows:

(i) 2,170 acre-feet for flood surcharge below the bottom of the outlet sill of the spillway,

(ii) 1,094 acre-feet above the sill of the outlet works herein designated inactive capacity, and

(iii) 3,266 acre-feet representing dead storage below the sill of the outlet works.

OPERATION AND MAINTENANCE OF PROJECT WORKS

8. a. The District shall, at its own cost and expense when notified by the Secretary, assume the care, operation, and maintenance of the project works herein described, or any part thereof after completion of construction by the United States.

b. The District shall care for and operate and maintain the works transferred hereunder in such manner that the same shall remain in good and efficient condition and of equal capacity for the carriage, control, and distribution of water as when received from the United States hereunder, and shall use all practicable methods including water measurement to insure the economical and beneficial use of water. The United States shall furnish the District with criteria governing the operations of the project including regulation of water storage, deliveries, and

exchanges, and the District agrees to follow such criteria. In connection with any such transfer of works hereunder, the United States shall furnish the District with items of operating equipment which are determined by the Contracting Officer in accordance with Article 2(a)(viii) to be required in the Project operation and shall transfer title thereof to the District at the time said equipment is furnished to the District for its use in the care, operation, and maintenance of works. After the care, operation, and maintenance of any such works or equipment shall have been assumed by the District, the District shall hold the United States, its officers, agents, attorneys, employees, and successors or assigns harmless from every claim for damages to persons or property, direct or indirect and of whatever nature, arising out of or in any manner connected with the care, operation, and maintenance thereof. No substantial change shall be made by the District in any of the project works without first obtaining the written consent of the Contracting Officer.

c. If, in the opinion of the Contracting Officer, the District shall have failed at any time, or from time to time, to perform substantially any provision of this contract, the Contracting Officer may give the District written notice specifying the respects in which the District has failed so to perform, and in the event the District fails to cure or take appropriate steps to cure such default within 30 days after the giving of such notice, the Contracting Officer may, on 30 days' written notice to the District, take over the operation and maintenance of all or any part of the project works including equipment of the District used for such purposes. Such operation and maintenance by the United

States shall continue until the Contracting Officer determines that the District is again capable of operating all or any part of the project works then being operated and maintained by the United States, and upon written notice to the District, establishing the effective date, may retransfer to the District operation and maintenance of all or any part of the project works. Upon receipt of such notice, the District shall accept the care, operation, and maintenance of such project works in accordance with this contract.

d. In the event the care, operation, and maintenance of the transferred works is resumed by the United States the District shall advance to the United States within ten (10) days after written demand by the Contracting Officer, the estimated cost of all such care, operation, and maintenance by the United States, during the period commencing with the date that the care, operation, and maintenance of such works is assumed by the United States and terminating on the first day of January next succeeding.

e. During all periods in which the project works are operated and maintained by the United States the cost of such operation and maintenance shall be paid in advance by the District to the United States. Payments under this subsection shall be on the basis of annual estimates made by the Contracting Officer. Except as provided in subsection (d) of this article a notice of the estimates shall be furnished to the District on or before July 1 of the year preceding the one for which the notice is issued. The District shall pay the amounts set out in any such notice on or

before December 31 of the year in which the notice is given, Provided, That if the care, operation, and maintenance of the transferred works is resumed by the United States in any year after the aforesaid date of July 1, notice shall be given the District as promptly as possible of the costs of such operation and maintenance and the payment thereof shall be made as provided herein.

f. Whenever, in the opinion of the Contracting Officer, funds so advanced will be inadequate to operate and maintain the works being operated by the United States, he may give a supplemental notice stating therein the amount of additional funds required, and the District shall advance that amount on or before the date specified in the supplemental notice. If funds advanced by the District under this article exceed the actual cost of operation and maintenance for such works for the year for which advanced, the surplus shall be credited to any amounts thereafter to become due from the District.

OTHER COSTS TO BE PAID BY DISTRICT

9. a. In addition to all other payments required by this contract, the District shall pay to the United States, to the extent required by the Contracting Officer, on or before March 1 of the year following that in which they have been incurred, the following costs: (1) inspections under the provisions of Article 13 of this contract; (2) crop production censuses and other reports to the extent not furnished as required in Article 24; (3) land classification or reclassification to the extent that such costs are prescribed by the Federal Reclamation Law to be repaid by water users; (4) protection of project water rights; and (5) special work requested by the District.

b. In the event that there are no funds available to the United States with which to do the work covered by subsection (a) of this article, the District will pay, in advance, to the United States the cost of such work as estimated by the Contracting Officer. If such costs are less than the funds advanced, appropriate credit will be given upon the next installment on the District irrigation repayment obligation thereafter becoming due.

RESERVE FUND FOR OPERATION AND MAINTENANCE

10. a. Beginning in the first calendar year of the development period and continuing until such time as all sums of money becoming due hereunder shall have been paid to the United States, the District shall accumulate and maintain, in the manner hereinafter provided, a reserve fund which shall be available for the purposes and in the circumstances herein mentioned.

b. Such reserve fund shall be accumulated by the District in annual amounts of not less than $5,000 during each year of the development period, and shall be accumulated annually thereafter until the aggregate reserve fund shall total not less than $15,000, which total amount shall be maintained, provided, however, that the District shall be required to replenish the reserve fund by amounts of not less than $3,000 annually unless a lesser amount will replenish said fund to $15,000 in one year.

c. The reserve fund shall be available only for the purposes of meeting the extraordinary and unforeseen costs of operation, maintenance, and replacement of the project works which are determined to be costs in excess of the ordinary costs of such operation and maintenance. The District shall advise the Contracting Officer in advance of the amount and the purposes for which the reserve fund is to be utilized.

d. The reserve fund shall be invested or deposited and maintained apart from other District funds, upon conditions concerning its liquidation or withdrawal and in a depository or investment satisfactory to the Contracting Officer.

e. During such times as the works constructed hereunder are operated and maintained by the United States in accordance with the provisions herein, the reserve fund shall be available for use by the United States for the purposes specified in this article.

TITLE TO PROJECT WORKS TO REMAIN IN THE UNITED STATES

11. Title to the project works constructed or acquired by the United States shall remain in the United States notwithstanding transfer of the care, operation, and maintenance of any of said works to the District, provided, however, that title to equipment may be transferred as set out in Article 8.

ACQUISITION OF LANDS AND INTERESTS IN LANDS

12. a. The United States shall not be obligated to commence construction work on any feature of the works described in Article 2 until all rights-of-way required for that feature have been secured or valid contracts entered into covering the purchase thereof in accordance with the provisions of this article.

b. The District shall, when requested in writing by the contracting officer, perform any or all actions necessary in connection with the acquisition of lands required by the United States for the construction, operation, and maintenance of the project works. Prices to be paid for lands so acquired shall be approved in advance

by the Contracting Officer and such acquisitions shall be on forms approved in advance by the United States. Payment for the cost of the lands including approved acquisition expense will be made by the United States.

c. Where rights-of-way over lands needed for the project have been reserved under Acts of Congress or granted under State law, the United States may reimburse the owners of servient lands for the value of improvements which may be taken or destroyed. The District shall secure the execution of contracts for the purchase of such improvements and for reimbursement of owners of improvements so taken or destroyed using forms of contracts satisfactory to the Contracting Officer, and payment shall be made in the manner provided by subsection (a) of this article.

INSPECTION OF PROJECT WORKS

13. After the District shall have taken over the care, operation, and maintenance of any of the transferred works, the Contracting Officer may, from time to time, cause an appropriate inspection of the project works to be made to ascertain whether the requirements of the contract are being performed satisfactorily by the District. Such inspections may include physical inspection of all properties and audit of the books and records of the District. Any such inspections or audit shall, except in case of an emergency, be made after written notice to the District and the actual expense thereof shall be paid by the District to the United States in the manner provided in Article 9 hereof. The Contracting Officer may require the District either to make repairs or to do any other work which, in his opinion, is necessary for the proper and

safe upkeep of the works. If the District fails to make needed repairs or to do other maintenance work, then the United States may do the necessary work and shall charge the cost thereof to the District, which cost the District agrees to pay within thirty (30) days after notice of the amount due.

AGREED CHARGES A GENERAL OBLIGATION OF THE DISTRICT

14. The District as a whole is obligated to pay to the United States the charges becoming due as provided in this contract, nonwithstanding the default in the payment to the District by individual water users of assessments, tolls, or other charges levied by the District.

LEVY OF ASSESSMENTS, TOLLS, AND CHARGES

15. The District shall cause to be levied and collected all necessary assessments, tolls, and other charges, and will use all of the authority and resources of the District to meet the obligations of the District to make in full all payments to be made pursuant to this contract on or before the date such payments become due and to meet its other obligations under this contract. Until such payments have been made in full, the District agrees to levy and collect the ad valorem taxes to the extent permitted under Section 73-9-16, Utah Code Annotated, 1953, as amended.

OPTIONAL VARIABLE REPAYMENT PLAN

16. On or before August 1 of any year after the annual installments commence as provided by Article 4, the District, by notice to the United States, in writing, may elect that beginning with the next succeeding calendar year the District will thereafter make payment of those costs allocated to irrigation under Article 4 in accordance

with the normal and percentage plan authorized by Section 4 of the Reclamation Project Act of 1939 (53 Stat. 1187), or such other variable repayment plan as may be authorized by law and agreed upon by the parties hereto.

PENALTY FOR DELINQUENT PAYMENTS

17. Every installment or charge required to be paid to the United States under this contract and which shall remain unpaid after it shall have become due and payable, shall be subject to a penalty of one-half of one percent ($\frac{1}{2}\%$) per month from the date of delinquency.

DEFAULTS

18. a. Should the District fail to levy the assessments, tolls, or other charges against any tract of land in the District required to be levied, or having levied, should the District be prevented from collecting such assessments, tolls, or other charges by any judicial proceedings, or otherwise fail to collect them, no such tract of land shall be entitled to receive water to be delivered under this contract or to the use of the project works.

b. No water shall be delivered to the District pursuant to this contract, or by the District through project works or otherwise, to or for the use of persons or lands therein during any period in which the District may be:

(1) More than 12 months in arrears in the payment to the United States of any construction charges accrued under Article 4(a) of this contract.

(2) In arrears in the advance payment to the United States of any charges under Article 4(b) and of the operation and maintenance charges fixed under Article 8 of this contract.

c. No water shall be delivered by the District through project works or otherwise to any person or lands therein which may be in arrears in the payment to the District of any assessments, tolls, or other charges levied or established by the District for the purpose of raising revenues to meet the payment by the District to the United States of any of the District's obligations under this contract.

d. All rights of action for breach of this contract are reserved to the United States as provided in Section 3737 of the Revised Statutes of the United States, as amended (41 U.S.C. 15).

RESPONSIBILITY FOR DISTRIBUTION AND USE OF WATER

19. a. The District shall be responsible for the control, carriage, handling, distribution, and use of all water delivered or taken hereunder and shall hold the United States, its officers, agents, employees, and successors or assigns harmless from every claim for damages to persons or property, direct or indirect, and of whatever nature, arising out of or in any manner connected with the control, carriage, handling, distribution, or use of such water. The District shall not use any of the irrigation water taken or delivered hereunder on any lands other than those irrigable lands which are situated within the Project and which have executed water allotment petitions as provided in Article 7.

b. Pursuant to the provisions of the Act of Congress approved April 11, 1956 (Public Law 485, 84th Congress, 2d Session), for a period of ten years from the date of enactment of said act, no water from any participating project authorized by said act shall be delivered to any water user through the works of the Vernal Unit for the production on newly irrigated lands of the Unitah Water Conservancy District of any basic agricultural commodity, as defined in the Agricultural Act of 1949, or any amendment thereof, if the total supply of such commodity for the marketing year in which the bulk of the crop would normally be marketed is in excess of the normal supply as defined in Section 301(b)(10) of the Agricultural Adjustment Act of 1938, as amended, unless the Secretary of Agriculture calls for an increase in the production of such commodity in the interest of national security.

RIGHT TO BENEFICIAL USE OF WATER

20. Beneficial use shall be the basis, the measure and the limit of the right to the use of project water. Such water shall be used on lands within the Project and by municipal and miscellaneous users who contract for the use thereof.

WATER SHORTAGES, WASTE, SEEPAGE, AND RETURN FLOWS

21. a. On account of drouth or other causes, there may occur at times during any year a shortage in the quantity of water available for delivery to the Project by the United States pursuant to this contract. In no event shall any liability accrue against the United States or any of its officers or employees for any damage, direct or indirect, arising out of any such shortage.

b. The United States claims all of the waste, seepage, and return flow water derived from water delivered pursuant to this contract and the same is hereby reserved and retained by the United States for beneficial use on the project.

c. During periods of water shortage, municipal water uses shall have first priority to the available project water supply.

LANDS FOR WHICH WATER IS FURNISHED: LIMITATIONS ON AREA

22. Pursuant to the provision of the Federal Reclamation Laws, water made available hereunder shall not be delivered to more than one hundred sixty (160) irrigable acres in the beneficial ownership of any one person or other entity or of more than 320 irrigable acres held in the beneficial ownership of husband and wife as joint tenants or as tenants in common except that delivery may be made to lands held in excess of this limitation pursuant to the provisions of Section 46 of the Act of May 25, 1926 (44 Stat. 649), as amended by the Act of July 11, 1956 (70 Stat. 524). In the case of an individual either having stock in two or more corporations which have title to irrigable lands within the District, or owning irrigable lands in his own name and having stock in a corporation or corporations which have irrigable lands within the District, the Individual's proportionate stockholdings in such corporations shall be regarded as proportionate interests in the corporations' landholdings for the purposes of the application of the acreage limitation stated in this article.

AMENDMENT OR REPEAL OF FEDERAL RECLAMATION LAWS

23. In the event that the Congress of the United States may repeal or amend any of the provisions of the Federal Reclamation Laws, the United States agrees, at the option of the District, to negotiate amendments of appropriate articles of this contract, consistent with the provisions of the laws affecting any such repeal or amendment.

DISTRICT TO KEEP BOOKS AND RECORDS AND REPORT CROP AND OTHER DATA

24. The District shall establish and maintain accounts and other books and records and furnish to the United States reports and statements as to information contained therein pertaining to:

a. Accounts and financial transactions of the District.

b. Crops raised and agricultural or livestock products produced on the lands within the District.

c. Water supply and the disposition thereof.

Reports thereon shall be furnished to the United States on such date or dates as may be fixed by the Contracting Officer.

ACCESS TO BOOKS AND RECORDS

25. Each party shall have the right, during office hours, to inspect and to make copies of the other party's books and official records relating to matters covered by this contract.

RULES AND REGULATIONS

26. There is reserved to the Contracting Officer the right, so far as the purport thereof may be consistent with the provisions of

this contract, to make rules and regulations and to add to or to modify them as may be deemed proper and necessary to carry out this contract, and to supply necessary details of its administration, and the District agrees to observe such rules and regulations.

PUBLIC USE OF RESERVOIRS

27. Public recreation, including boating, fishing, and hunting will be allowed on or in project reservoirs. Fishing and hunting on or in said reservoirs will be allowed in accordance with State and Federal laws without payment of any charge or fee except as required by such laws. The Contracting Officer may promulgate or approve such rules and regulations as he may deem necessary and proper for project purposes, for the protection of the works, and for public health and safety, including the establishment of charges for boating and use of recreation facilities, the revenues from which may be disposed of by the United States in conformance with any agreements with respect to administration of recreation. Such agreements shall be made by the United States after consultation with the Board of Directors of the District. Nothing in this Article shall affect the use of project reservoirs for recreation in accordance with Section 8 of the Act of Congress approved April 11, 1956 (70 Stat. 105). Public use of reservoirs as provided herein or as provided in said Section 8 shall be consistent with the primary purposes of the project.

DISPOSITION OF MISCELLANEOUS REVENUES

28. All revenues derived from the rental or sale of land, interests in land, or other property acquired for project purposes and

not required for operation and maintenance of the project works shall belong to the United States and not be credited to the District.

NOTICES

29. a. Any notice authorized or required to be given to the United States shall be delivered or mailed, postage prepaid, to the Regional Director, Region 4, Bureau of Reclamation, Salt Lake City, Utah. Any notice authorized or required to be given to the District shall be delivered or mailed, postage prepaid, to the Uintah Water Conservancy District, Vernal, Utah.

b. The designation of the addressee or the address given above may be changed by notice given in the same manner as provided in this article for other notices.

APPROVAL OF CONTRACTS BY THE UNITED STATES

30. No contract made by the District affecting the project works, or relating to the delivery or distribution of water, except contracts for the usual labor, equipment, supplies, and service in connection with the operation and maintenance by the District of the said works, shall be valid until approved by the Contracting Officer.

CHANGES IN ORGANIZATION OF THE DISTRICT

31. While this contract is in effect, no change shall be made in the District, by inclusion or exclusion of lands, by dissolution, consolidation, or merger or otherwise, except upon the Contracting Officer's written consent thereto.

CONTINGENT UPON APPROPRIATIONS OR ALLOTMENT OF FUNDS

32. The expenditure of any money or the performance of any work by the United States herein provided for, which may require appropriations of money by Congress or the allotment of funds, shall be contingent upon such appropriations or allotments being made. The failure of Congress to so appropriate funds or the failure of an allotment of funds shall not relieve the District from any obligations under this contract nor give the District the right to terminate this contract or to any of its executory features. No liability shall accrue against the United States in case of such funds not being appropriated or allotted.

ASSURANCES RELATING TO VALIDITY OF CONTRACT

33. This contract shall not be binding upon the United States nor shall any water be delivered pursuant to this contract until the proceedings on the part of the District for the authorization of the execution of this contract shall have been confirmed by decree of a court of competent jurisdiction or pending appellate action if ground for appeal be laid. Upon the execution of this contract, the District diligently shall prosecute to final conclusion such confirmation proceedings. The District, at its cost, shall furnish to the United States two certified copies of such decree and of all pertinent supporting records.

ASSIGNMENT LIMITED - SUCCESSORS AND ASSIGNS OBLIGATED

34. The provisions of this contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or

transfer of this contract or any part or interest therein shall be valid until approved by the Secretary.

DISCRIMINATION AGAINST EMPLOYEES OR APPLICANTS FOR EMPLOYMENT PROHIBITED

35. a. In connection with the performance of work under this contract, the District agrees not to discriminate against any employee or applicant for employment because of race, religion, color, or national origin. The aforesaid provision shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The District agrees to post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Secretary setting forth the provisions of the nondiscrimination clause.

b. The District further agrees to insert the foregoing provisions in all subcontracts hereunder, except subcontracts for standard commercial supplies or raw materials.

CONTINGENT FEE CLAUSE

36. The District warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the District for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract

without liability or in its discretion to deduct from the contract price or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

OFFICIALS NOT TO BENEFIT

37. No member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this contract or to any benefit that may arise herefrom, but this restriction shall not be construed to extend to this contract if made with a corporation or company for its general benefit.

IN WITNESS WHEREOF, the parties hereto have signed their names the day and year first above written.

THE UNITED STATES OF AMERICA

Appd. Sol. Off.
/s/ T. O. Parker

By /s/ E. O. Larson
Regional Director
Bureau of Reclamation
Acting under authority delegated
by the Secretary of the Interior

UINTAH WATER CONSERVANCY DISTRICT

(SEAL)

By /s/ C. R. Henderson
President

ATTEST:

/s/ L. Y. Siddoway
Secretary

C O P Y

R E S O L U T I O N

WHEREAS, the Board of Directors of the Uintah Water Conservancy District of Uintah County, State of Utah, has considered a draft of contract proposed to be entered into between the United States of America and the District to repay the reimbursable costs of the Vernal Unit, Central Utah Project, authorized pursuant to the Act of Congress of April 11, 1956 (70 Stat. 105).

NOW, THEREFORE, be it resolved that the Board of Directors hereby approves the draft designated "F. S. Draft 4/29/58 as amended 5/6/58", titled "Contract Between the United States of America and the Uintah Water Conservancy District." and urgently requests the Secretary of the Interior to approve said draft for execution as soon as possible.

Upon such approval, the Board will call an election within the District as provided by law, and will recommend favorable action by the electors, and upon a favorable vote of said electorate, will direct the President and Secretary of the District to execute said contract.

C E R T I F I C A T E

I, L. Y. Siddoway, Secretary of the Board of Directors of the Uintah Water Conservancy District, do hereby certify that the foregoing is a full, true, and correct copy of a resolution duly adopted by the Board of Directors of the Uintah Water Conservancy District at a special meeting held on the 6th day of May, 1958.

I further certify seven directors were present at said meeting, that seven directors voted in favor of said resolution, and that no directors voted against said resolution.

I further certify that the total number of directors of the Uintah Water Conservancy District is seven.

Dated at Vernal, Utah, this 7th day of May, 1958.

/s/L. Y. Siddoway
L. Y. Siddoway, Secretary

SEAL

Certificate of Canvass of Returns of July 8, 1958 Election of the Uintah Water Conservancy District, and Resolution Declaring Results of Election and Authorizing Execution of the Repayment Contract with the United States

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WHEREAS, the Board of Directors of the Uintah Water Conservancy District, sitting as a canvassing board, held a meeting on July 14, 1958, at Vernal, Utah, for the purpose of canvassing the returns of a special election held in the District on July 8, 1958, for the purpose of voting on the following proposition:

P R O P O S I T I O N

Shall the Uintah Water Conservancy District enter into a contract with the United States of America for the construction of works and the acquisition of a water supply for the District on the terms and conditions of the contract set forth in the resolution by which this election is called?

and,

WHEREAS, the Secretary of the presented the notice of the special election, the proof of publication thereof, the certificate of the judges and officers of the election, tally sheets, poll books, ballots and other documents connected with said election, and this body examined the said documents, determined that the said election was duly authorized, called, noticed, and held as provided by law, and determined the result of the election.

IT IS CERTIFIED, That the result of the vote on the proposition hereinabove stated, is as follows:

YES - 1317

NO - 22

/s/ C. R. Henderson
C. R. Henderson

/s/ Curtis D. Dudley
Curtis D. Dudley

/s/ B. H. Stringham
B. H. Stringham

/s/ H. Leroy Morrill
H. Leroy Morrill

/s/ L. P. Christensen
L. P. Christensen

/s/ Grant Pickup
Grant Pickup

/s/ Leland Sowards
Leland Sowards

The canvassing body adjourned and thereupon reconvened as the Board of Directors of the District and adopted the following:

R E S O L U T I O N

WHEREAS, the duly appointed canvassing body has certified to this Board that a special election was duly and regularly called and held on July 8, 1958, as provided by law, that returns of election have been examined, and the votes counted and that it has been determined by said canvassing body that at said special election a majority of qualified electors of the District who voted on the proposition submitted to the electors, voted in favor of the proposition,

BE IT RESOLVED that the President and Secretary, be and they are hereby authorized and directed to execute on behalf of the District a contract with the United States for the construction of the works of the Vernal Unit of the Central Utah Project and the acquisition of the water for the District upon the terms and conditions of the draft of contract heretofore approved by the Board of Directors and duly authorized at the said special election.

DATED this 14th day of July, 1958.

ATTEST: /s/ L. Y. Siddoway
L. Y. Siddoway, Secretary

/s/ C. R. Henderson
C. R. Henderson, Chairman of the Board

(SEAL)

C E R T I F I C A T E

STATE OF UTAH)
(ss.
COUNTY OF UINTAH)

I, L. Y. SIDDOWAY, the duly chosen, qualified, and acting Secretary of the Board of Directors of the Uintah Water Conservancy District, Utah, do hereby certify that the foregoing constitutes a true and correct copy of the certificate of the Board of Directors of the District sitting as a canvassing body and of a resolution of the Board sitting as the Board of Directors made and adopted at meetings held at Vernal, Utah, within said District on the 14th day of July, 1958, as recorded in the regular official Book of Minutes of the Proceedings of the Board of Directors kept in my office, that said proceedings were duly had and taken as herein shown, that all members of the Board were given due legal and timely notice of said meeting, that the meeting therein shown was called, held, and conducted in accordance with law, and in full conformity therewith, and that the persons therein named were present at said meeting as therein shown.

IN TESTIMONY WHEREOF, I have hereunto set my hand and set the official seal of the District, this 14th day of July, 1958.

/s/ L. Y. Siddoway
L. Y. Siddoway, Secretary
Board of Directors of the Uintah
Water Conservancy District, Utah

(SEAL)

EXHIBIT 6

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

Contract No. 14-06-W-269

UNITED STATES

DEPARTMENT OF THE INTERIOR

Navajo Indian Irrigation Project, New Mexico

Agreement Between the United States and the Navajo Tribe of Indians for Delivery of Water from Navajo Reservoir.

THIS AGREEMENT entered into the 10th day of April, 1976, between the UNITED STATES OF AMERICA ("United States"), acting through the Secretary of the Interior, and the NAVAJO NATION ("Navajo Nation"), also known as the Navajo Tribe of Indians, pursuant to the Act of Congress of April 11, 1956 (70 Stat. 105); the Act of June 13, 1962 (76 Stat. 96) (hereinafter referred to as "the Act"); and the Act of August 1, 1914 (38 Stat. 583; 25 U.S.C. 385); all as amended or supplemented.

WITNESSETH:

WHEREAS, the United States is in the process of constructing the Navajo Indian Irrigation Project ("the project") for the principal purpose of furnishing irrigation water; and

WHEREAS, the Navajo Nation wishes to enter into a contract with the United States for the delivery of water from said project to Navajo lands.

NOW THEREFORE, it is mutually agreed as follows:

I. Definitions.

When used herein, unless otherwise distinctly expressed or manifestly incompatible with the intent hereof, the term:

a. "Act" shall mean, unless otherwise specified, the Act of June 13, 1962, 76 Stat. 96.

b. "Project Works" shall mean those facilities of the Navajo Indian Irrigation Project constructed pursuant to the Act of June 13, 1962.

c. "Contracting Officer" shall mean the Commissioner of the Bureau of Reclamation, or his duly authorized representative.

II. Delivery of Water.

Section 2 of the Act provides that pursuant to the provisions of the Act of April 11, 1956 [Colorado River Storage Project Act], as amended, the Secretary of the Interior is authorized to construct, operate, and maintain the Navajo Indian Irrigation Project for the principal purpose of furnishing irrigation water to approximately one hundred and ten thousand six hundred and thirty acres of land, said project to have an average annual diversion of five hundred and eight thousand acre-feet of water and the repayment of the costs of construction thereof to be in accordance with the provisions of said

Act of April 11, 1956, as amended, including, but not limited to, section 4(d) thereof. The Contracting Officer shall deliver water to the Navajo Nation in accord with the foregoing sentence, such deliveries to be made through the main canal headworks at Navajo Dam for the Navajo Indian Irrigation Project.

III. Sharing of Shortages.

In any year in which the Secretary anticipates a shortage of water taking into account both prospective runoff originating above Navajo Reservoir and the available water in storage in Navajo Reservoir, he shall provide for a sharing of the available water in the following manner: The prospective runoff shall be apportioned between the contractors diverting above and those diverting at or below Navajo Reservoir in the proportion that the total normal diversion requirement of each group bears to the total of all normal diversion requirements. In the case of contractors diverting above Navajo Reservoir, each such contract shall provide for a sharing of the runoff apportioned to said group in the same proportion as the normal diversion requirement under said contract bears to the total normal diversion requirements of all such contracts that have been made hereunder: Provided, That for any year in which the foregoing sharing procedure either would apportion to any contractor diverting above Navajo Reservoir an amount in excess of the runoff anticipated to be physically available at the

point of his diversion, or would result in no water being available to one or more such contractors, the runoff apportioned to said group shall be reapportioned, as near as may be, among the contractors diverting above Navajo Reservoir in the proportion that the normal diversion requirements of each bears to the total normal diversion requirements of the group. In the case of contractors diverting from or below Navajo Reservoir, each such contract shall provide for a sharing of the remaining runoff together with the available storage in the same proportion as the normal diversion requirement under said contract bears to the total normal diversion requirements under all such contracts that have been made under the Act. The Secretary shall not enter into contracts for a total amount of water beyond that which, in his judgment, in the event of shortage, will result in a reasonable amount being available for the diversion requirements for the Navajo Indian Irrigation Project and the initial stage of the San Juan-Chama project as specified in sections 2 and 8 of the Act.

No long-term contract, except contracts for the benefit of the lands and for the purpose specified in sections 2 and 8 of the Act, shall be entered into for the delivery of water stored in Navajo Reservoir or of any other waters of the San Juan River and its tributaries, as aforesaid, until the Secretary has determined by hydrologic investigations that sufficient water to fulfill said contract is reasonably likely to be available for use in the State of New Mexico during the term thereof under the allocations made in

articles III and XIV of the Upper Colorado River Basin compact, and has submitted such determination to the Congress of the United States and the Congress has approved such contracts: Provided, That nothing contained in the foregoing shall be construed to forbid the Secretary from entering into temporary water supply contracts in the San Juan River Basin for any year in which he determines that water legally available for use in the upper basin of the Colorado River system would otherwise not be used there and is not needed to fulfill the obligations of the upper division States with respect to delivery of water at Lee Ferry.

IV. Compacts, Project Acts, and Treaty.

The use of water, including that diverted from the Colorado River system to the Rio Grande Basin, through works constructed under authority of the Act, shall be subject to and controlled by the Colorado River compact, the Upper Colorado River Basin compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act, the Colorado River Storage Project Act, and the Mexican Water Treaty (Treaty Series 994), and shall be included within and shall in no way increase the total quantity of water to the use of which the State of New Mexico is entitled and limited under said compacts, statutes, and treaty.

V. Surplus Crops.

Delivery of water for production of surplus crops shall be in accordance with section 6 of the Act of June 13, 1962.

VI. Project Operation Information.

The Navajo Nation shall furnish to the Contracting Officer, as requested, information pertaining to land use and crop census, water supply, water use, changes in project works, and to other matters relating to the Navajo Indian Irrigation Project.

VII. No Waiver.

The Navajo Nation does not waive any reserved Winters rights or consent that such rights have been or will be determined or limited by the Act of June 13, 1962, by execution of this agreement, or by delivery of water pursuant to this agreement; and the United States does not waive its right to assert a position on these issues which is neutral, in support of, or contrary to that of the Navajo Nation.

VIII. Term.

This agreement shall continue in effect for a 40-year period, and shall be subject to renewal at the option of the Navajo Nation for additional periods of 40 years.

IX. Notices.

Any notice, demand, or request authorized or required by this agreement shall be deemed to have been given when mailed, or delivered to the Commissioner of the Bureau of Reclamation, United States Department of the Interior, Washington, D.C. 20240, or his designated representative on behalf of the United States and to the Chairman, Navajo Tribal Council, Window Rock, Navajo Nation, Arizona 86515, on behalf of the Navajo Nation. The designation of the addressees or the addresses may be changed by written notice.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be duly executed the day and year first hereinabove written.

THE UNITED STATES OF AMERICA
Department of the Interior

By /s/ G. G. Stamm
Commissioner, Bureau of Reclamation

NAVAJO NATION

By /s/ Peter MacDonald
Chairman, Navajo Tribal Council

EXHIBIT 7

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

Contract No. 01-WC-40-6860

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLORADO RIVER STORAGE PROJECT
FLAMING GORGE STORAGE UNIT

LONG-TERM WATER SERVICE CONTRACT
Between
THE UNITED STATES OF AMERICA
and
DAGGETT COUNTY

THIS CONTRACT, made this 6th day of March, 2001, pursuant to the Act of Congress approved June 17, 1902 (32 Stat. 388), and acts amendatory thereof or supplementary thereto, and particularly pursuant to the Colorado River Storage Project Act approved April 11, 1956 (70 Stat. 105); the Reclamation Projects Act approved August 4, 1939 (53 Stat. 1187); and the Dutch John Federal Property Disposition and Assistance Act of 1998 approved October 30, 1998 (16 U.S.C. 460v note, P.L. 105-326); between the UNITED STATES OF AMERICA, represented by the officer executing this contract, his duly appointed successor or his duly authorized representative, hereinafter referred to as the Contracting Officer, and DAGGETT COUNTY, a local county government organized and existing under the laws of the State of Utah, with its principal offices located in Manila, Utah;

WITNESSETH:

WHEREAS, the United States constructed Flaming Gorge Dam and Reservoir as a unit of the Colorado River Storage Project, for the furnishing of water for irrigation, municipal, and other beneficial uses; and

WHEREAS, the United States also constructed the community of Dutch John, Utah, on Federal lands located within Daggett County as a Federal townsite to house and support Federal workers during the construction of Flaming Gorge Dam and powerplant; and

WHEREAS, on October 30, 1998, Congress passed the Dutch John Federal Property Disposition and Assistance Act, hereinafter referred to as the Privatization Act, directing the Secretaries of Agriculture and Interior to transfer and dispose of certain Federal lands and facilities associated with the Dutch John community; and

WHEREAS, the Privatization Act found that certain lands and structures located in Dutch John are no longer essential to the management of the Colorado River Storage Project; and that

SCANNED RJ

privatization and disposal of said lands and structures to the local government is in the public interest; and

WHEREAS, Daggett County is the local government for initial privatization purposes; and

WHEREAS, the Privatization Act directs the Secretary of the Interior to transfer all water rights held by the Secretary of the Interior which are applicable to the Dutch John municipal water system to Daggett County;

WHEREAS, transfer of these water rights is contingent on Daggett County entering into a water service contract with the United States covering payment for and delivery of untreated water pursuant to the Colorado River Storage Project Act;

NOW, THEREFORE, in consideration of the mutual and dependent covenants herein contained, the parties hereto agree as follows:

GENERAL DEFINITIONS

1. Where used in this contract:

(a) "Federal Reclamation Laws" means the Act of June 17, 1902, and all acts amendatory thereof or supplementary thereto.

(b) "The Privatization Act" means the Dutch John Federal Property Disposition and Assistance Act of 1998 (16 U.S.C. 460v note, P.L. 105-326)

(c) "Secretary of the Interior" or "Contracting Officer," or either of them means the Secretary of the Interior, acting through the Bureau of Reclamation, or his/her duly authorized representative.

(d) "Secretary of Agriculture" means the Secretary of Agriculture, acting through the United States Forest Service, or his/her duly authorized representative.

(e) "Contractor" means Daggett County, a local county government organized and existing under the laws of the State of Utah.

TERM OF CONTRACT

2. (a) This contract shall be effective for 25 years from the date of execution.

(b) The Contractor may terminate this contract at any time.

SCANNED RJ

(c) Termination as provided above shall be accomplished by written notice by the Contractor to the United States as provided in Article 13 hereof, at least 1 year prior to the date of such termination. Prior to such termination, however, Contractor shall ensure that culinary water service meeting State water quality standards shall continue to be provided from an alternative source to facilities owned by the United States which, prior to such termination, were served under the terms of this contract.

(d) Termination by the Contractor as herein provided shall not relieve the Contractor of its obligation to pay for delivery of water which became due prior to the termination date.

(e) Upon failure of the Contractor to perform its obligations under this contract, the United States will notify the contractor in writing of the intent to terminate this agreement. The said Notice of Termination shall specify each failure of the Contractor, and shall further provide that the Contractor may, within a 90-day period from the date of said notice, present a detailed program to correct such deficiencies, and the United States shall review and reasonably accept such corrections and thereby waive the termination notice.

(f) Upon mutual agreement of the parties hereto, this contract may be renewed at the expiration of its initial term; provided, however, that any such renewal shall be accomplished subject to Reclamation Law and policy in effect at the time of renewal and other then-current Federal law and requirements, including but not limited to environmental law.

TRANSFER OF WATER RIGHTS

3. (a) Following execution of this contract and pursuant to Section 10(k)(1) of the Privatization Act, the United States shall transfer to the Contractor by a separate Quitclaim Deed all existing water rights held by the Secretary of the Interior which are applicable to the Dutch John municipal water system; said water rights include the following:

(1) Utah Water Right 41-2942 (A30557, Cert. No. 5903) for 0.08 cubic feet per second from a water well.

(2) Utah Water Right 41-3470 (A30414b), an approved application to segregate 12,000 acre-feet per year of water from the original approved Flaming Gorge water right (41-2963) for municipal use in the town of Dutch John and surrounding areas.

(3) Any and all other unspecified water rights as may be held by the Secretary of the Interior which are applicable to the Dutch John municipal water system.

(b) Subsequent to completion of such transfer, Contractor shall be responsible for having the Quitclaim Deed recorded in the appropriate county records and for filing the Quitclaim Deed or other appropriate notice of transfer of ownership with the State Engineer of the State of

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Utah. Further, the Contractor shall be responsible for filing with the State Engineer all change applications or other documentation required by State law for any future actions involving the transferred water rights.

DELIVERY OF WATER

4. (a) The Contracting Officer shall deliver up to 1,000 acre-feet from Utah Water Right 41-3470 (A30414b), as transferred to Contractor under Article 3(a)(2) above, from Flaming Gorge Reservoir on an annual basis throughout the term of this contract. The Contracting Officer shall deliver Contractor's water to the Dutch John Water Treatment Plant; said deliveries not to exceed 1,000 acre-feet of water annually.

(b) The Contractor shall have no holdover storage rights in Flaming Gorge Reservoir from year to year. Any portion of Contractor's water which is not used by the end of each calendar year shall become integrated with the water supply for all purposes of the Flaming Gorge Reservoir and be available for all purposes at that time.

(c) The Contractor shall not enter into a contract with any third-party for the sale of water outside of the boundaries of the area described in the Privatization Act without the prior review and written approval of the United States. Such approval shall not be unreasonably withheld, provided that the terms of such contracts comply with then-current Reclamation Law and policy, and with other applicable Federal laws and programs, including but not limited to the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin.

(d) Following the transfer provided for in Article 3(a)(2) above, Utah Water Right 41-3470 (A30414b) will provide Contractor the right to use 12,000 acre-feet annually from Flaming Gorge Reservoir. However, the Contracting Officer's ability to deliver water to the Contractor is limited to 1,000 acre-feet annually, the maximum capacity of the existing federally owned pumping and conveyance facilities. At such time as Contractor requires delivery of water in excess of the initial 1,000 acre-feet provided under this contract, the parties shall enter into a new contract, under authority and terms acceptable to the United States, to provide additional water, subject to the Privatization Act, and under following terms:

(1) Additional water shall be contracted for in increments of 1,000 acre-feet; however, as required by the Privatization Act, Contractor shall pay only for water actually used;

(2) Contractor shall be responsible for developing and constructing additional delivery and conveyance capacity to make such delivery possible and for obtaining all necessary approvals, permits, and clearances necessary for design and construction of additional delivery capacity;

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(3) Such contract shall comply with then-current Reclamation Law and policy, and with other applicable Federal laws and programs, including but not limited to the NEPA, ESA, and the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin.

(4) The Contracting Officer and Contractor shall coordinate efforts in completion of all necessary environmental compliance; however, Contractor shall be solely responsible for funding such compliance.

(e) Use by the Contractor of Utah Water Right 41-2942 (A30557, Cert. No. 5903), as more particularly described in Article 3(a)(1) above, is neither covered by nor limited by this contract.

CULINARY WATER SUPPLY FOR FACILITIES OF THE UNITED STATES

5. (a) The Contractor shall provide a culinary water supply to all United States Forest Service campgrounds served by the Dutch John municipal water system on the date of enactment of the Privatization Act, as well as any other United States Forest Service facilities which are served by the Dutch John municipal water system.

(b) The Contractor shall provide a culinary water supply to all Bureau of Reclamation facilities, including but not limited to the Flaming Gorge Powerplant, Flaming Gorge Visitors Center, residential units, warehouse, and maintenance complex, which are served by the Dutch John municipal water system.

(c) Culinary water supplied by the Contractor to campgrounds and facilities of the United States Forest Service and the Bureau of Reclamation under Articles 5(a) and 5(b) above shall be priced at a rate equivalent to that charged by the Contractor to other customers for similar uses.

(d) The United States Forest Service and the Bureau of Reclamation shall each be responsible for maintenance of their respective water systems from the point of metering of the distribution lines of the systems, except that the Bureau of Reclamation shall be responsible for maintenance of the waterline which delivers treated water from the Dutch John Water Treatment Plant to the Flaming Gorge Powerplant.

(e) If under the terms of Articles 11(c) or 12 hereof, the quantity of water delivered by the United States to the Dutch John Water Treatment Plant is reduced, the obligation of the Contractor to supply culinary water to facilities of the United States Forest Service and the Bureau of Reclamation under the terms of Articles 5(a) and 5(b) above shall be reduced proportionately.

SCANNED RJ

(f) Notwithstanding the requirements of Section E of Exhibit A, if the ability of the United States to perform under this contract is reduced as a result of absence of appropriation or allotment of funds, the obligation of the Contractor to supply culinary water to the facilities of the United States Forest Service and the Bureau of Reclamation under the terms of Articles 5(a) and 5b) above shall be reduced proportionately.

RATE AND METHOD OF PAYMENT FOR DELIVERY OF WATER

6. (a) The Contractor shall pay the United States annually only for the quantity of water actually delivered to the Dutch John Water Treatment Plant. The payment rate for delivery of municipal water will be reviewed and adjusted annually in accordance with the established Debt Service Methodology used for pricing water service from the Colorado River Storage Project. The Debt Service Methodology is based upon the costs of servicing a portion of the Federal debt incurred in developing water for consumptive uses in the Colorado River Storage Project initial units named, Navajo Reservoir, Wayne N. Aspinall, Glen Canyon, and Flaming Gorge. The debt to be serviced by this Contract, established as of January 1, 2001 is $1,039,813.84, based on a total contractual water supply of 1,000 acre-feet annually. The first year payment will be calculated from an amortization of the above amount, using the annuity due formula, and based on a 40-year payment term at an interest rate that is the 1999 annual average rate for 10-year Treasury constant maturities and is calculated to be $64.21 per acre-foot. For each succeeding year thereafter, the cumulative debt to be serviced shall be recalculated as of each January 15 in accordance with the following:

$$D_n = D_{n-1} - P_{n-1} - C_{n-1} + I_{n-1} \pm \Delta R_{n-1}$$

Where:
- D_n = The recalculated total debt for water to be serviced by the Contractor.
- D_{n-1} = The debt to be serviced by the Contractor as it existed at the beginning of the previous year.
- P_{n-1} = Payments for water service made by the Contractor for the previous year.
- C_{n-1} = Credit on debt service of non-delivered water for the previous year.
- I_{n-1} = Interest accrued for the previous year based on the annual average interest rate of the previous year for 10-year Treasury constant maturities.
- ΔR_{n-1} = A pro rata share of any change during the previous year in multipurpose costs allocated to consumptive use for the consolidated Colorado River Storage Project.

The rate per acre-foot for payments after the first year shall then be determined in accordance with the following procedure:

STEP 1: D_n for the year of calculation is divided by the total number of acre-feet under contract = X.

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STEP 2: Amortize X, using the annuity due formula, with the interest rate as described above and for the number of years equal to 40 minus the number of years the contract has been in effect.

Additionally, an adjustable surcharge, currently $1.00 per acre-foot, will be added annually to the municipal delivery rate, to defray the annual O&M costs of Flaming Gorge Dam and Reservoir.

(b) For each annual payment, the United States will promptly bill the Contractor by February 15, and the Contractor agrees to pay for the amount of water actually delivered from the Flaming Gorge Powerplant to the Dutch John Water Treatment Plant during the previous calendar year at the then-current rate charged for delivery of such water, plus the adjustable operations and maintenance (O&M) surcharge. Upon receipt of such bill for water used during the previous calendar year, the Contractor shall remit payment to the United States within 30 days from the date of said bill.

(c) Further, the Contractor agrees to reimburse the United States quarterly for the actual costs, including electricity, of O&M and replacement of the Federally-owned pumps used to supply water from Flaming Gorge Powerplant and Dam to the Dutch John Water Treatment Plant. Within 30 days after the end of each quarter-year which ends on March 31, June 30, September 30, and December 31, the Contracting Officer will calculate the actual costs of O&M, replacement, and electricity for said pumps for the immediately-preceding quarter and shall promptly bill the Contractor. Upon receipt of such bill, the Contractor shall remit payment to the United States within 30 days from the date of said bill.

(d) Federal revenues generated pursuant to this contract shall be credited in accordance with Section 5 of the Colorado River Storage Project Act.

DEPLETION CHARGE, RECOVERY IMPLEMENTATION PLAN, COMPLIANCE WITH THE ENDANGERED SPECIES ACT, AND THE NATIONAL ENVIRONMENTAL POLICY ACT

7. (a) The Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (RIP) implemented under the authority of the Act of December 28, 1973 (87 Stat. 884), more commonly known as the Endangered Species Act (ESA), requires that new depletions from the Green River are subject to a one time depletion charge. The rate of said depletion charge is adjusted annually for inflation. As of October 1, 2000, said depletion charge was $14.75 per acre-foot. Historic annual depletions are not subject to this depletion charge.

(b) Historic annual depletions at Dutch John are 150 acre-feet. Within 60 days following execution of this contract and prior to September 30, 2001, the Contractor shall make a one-time payment in the amount of $12,537.50, the depletion charge due at the 2000 rate for new annual depletions of 850 acre-feet (1,000 acre-feet total depletions - 150 acre-feet historic depletions = 850 new depletions x $14.75 = $12,537.50). Payment shall be made to the National

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Fish and Wildlife Foundation (Foundation) at the following address: National Fish and Wildlife Foundation,1120 Connecticut Avenue Northwest, Suite 900, Washington DC 20036. Payment shall be accompanied by a cover letter, with a courtesy copy to the Bureau of Reclamation. The cover letter shall include the following information:

(1) Amount of the payment enclosed ($12,537.50) and check number;

(2) Project requiring payment: "The Long-Term Water Service Contract between United States of America and Daggett County";

(3) Biological opinion requiring payment: "The Long-Term Water Service Contract between United States of America and Daggett County";

(4) Payor's (Contractor) name and address (shown in Article 13);

(5) Name and address of the Federal agency responsible for authorizing the project (Bureau of Reclamation, address shown in Article 13);

(6) Name and address of the Fish and Wildlife Service Office issuing the biological opinion: Mountain-Prairie Regional Office, P.O. Box 25486, Denver Federal Center, Denver, Colorado 80225.

The National Wildlife Foundation will use the above information to send notices of receipt of payment to the parties identified in Articles 7(a)(4), 7(a)(5), and 7(a)(6) within 5 working days of receipt of payment.

(c) Annual depletions in excess of the 1,000 acre-feet required herein to be paid will trigger an additional depletion charge under the RIP, and said additional depletion charge shall be the sole responsibility of the Contractor. Any additional depletions will also trigger additional compliance with the NEPA and the ESA.

(d) The United States shall complete an Environmental Assessment prior to execution of this contract. Any additional future deliveries having impacts not assessed in the Environmental Assessment for this contract will require additional compliance with NEPA.

CHARGES FOR DELINQUENT PAYMENTS

8. (a) The Contractor shall be subject to interest, administrative and penalty charges on delinquent installments or payments. When a payment is not received by the due date, the Contractor shall pay an interest charge for each day the payment is delinquent beyond the due date. When a payment becomes 60 days delinquent, the contractor shall pay an administrative charge to cover additional costs of billing and processing the delinquent payment. When a payment is delinquent 90 days or more, the Contractor shall pay an additional penalty charge of

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6 percent per year for each day the payment is delinquent beyond the due date. Further, the contractor shall pay any fees incurred for debt collection services associated with a delinquent payment.

(b) The interest charge rate shall be the greater of the rate prescribed quarterly in the Federal Register by the Department of the Treasury for application to overdue payments, or the interest rate of 0.5 percent per month prescribed by Section 6 of the Reclamation project Act of 1939 (P.L. 76-260). The interest charge rate shall be determined as of the due date and remain fixed for the duration of the delinquent period.

(c) When a partial payment on a delinquent account is received, the amount received shall be applied first to the penalty, second to the administrative charges, third to the accrued interest, and finally to the overdue payment.

CONTINGENCY FUND

9. The Contractor shall at all times during the term of this contract maintain a contingency fund in the amount of $18,000.00 to cover emergency repairs to the Federally owned pumps used to pump and deliver the Contractor's water covered under this contract from the Flaming Gorge Powerplant to the Dutch John Water Treatment Plant

GENERAL OBLIGATION--BENEFITS CONDITIONED UPON PAYMENT

10. (a) The obligation of the Contractor to pay the United States as provided in this contract is a general obligation of the Contractor notwithstanding the manner in which the obligation may be distributed among the Contractor's water users and notwithstanding the default of individual water users in their obligation to the Contractor.

(b) The payment of charges becoming due hereunder is a condition precedent to continuing benefits under this contract.

MEASUREMENT AND RESPONSIBILITY FOR DISTRIBUTION

11. (a) The water to be delivered for the Contractor will be measured at an existing meter located inside the Dutch John Water Treatment Plant. The Contractor shall suffer all distribution and administration losses from the point of such delivery to the place of use. In the event the Contractor desires in the future to take delivery of water at a location other than the existing Dutch John Water Treatment Plant, the Contractor shall install, at its own expense, appropriate metering equipment at the new location, subject to acceptance by the Bureau of Reclamation.

(b) From the point of delivery of water at the Dutch John Water Treatment Plant, the Contractor shall hold the United States harmless on account of damage or claim of damage of any

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nature whatsoever, including property damage, personal injury, or death arising out of or connected with the control, carriage, handling, use, disposal, or distribution of such water by the Contractor.

(c) This contract and all water taken pursuant hereto shall be subject to and controlled by the Colorado River Compact, dated November 24, 1922, and proclaimed by the President of the United States June 25, 1929, the Boulder Canyon Project Adjustment Act of July 19, 1940, the Upper Colorado River Basin Compact dated October 11, 1948, the Mexican Water Treaty of February 3, 1944, and the Colorado River Basin Project Act of September 30, 1968, P.L. 90-537. In the event water available to the Contractor is required to be curtailed under and by reason of the provisions of the foregoing acts, including the reaching of maximum use of water allotted to the State of Utah, no liability shall attach to the United States for such curtailment, and the Contractor agrees to reduction of the amount of water taken hereunder as the Secretary of the Interior determines necessary to comply with the provisions of said acts.

UNITED STATES NOT LIABLE FOR WATER SHORTAGE–ADJUSTMENTS

12. On account of drought; errors in operations; mechanical, structural, or system failure; or other causes, there may occur at times a shortage during any year in the quantity of water delivered at the request of the Contractor by the United States pursuant to this contract, and in no event shall any liability accrue against the United States or any of its officers, agents, or employees for any damage direct or indirect, arising therefrom. In any year in which there may occur such a shortage, the United States reserves the right to apportion the available water supply among the Contractor and others entitled, under existing and future contract, to receive water from the same project water supply all in a manner to be prescribed by the Contracting Officer.

NOTICES

13. (a) Any notice, demand, or request authorized or required by this contract shall be deemed to have been given, on behalf of the Contractor, when mailed, postage prepaid, or delivered to the Regional Director, Upper Colorado Region, Bureau of Reclamation, 125 South State Street, Room 6107, Salt Lake City, Utah 84038-1102, except as provided in Articles 7(b) and 13(b), and on behalf of the United States, when mailed, postage prepaid, or delivered to Daggett County, P.O. Box 219, Manila, Utah 84046. The designation of the addressee or the address may be changed by notice given in the same manner as provided in this article for other notices.

(b) Request for the delivery of water will be coordinated between the Flaming Gorge Powerplant and the Dutch John Water Treatment Plant under normal conditions ; however, in emergency circumstances involving a request for water delivery, the Contractor may call the Bureau of Reclamation at the Glen Canyon Control Room, Page, Arizona, (502) 645-0472.

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WATER CONSERVATION

14. (a) Prior to the delivery of water provided from or conveyed through Federally constructed or Federally financed facilities pursuant to this contract, the Contractor shall have developed a water conservation plan (Plan), as required by Section 210(b) of the Reclamation Reform Act of 1982 (RRA), Part 427.1 of the RRA Rules and Regulations (dated December 18,1996), and consistent with additional water conservation plan guidance provided in the Reclamation Manual WTR 01-01. Further, the Contractor shall be implementing measures, activities, and programs specified in the Plan in accordance with the Plan's schedule. The Contractor's Plan and Plan implementation shall be acceptable to the Contracting Officer.

(b) Notwithstanding the provisions of Article 14(a) above, the United States recognizes that, pursuant to the Commissioner's memorandum of December 10, 1996, and Section 1C(2)(b) of Reclamation Manual, Directives and Standards (WTR-01-01), as of the date of this contract, Contractor qualifies for an exception from the requirement to develop a Plan because Contractor receives and provides only municipal and industrial water to fewer than 3,300 people. Therefore, the United States shall not invoke Article 14(a) to require Contractor to develop a Plan until such time as Contractor no longer qualifies for said exception.

(c) At such time as Contractor is required to develop a Plan, Reclamation's Water Conservation Field Services Program shall be available to provide assistance and guidance to the Contractor in preparing and implementing a Plan.

STANDARD CONTRACT ARTICLES

15. The standard contract articles applicable to this contract are listed below. The full text of these standard articles is attached as Exhibit A, and is hereby made a part of this contract.

A. Quality of Water
B. Water and Air Pollution Control
C. Books, Records, and Reports
D. Compliance with Reclamation Law
E. Contingent on Appropriation or Allotment of Funds
F. Officials Not to Benefit
G. Assignment Limited–Successors and Assigns Obligated
H. Equal Opportunity
I. Compliance with Civil Rights Laws and Regulations
J. Certification of Nonsegregated Facilities
K. Notice to Prospective Subcontractors or Requirement for Certifications of Nonsegregated Facilities

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IN WITNESS WHEREOF, the parties hereto have caused this contract to be duly executed as of the day and year first written above.

UNITED STATES OF AMERICA

Approved:

Field Solicitor's Office

By: Acting
Regional Director
Upper Colorado Region
Bureau of Reclamation

ATTEST:

DAGGETT COUNTY

County Clerk

By:
Chairman, County Commission

Approved:

County Attorney

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EXHIBIT A

A. QUALITY OF WATER

The operation and maintenance of project facilities shall be performed in such manner as is practicable to maintain the quality of raw water made available through such facilities at the highest level reasonably attainable, as determined by the Contracting Officer. The United States does not warrant the quality of water and is under no obligation to construct or furnish water treatment facilities to maintain or better the quality of water.

B. WATER AND AIR POLLUTION CONTROL

The Contractor, in carrying out this contract, shall comply with all applicable water and air pollution laws and regulations of the United States and the State of Utah, and shall obtain all required permits or licenses from the appropriate Federal, State, or local authorities.

C. BOOKS, RECORDS, AND REPORTS

The Contractor shall establish and maintain accounts and other books and records pertaining to administration of the terms and conditions of this contract, including: the Contractor's financial transactions, water supply data, water use data, and other matters that the Contracting Officer may require. Subject to applicable Federal laws and regulations, each party to this contract shall have the right during office hours to examine and make copies of the other party's books and records relating to matters covered by this contract.

D. COMPLIANCE WITH RECLAMATION LAWS

(1) The parties agree that the delivery of water or the use of Federal facilities pursuant to this contract is subject to Reclamation law, as amended and supplemented, and the rules and regulations promulgated by the Secretary of the Interior under Reclamation law.

(2) The Contracting Officer shall have the right to make determinations necessary to administer this contract that are consistent with the expressed and implied provisions of this contract, the laws of the United States and the State, and the rules and regulations promulgated by the Secretary of the Interior. Such determinations shall be made in consultation with the Contractor.

E. CONTINGENT ON APPROPRIATION OR ALLOTMENT OF FUNDS

The expenditure or advance of any money or the performance of any obligation of the United States under this contract shall be contingent upon appropriation or allotment of funds. Absence of appropriation or allotment of funds shall not relieve the Contractor from any

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obligations under this contract. No liability shall accrue to the United States in case funds are not appropriated or allotted.

F. OFFICIALS NOT TO BENEFIT

No Member of or Delegate to Congress, Resident Commissioner or official of the Contractor shall benefit from this contract other than as a water user or landowner in the same manner as other water users or landowners.

G. ASSIGNMENT LIMITED-- SUCCESSORS AND ASSIGNS OBLIGATED

The provisions of this contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this contract or any right or interest therein shall be valid until approved in writing by the Contracting Officer.

H. EQUAL OPPORTUNITY

In its performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without discrimination because of race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising the said labor union or worker's representative of the Contractor's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

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(5) The Contractor will furnish all information and reports required by said amended Executive Order and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Contracting Officer and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in said amended Executive Order, and such other sanctions may be imposed and remedies invoked as provided in said Executive Order, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of said amended Executive Order, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

I. COMPLIANCE WITH CIVIL RIGHTS LAWS AND REGULATIONS

(1) The Contractor shall comply with Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d), Section 504 of the Rehabilitation Act of 1973 (P.L. 93-112, as amended), the Age Discrimination Act of 1975 (42 U.S.C. 6101, et seq.) and any other applicable civil rights laws, as well as with their respective implementing regulations and guidelines imposed by the U.S. Department of the Interior and/or Bureau of Reclamation.

(2) These statutes require that no person in the United States shall, on the grounds of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving financial assistance from the Bureau of Reclamation. By executing this contract, the Contractor agrees to immediately take any measures necessary to implement this obligation, including permitting officials of the United States to inspect premises, programs, and documents.

(3) The Contractor makes this agreement in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property discounts or other Federal financial assistance extended after the date hereof to the Contractor by the Bureau of Reclamation, including installment payments after such date on account of arrangements for Federal financial

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assistance which were approved before such date. The Contractor recognizes and agrees that such Federal assistance will be extended in reliance on the representations and agreements made in this article, and that the United States reserves the right to seek judicial enforcement thereof.

J. CERTIFICATION OF NONSEGREGATED FACILITIES

The Contractor hereby certifies that it does not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. It certifies further that it will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it will not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The Contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, timeclocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The Contractor further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that it will retain such certifications in its files; and that it will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

L. NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

A Certification of Nonsegregated Facilities must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually). Note: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

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EXHIBIT 8

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

Contract No. 04-WC-40-010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLORADO RIVER STORAGE PROJECT
WAYNE N. ASPINALL STORAGE UNIT

LONG-TERM WATER SERVICE CONTRACT BETWEEN
THE UNITED STATES
and
THE UPPER GUNNISON RIVER WATER CONSERVANCY DISTRICT

THIS CONTRACT, made this 1st day of April 2004, pursuant to the Act of Congress approved June 17, 1902 (32 Stat. 388), and acts amendatory thereof or supplementary thereto, and particularly Pursuant to the Colorado River Storage Project Act approved April 11, 1956 (70 Stat. 105), between THE UNITED STATES OF AMERICA, hereinafter referred to as the United States, represented by the officer executing this contract, his duly appointed successor or his duly authorized representative, hereinafter referred to as the Contracting Officer, and the UPPER GUNNISON RIVER WATER CONSERVANCY DISTRICT, a water conservancy district organized pursuant to the Water Conservancy Act (§§ 37-45-101, *et seq.*, C.R.S. (2003)), hereinafter referred to as the District,

WITNESSETH:

WHEREAS, the following statements are made in explanation:

(a) The United States has constructed Blue Mesa Dam and Reservoir as a unit of the Colorado River Storage Project, for the furnishing of water for irrigation, municipal, and other beneficial uses; and

(b) The District has filed in the Water Court, Water Division 4, Colorado, an Application for Approval of Plan for Augmentation (Case No. 03CW49) and is in the process of completing and filing with the Colorado Division of Water Resources an application for renewal of its Substitute Water Supply Plan for water uses within Upper Gunnison River Basin and is requesting a water service contract for 500 acre-feet of municipal and industrial (M&I) water stored in Blue Mesa Reservoir to support the District's Plan for Augmentation and Substitute Water Supply Plan; and

(c) The 500 acre-feet of M&I water may be resold by the District under third-party contracts to non-agricultural water users within the Gunnison River Basin who are covered under the District's Plan for Augmentation and Substitute Water Supply Plan and can benefit from water released from Blue Mesa Reservoir.

NOW, THEREFORE, in consideration of the mutual and dependent covenants herein contained, the parties hereto agree as follows:

1. TERM OF CONTRACT

(a) This contract shall be effective for 40 years from the date of execution.

(b) The District may terminate this contract at any time.

(c) Termination as above provided shall be accomplished by written notice by the District to the United States pursuant to Article 9 herein, at least 1 year prior to the date of such termination.

(d) Upon failure of the District to perform its obligations under this contract, the United States will notify the District in writing of the intent to terminate this agreement. The said Notice of Termination shall specify each failure of the District, and shall further provide that the District may, within a 90-day period from the date of said notice, present a detailed program to correct such deficiencies, and the United States shall review and reasonably accept such corrections and thereby waive the termination notice.

2. RESALE OF WATER

(a) The Contracting Officer shall store a total of 500 acre-feet of M&I water in Blue Mesa Reservoir for the District to resell under third-party contracts in the form attached hereto as ADDENDUM B. Any modifications to the form of third-party contract shall be satisfactory to and approved by the Contracting Officer.

(b) For purposes of Section G (g) of ADDENDUM "A" to this Contract, approved third-party contracts shall not be deemed to be subcontracts.

(c) The District and the third-party contractors shall sign the third-party contracts then submit them to the Contracting Officer for his/her signature and execution. All third-party contracts shall be submitted to the Contracting Officer at the following address: Bureau of Reclamation, Western Colorado Area Office, Water Management Group Chief, 2764 Compass Drive Suite 106, Grand Junction CO 81506.

(d) All third-party contracts shall have a term equal to or less than the term of this contract.

(e) All third-party contracts shall refer to and be subject to the terms and conditions of this contract.

3. DELIVERY OF WATER

(a) The Contracting Officer, during the term of this contract shall release water, not to exceed 500 acre-feet at the outlet works of the Blue Mesa Dam.

(b) Requests for the release of water under this contract from Blue Mesa Reservoir shall be made by the Colorado Division of Water Resources, Water Division 4 Engineer, by calling the Water Management Group at the Western Colorado Area Office of the Bureau of Reclamation at (970) 248-0652 or (970) 248-0600.

(c) The District shall have no holdover storage rights in Blue Mesa Reservoir from year to year. Any water purchased hereunder not called for by the end of each calendar year shall become integrated with the water supply for all purposes of the Blue Mesa Reservoir and be available for all purposes at that time.

4. RATE AND METHOD OF PAYMENT FOR DELIVERY OF WATER

(a) The District shall pay the United States annually only for the quantity of water it has sold using third-party contracts approved and executed by the Contracting Officer pursuant to Article 2(b) herein (hereinafter referred to as approved third-party contracts), whether or not such water is released pursuant to paragraph 3. The payment rate for delivery of M&I water pursuant to this Contract will be reviewed and adjusted annually in accordance with the established Debt Service Methodology used for pricing water service from the Colorado River Storage Project. The Debt Service Methodology is based upon the costs of servicing a portion of the Federal debt incurred in developing water for consumptive uses in the Colorado River Storage Project initial units named Navajo Reservoir, Wayne N. Aspinall, Glen Canyon, and Flaming Gorge. The debt to be serviced by this Contract, established as of January 1, 2004 is $611,745.00, based on a total contractual water supply of 500 acre-feet annually.

The first year per acre-foot rate of $71.66 will be charged for any approved third-party contract and is calculated from an amortization of the total debt service amount of $611,745.00, using the annuity due formula, a 40-year payment term, and an interest rate of 5.49 percent, which is the 2001 annual average rate for 20-year Treasury constant maturities.

For each succeeding year thereafter, the cumulative debt to be serviced from executed third-party contracts shall be recalculated as of each January 15 in accordance with the following:

$$D_n = D_{n-1} - P_{n-1} + N_{n-1} + I_{n-1} \pm \triangle R_{n-1}$$

Where: D_n = The recalculated total debt to be serviced by the District only for water sold under all approved third-party contracts.

D_{n-1} = The debt to be serviced by the District as it existed at the beginning of the previous year.

P_{n-1} = Payments for water service made by the District for the previous year's approved third-party contracts.

N_{n-1} = New debt to be serviced on water sold under approved third-party contracts during the previous year. The amount of new debt added each year is calculated by: $611,745.00 x (total # of acre-feet sold under approved third-party contracts that year/500 acre-feet)

I_{n-1} = Interest accrued for the previous year based on the annual average interest rate of the previous year for 20-year Treasury constant maturities.

$\triangle R_{n-1}$ = A pro rata share of any change during the previous year in multipurpose costs allocated to consumptive use for the consolidated Colorado River Storage Project.

The rate per acre-foot for payments after the first year shall then be determined in accordance to the following procedure:

STEP 1: D_n for the year of calculation is divided by the total number of acre-feet sold under approved third-party contracts during the previous year = X.

STEP 2: Amortize X, using the annuity due formula, with the interest rate as describe above and for the number of years equal to 40 minus the number of years this Contract has been in effect.

(b) The first annual payment for water service and O&M charges by the District for each third-party contract shall be submitted along with the third-party contract pursuant to paragraph 2.(c) herein. The amount due the United States shall be based on increments of 1 acre-foot. *Example: the District submits 10 third-party contracts for a total of 30 ½ acre-feet of water, the amount due the United States shall be for 31 acre-feet of water.*

(c) For each annual payment thereafter, the United States will bill the District by February 15, and the District agrees to pay for the amount of water sold under approved third-party contracts at the then-current rate calculated according to the above procedure, and based on increments of 1 acre-foot. Additionally, an adjustable operations and maintenance surcharge, currently $1.00 per acre-foot, will be added annually to the M&I delivery rate for water sold under approved third-party contracts. Upon receipt of such bill for water, the District shall remit payment to the United States within 45 days from the date of said bill.

(d) All payments from the District to the United States under this Contract shall be by the medium requested by the United States on or before the date payment is due. The required method of payment may include checks, wire transfers, or other types of payment specified by the United States.

(e) Federal revenues generated pursuant to this Contract shall be credited in accordance with Section 5 of the Colorado River Storage Project Act.

5. CHARGES FOR DELINQUENT PAYMENTS

(a) The District shall be subject to interest, administrative, and penalty charges on delinquent payments. If a payment is not received by the due date, the District shall pay an interest charge on the delinquent payment for each day the payment is delinquent beyond the due date. If a payment becomes 60 days delinquent, in addition to the interest charge, the District shall pay an administrative charge to cover additional costs of billing and processing the delinquent payment. If a payment is delinquent 90 days or more, in addition to the interest and administrative charges, the District shall pay a penalty charge for each day the payment is delinquent beyond the due date, based on the remaining balance of the payment due at the rate of 6 percent per year. The District shall also pay any fees incurred for debt collection services associated with a delinquent payment.

(b) The interest charge rate shall be the greater of either the rate prescribed quarterly in the Federal Register by the Department of the Treasury for application to overdue payments or the interest rate of 0.5 percent per month. The interest charge rate will be determined as of the due date and remain fixed for the duration of the delinquent period.

(c) When a partial payment on a delinquent account is received, the amount received shall be applied first to the penalty charges, second to the administrative charges, third to the accrued interest, and finally to the overdue payment.

6. GENERAL OBLIGATION--BENEFITS CONDITIONED UPON PAYMENT

(a) The obligation of the District to pay the United States as provided in this contract is a general obligation of the District notwithstanding the manner in which the obligation may be distributed among the District's water users and notwithstanding the default of individual water users in their obligation to the District.

(b) The payment of charges becoming due pursuant to this contract is a condition precedent to receiving benefits under this contract. The United States shall not make water available to the District through the Colorado River Storage Project, Aspinall Storage Unit facilities during any period in which the District is in arrears in the advance payment of water rates due the United States. The District shall not deliver water under the terms and conditions of this contract for lands or parties that are in arrears in the advance payment of water rates as levied or established by the District.

7. MEASUREMENT AND RESPONSIBILITY FOR DISTRIBUTION

(a) The water to be released for the District shall be measured by facilities of the United States and delivered into the Gunnison River at the outlet works of Crystal Dam. The District shall suffer all distribution and administration losses from the point of such delivery to the place of use.

(b) The District shall hold the United States harmless on account of damage or claim of damage of any nature whatsoever, including property damage, personal injury, or death arising out of or connected with the control, carriage, handling, use, disposal, or distribution of such water by the District.

(c) This contract and all water taken pursuant hereto shall be subject to and controlled by the Colorado River Compact, dated November 24, 1922, and proclaimed by the President of the United States June 25, 1929, the Boulder Canyon Project Act approved December 21, 1928, the Boulder Canyon Project Adjustment Act of July 19, 1940, Upper Colorado River Basin Compact dated October 11, 1948, the Mexican Water Treaty of February 3, 1944, and the Colorado River Basin Project Act of September 30, 1968, Public Law 90-537.

(d) In the event water available to the District is required to be curtailed under and by reason of the provisions of the foregoing acts, including the reaching of maximum use of water allotted to the State of Colorado, no liability shall attach to the United States for such curtailment, and the District agrees to reduction of the amount of water taken hereunder as the Secretary determines necessary to comply with the provisions of said acts.

8. UNITED STATES NOT LIABLE FOR WATER SHORTAGE--ADJUSTMENTS

On account of drought, errors in operation, or other causes, there may occur at times a shortage during any year in the quantity of water released at the request of the District by the United States pursuant to this contract through and by means of the project, and in no event shall any liability accrue against the United States or any of its officers, agents, or employees for any damage direct or indirect, arising therefrom. In any year in which there may occur such a shortage, the United States reserves the right to apportion the available water supply among the District and others entitled, under existing and future contract(s), to receive water from the same project water supply all in a manner to be prescribed by the Contracting Officer.

9. NOTICES

Any notice, demand, or request authorized or required by this contract other than as addressed in Article 2(b) or requests for the release of water as addressed in Article 3 (b) above shall be deemed to have been given on behalf of the District when mailed, postage prepaid, or delivered to the Regional Director, Upper Colorado Region, Bureau of Reclamation, 125 South State Street, Room 6107, Salt Lake City, Utah 84138-1102 and on behalf of the United States when mailed, postage prepaid, or delivered to the District to the Manager, Upper Gunnison River Water Conservancy District, 200 East Virginia Ave., Gunnison CO 81230. The designation of the addressee or the address may be changed by notice given in the same manner as provided in this article for other notices.

10. ASSIGNMENT LIMITED--SUCCESSORS AND ASSIGNS OBLIGATED

The provisions of this contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this contract or any right or interest therein by either party shall be valid until approved in writing by the other party.

11. STANDARD CONTRACT ARTICLES

The standard contract articles applicable to this contract are listed below. The full text of these standard articles is attached hereto as Addendum "A " and by this reference made a part thereof.

A. CONTINGENT UPON APPROPRIATION OR ALLOTMENT OF FUNDS
B. BOOKS, RECORDS, AND REPORTS
C. RULES, REGULATIONS, AND DETERMINATIONS
D. CHANGES IN CONTRACTOR'S ORGANIZATION
E. PROTECTION OF WATER AND AIR QUALITY
F. OFFICIALS NOT TO BENEFIT
G. EQUAL EMPLOYMENT OPPORTUNITY
H. COMPLIANCE WITH CIVIL RIGHTS LAWS AND REGULATIONS
I. CERTIFICATION OF NONSEGREGATED FACILITIES

12. CONTRACT DRAFTING CONSIDERATIONS

Articles 1 through 12 of this Contract have been drafted, negotiated, and reviewed by the parties hereto, each of whom is sophisticated in the matters to which this Contract pertains, and no one party shall be considered to have drafted the stated articles.

IN WITNESS WHEREOF, the parties hereto have caused this contract to be duly executed as of the day and year first written above.

UPPER GUNNISON RIVER WATER CONSERVANCY DISTRICT

Robert E. Drexel, President

Attest:

Brett W. Redden, Secretary

UNITED STATES OF AMERICA
BUREAU OF RECLAMATION

Rick Gold, Regional Director
Upper Colorado Region

Approved by
Office of the Regional Solicitor

ADDENDUM "A "

A. CONTINGENT UPON APPROPRIATION OR ALLOTMENT OF FUNDS

The expenditure or advance of any money or the performance of any obligation of the United States under this contract shall be contingent upon appropriation or allotment of funds. Absence of appropriation or allotment of funds shall not relieve the District from any obligations under this contract. No liability shall accrue to the United States in case funds are not appropriated or allotted.

B. BOOKS, RECORDS, AND REPORTS

Upper Gunnison shall establish and maintain accounts and other books and records pertaining to administration of the terms and conditions of this contract, including the District 's financial transactions; water supply data; project operation, maintenance, and replacement logs; project land and rights-of-way use agreements; the water users' land-use (crop census), land-ownership, land-leasing, and water-use data; and other matters that the Contracting Officer may require. Reports shall be furnished to the Contracting Officer in such form and on such date or dates as the Contracting Officer may require. Subject to applicable Federal laws and regulations, each party to this contract shall have the right during office hours to examine and make copies of the other party's books and records relating to matters covered by this contract.

C. RULES, REGULATIONS, AND DETERMINATIONS

(a) The parties agree that the delivery of water or the use of Federal facilities pursuant to this contract is subject to Federal reclamation law, as amended and supplemented, and the rules and regulations promulgated by the Secretary of the Interior under Federal reclamation law.

(b) The Contracting Officer shall have the right to make determinations necessary to administer this contract that are consistent with the expressed and implied provisions of this contract, the laws of the United States, the State of Colorado and the rules and regulations promulgated by the Secretary of the Interior. Such determinations shall be made in consultation with the District.

D. CHANGES IN CONTRACTOR'S ORGANIZATION

While this contract is in effect, no change may be made in the District's organization which may affect the respective rights, obligations, privileges, and duties of either the United States or the District under this contract including, but not limited to, dissolution, consolidation, or merger, except upon the Contracting Officer's written consent.

E. PROTECTION OF WATER AND AIR QUALITY

Project facilities used to make available and deliver water to the District shall be operated and maintained in the most practical manner to maintain the quality of the water at the highest level possible as determined by the Contracting Officer: *Provided, That* the United States does not warrant the quality of the water delivered to the District and is under no obligation to furnish or construct water treatment facilities to maintain or improve the quality of water delivered to the District.

(b) Upper Gunnison shall comply with all applicable water and air pollution laws and regulations of the United States and the State of Colorado: and shall obtain all required permits or licenses from the appropriate Federal, State, or local authorities necessary for the delivery of water by Upper Gunnison; and shall be responsible for compliance with all Federal, State, and local water quality standards applicable to surface and subsurface drainage and/or discharges generated through the use of Federal or Contractor facilities or project water provided by Upper Gunnison within Upper Gunnison's Project Water Service Area.

F. OFFICIALS NOT TO BENEFIT

No Member of or Delegate to the Congress, Resident Commissioner, or official of the District shall benefit from this contract other than as a water user or landowner in the same manner as other water users or landowners.

G. EQUAL EMPLOYMENT OPPORTUNITY

During the performance of this contract, the District agrees as follows:

(a) The District will not discriminate against any employee or applicant for employment because of race, color, religion, sex, disability, or national origin. The District will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, disability, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or

transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The District agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(b) The District will, in all solicitations or advertisements for employees placed by or on behalf of the District, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, disability, or national origin.

(c) The District will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising the labor union or workers' representative of the District's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) The District will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(e) The District will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Contracting Agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(f) In the event of the District's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the District may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965 or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(g) The District will include the provisions of paragraphs (a) through (g) in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The District will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however,* that in the event the District becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the District may request the United States to enter into such litigation to protect the interests of the United States.

H. COMPLIANCE WITH CIVIL RIGHTS LAWS AND REGULATIONS

(a) The District shall comply with Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d), Section 504 of the Rehabilitation Act of 1973 (P.L. 93-112, as amended), the Age Discrimination Act of 1975 (42 U.S.C. 6101, *et seq.*), Title II of the Americans with Disabilities Act of 1990 if the entity is a State or local government entity [Title III if the entity is a non-government entity], and any other applicable civil rights laws, as well as with their respective implementing regulations and guidelines imposed by the U.S. Department of the Interior and/or Bureau of Reclamation.

(b) These statutes require that no person in the United States shall be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving financial assistance from the Bureau of Reclamation on the grounds of race, color, national origin, disability, or age. By executing this contract, the District agrees to immediately take any measures necessary to implement this obligation, including permitting officials of the United States to inspect premises, programs, and documents.

(c) The District makes this agreement in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property discounts, or other Federal financial assistance extended after the date hereof to the District by the Bureau of Reclamation, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. the District recognizes and agrees that such Federal assistance will be extended in reliance on the representations and agreements made in this article and that the United States reserves the right to seek judicial enforcement thereof.

(d) Complaints of discrimination against the District shall be investigated by the Contracting Officer's Office of Civil Rights.

I. CERTIFICATION OF NONSEGREGATED FACILITIES

The District hereby certifies that it does not maintain or provide for its employees any segregated facilities at any of its establishments and that it does not permit its employees to perform their services at any location under its control where segregated facilities are maintained. It certifies further that it will not maintain or provide for its employees any segregated facilities at any of its establishments and that it will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. the District agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin,

because of habit, local custom, disability, or otherwise. The District further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Employment Opportunity clause; that it will retain such certifications in its files; and that it will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

A Certification of Nonsegregated Facilities must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually). Note: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

EXHIBIT 9

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

Contract No. 10-WC-40-384

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONTRACT BETWEEN THE UNITED STATES AND
THE NAVAJO NATION

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Contract No. 10-WC-40-384

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONTRACT BETWEEN THE UNITED STATES AND
THE NAVAJO NATION

PART I. **SETTLEMENT**

1. PREAMBLE

This contract is entered into this _17th_ day of _December__, 2010, between the United States of America, acting through the Secretary of the Interior pursuant to the Northwestern New Mexico Rural Water Projects Act of March 30, 2009 (123 Stat. 1367), the Act of June 17, 1902 (32 Stat. 388), and acts amendatory thereof and supplementary thereto, all of which acts are commonly known and referred to as the Federal Reclamation Laws, specifically the Act of June 13, 1962 (76 Stat. 96), the Act of April 11, 1956 (CRSP) (70 Stat. 105; 43 U.S.C. 620 et seq.), the Colorado Ute Settlement Act Amendments of 2000 (114 Stat. 2763A-258), and the Act of August 1, 1914 (38 Stat. 583; 25 U.S.C. 385), and the Navajo Nation.

2. EXPLANATORY RECITALS

WHEREAS, the United States, the State of New Mexico, and the Navajo Nation have negotiated a resolution of all water right claims of the Navajo Nation to waters of the San Juan River Basin in New Mexico which are the subject of a general stream adjudication in New Mexico state court ; and

WHEREAS, the settlement of these claims will secure to the Navajo Nation a water supply; and

WHEREAS, it is the intent of this Contract that the Navajo Nation may exercise the right to market the water supply secured to it under this Contract subject to the provisions of this Contract and the agreement between the State of New Mexico, the Navajo Nation and the United States setting forth a stipulated and binding Settlement

Agreement, as amended, pursuant to Section 10701 of the Northwestern New Mexico Rural Water Projects Act (123 Stat. 1367); and

WHEREAS, the Federal government is undertaking to construct additional water development facilities to fulfill the terms and conditions of the Northwestern New Mexico Rural Water Projects Act (123 Stat. 1367) and this Contract, as well as facilities to extend the current service area of the Navajo Indian Irrigation Project and facilities to convey municipal, industrial and domestic water supplies to Navajo Nation communities; and

WHEREAS, the Secretary of the Interior has determined in accordance with Section 11 of the Act of June 13, 1962 (76 Stat. 96), pursuant to the hydrologic determination recognized at Section 10604(a)(1) of the Northwestern New Mexico Rural Water Projects Act (123 Stat. 1367) that there is sufficient water reasonably likely to be available for use in the State of New Mexico to enable the United States to enter into this Contract:

NOW, THEREFORE, in consideration of mutual and dependent covenants and conditions contained herein, the parties agree to the following:

3. GENERAL DEFINITIONS

For the purposes of this Contract only, unless otherwise distinctly expressed or manifestly incompatible with the intent hereof, the term:

(a) "Animas-La Plata Project", or "ALP", means the project of the same name authorized by the Colorado Ute Settlement Act Amendments of 2000 (114 Stat. 2763A-258; Public Law 106-554, Appendix D, Title III) including Ridges Basin Dam and Lake Nighthorse, the Durango Pumping Plant, the Ridges Basin Inlet Conduit, the Navajo Nation Municipal Pipeline and related facilities.

(b) "Association" means the Animas-La Plata Operations, Maintenance, and Replacement Association, established by the ALP Project sponsors who were signatory to the IGA, dated March 4, 2009, pursuant to the Colorado Uniform Unincorporated Nonprofit Association Act, 7-30-101 et seq., CRS (2006), to carry out the OM&R activities and responsibilities of the Project.

(c) “Consultation” or “Consult” refers to an ongoing obligation of both parties to implement the provisions of this Contract with a full exchange of information so as to assure that each party is provided full participation in the decision making process. Consultation shall be required of each party with respect to each section of the Contract regardless of whether the section itself sets forth a Consultation requirement. The Consultation required shall be reasonable under the circumstances, and except in exigent circumstances Consultation shall be undertaken in advance of decision making. In the event that agreement cannot be reached and the United States makes a decision, appeals are available to the extent allowed under applicable laws.

(d) “Contracting Officer” means the representative of the Secretary of the Interior authorized to administer this Contract.

(e) “Fixed OM&R costs” means costs of administration, overhead, labor, materials, and equipment required to maintain all pumps, storage tanks, pipelines, diversion facilities, reservoirs and inlet conduits, as may be appropriate. Fixed OM&R costs shall also include annual payments to an emergency reserve fund to meet costs incurred during periods of special stress caused by damaging droughts, storms, earthquakes, floods, or other emergencies threatening or causing interruption of water service, and annual payments to a replacement reserve fund to ensure adequate funds are available to replace equipment when needed.

(f) “Intergovernmental Agreement” or “IGA” means that agreement dated March 4, 2009 and entered into by the Colorado Water Resource and Power Development Authority, the La Plata Conservancy District, the Navajo Nation, the San Juan Water Commission, the Southern Ute Indian Tribe, and the Ute Mountain Ute Indian Tribe to establish the Animas-La Plata Operations, Maintenance, and Replacement Association (Association) and provide for the terms, conditions, and concepts under which OM&R of the transferred works of the ALP is to take place.

(g) “Lake Nighthorse”, formerly Ridges Basin Reservoir, means the reservoir created by the impoundment on Basin Creek by Ridges Basin Dam, a facility of the ALP as authorized by the Colorado Ute Settlement Act Amendments of 2000 (114 Stat. 2763A-258).

(h) "Navajo Dam and Reservoir" means Navajo Dam and the reservoir created by the impoundment of the San Juan River at Navajo Dam as authorized by the Act of April 11, 1956, the Colorado River Storage Project Act (70 Stat. 105; Public Law 84-485), as amended.

(i) "Navajo-Gallup Water Supply Project", or "NGWSP", means the project of the same name authorized by Section 10602 of the Northwestern New Mexico Rural Water Projects Act (123 Stat. 1367).

(j) "Navajo Indian Irrigation Project", or "NIIP", means the project of the same name authorized by the Act of June 13, 1962 (76 Stat. 96; Public Law 87-483), as amended.

(k) "Navajo Lands" means lands set aside as reservation lands for the Navajo People, whether by treaty, statute, executive order or public land order. Also included in this definition are lands that are held in trust for the Navajo Nation by the United States, held in trust for members of the Navajo Nation by the United States, or held in fee ownership by the Navajo Nation.

(l) "Navajo Nation" means a body politic and federally-recognized Indian nation as provided for in Section 101(2) of the Federally Recognized Indian Tribe List of 1994 (Public Law 103-454, 25 U.S.C. 497a(2)), also known variously as the "Navajo Tribe," the "Navajo Tribe of Arizona, New Mexico & Utah," and the "Navajo Tribe of Indians" and other similar names, and includes all bands of Navajo Indians and chapters of the Navajo Nation, acting through its authorized representative.

(m) "Navajo Nation Municipal Pipeline", or "NNMP", means the pipeline to convey the Navajo Nation's ALP water from the City of Farmington, New Mexico, to Navajo Nation communities along the San Juan River valley in New Mexico, including the City of Shiprock, as a facility of the ALP authorized by the Colorado Ute Settlement Act Amendments of 2000 (114 Stat. 2763A-258; Public Law 106-554, Appendix D, Title III).

(n) "Navajo Settlement Act" means Subtitle B of Title X the Act of March 30, 2009 (123 Stat. 1367; Public Law 111-11).

(o) "OM&R" means annual operation, maintenance and replacement.

(p) "Partial Final Decree" means a final and binding judgment and decree entered by the court in the stream adjudication, setting forth the rights of the Navajo Nation to use and administer waters of the San Juan River Basin in New Mexico, the form of which is attached as Appendix 1 of the Settlement Agreement.

(q) "Project Operator" means the entity that has been transferred the OM&R responsibilities for a specific project covered under this Contract.

(r) "Project Participant(s)" means participant(s) in the NGWSP, namely the Navajo Nation, the City of Gallup and, should it choose to participate, the Jicarilla Apache Nation.

(s) "San Juan River" means that river which originates in the State of Colorado and flows through or constitutes the boundary of the Navajo Indian Reservation in northwestern New Mexico and southeastern Utah, where it flows into Lake Powell.

(t) "Secretary" means the Secretary of the United States Department of the Interior or an authorized designee.

(u) "Settlement Agreement" means the agreement between the State of New Mexico, the Navajo Nation and the United States executed in 2010, pursuant to Section 10701 of the Northwestern New Mexico Rural Water Projects Act (123 Stat. 1367).

(v) "Statutory Water Allocation" means the municipal and industrial (M&I) water allocation delivered to the Navajo Nation from the ALP pursuant to Section 6(a)(1)(A)(ii)(III) of the Colorado Ute Settlement Act Amendments of 2000, Public Law 106-554.

(w) "Subcontract" means a contract between the Navajo Nation and a third party, pursuant to this Contract and subject to the provisions of the Navajo Settlement Act, the Settlement Agreement, the Partial Final Decree, and approval of the Secretary or authorized representative, to supply water for beneficial use on or off Navajo Lands in the State of New Mexico, subject to and consistent with the same requirements and conditions of State law, and any applicable Federal law, interstate compact, and international treaty as they apply to the exercise of water rights held by non-federal, non-Indian entities.

(x) "Subcontractor" means any entity and/or persons entering into a subcontract with the Navajo Nation, subject to the approval of the Secretary or authorized representative.

(y) "Transferred Works" means facilities which are necessary to support the operation and maintenance of one of the three projects identified in this Contract, and for which the OM&R responsibility has been transferred to the Navajo Nation by the United States.

(z) "Variable OM&R costs" means the costs of power including power consumption and a proportional percentage of power demand costs for the pumping of water. In the case of the NGWSP, Variable OM&R costs also include costs associated with the treatment of water.

4. CONDITIONS

This Contract will give rise to rights and obligations on the part of the Navajo Nation and the United States. The provisions of Part IV, and the provisions of Article 32 Part V as they relate to Part II and Part IV, will become enforceable only after the Partial Final Decree is entered by the District Court of San Juan County, New Mexico, in the general stream adjudication of the San Juan River stream system, *New Mexico v. United States*, No. 75-184, which Partial Final Decree adjudicates water rights of the Navajo Nation in and from the San Juan River Basin in New Mexico per paragraph 3.0 of the Settlement Agreement and is of the form provided in Appendix 1 to the Settlement Agreement. All other provisions of the Contract will be enforceable upon execution of the Contract.

5. PRELIMINARY UNDERSTANDINGS

(a) The Navajo Nation may purchase, receive and use ALP water in accordance with the relevant provisions of this Contract prior to the entry of the Partial Final Decree.

(b) The obligations of the parties under Contract No. 14-06-W-269 between the United States and the Navajo Nation for delivery of water from Navajo Reservoir for the principal purpose of furnishing irrigation water to the NIIP shall continue in force until

the entry of the Partial Final Decree after which Contract No. 14-06-W-269 shall be superseded by this Contract.

(c) Separate contracts for additional water, as available, may be negotiated between the Navajo Nation and the United States in the future pursuant to the provisions of paragraph 8.0 of the Settlement Agreement, but they do not constitute any part of the consideration for this Contract.

(d) Except as specifically provided in this Contract and as provided in the waivers and releases set forth in Section 10703 of the Navajo Settlement Act, nothing in this Contract should be construed to affect or alter other obligations that the United States may have under treaty, statute, or otherwise to provide or operate water project facilities and water distribution systems on Navajo Lands.

PART II. **NIIP**

6. WATER DELIVERY PROVISIONS

(a) The United States agrees to deliver, or make available for delivery, to the Navajo Nation an average diversion of not more than 508,000 acre-feet per year, or the quantity of water necessary to supply an average depletion of 270,000 acre-feet per year from the San Juan River, whichever is less, during any period of ten consecutive years, and not more than 584,200 acre-feet in any one year for delivery to the NIIP from:

(i) Navajo Reservoir from the following delivery points under State Engineer File No. 2849:

(A) the intake to the NIIP main canal; or

(B) the Navajo Dam outlet works; or

(ii) inflows below Navajo Dam under State Engineer File No. 3215 at Cutter Reservoir or at Gallegos Reservoir or suitable alternative; or

(iii) both (i) and (ii) in combination.

(b) Pursuant to Section 2(c) of the Act of June 13, 1962, as amended by Section 10402(a) of the Navajo Settlement Act, water delivered pursuant to Part II Article 6(a) may be used within the area served by the NIIP facilities for irrigation and the following purposes:

(i) Aquaculture purposes, including the rearing of fish in support of the San Juan River Basin Recovery Implementation Program authorized by Public Law 106-392 (114 Stat. 1602).

(ii) Domestic, industrial, or commercial purposes relating to agricultural production and processing.

(iii) The generation of hydroelectric power as an incident to the diversion of water by the NIIP for authorized purposes.

(iv) The implementation of the alternate water source provisions described in subparagraph 9.2 of the Settlement Agreement executed under Section 10701(a)(2) of the Navajo Settlement Act.

(c) Pursuant to Section 2(d) of the Act of June 13, 1962, as amended by Section 10402(a) of the Navajo Settlement Act, water diverted by the NIIP may be transferred to areas located within or outside the area served by the NIIP facilities and on or off Navajo Lands for any beneficial use in accordance with:

(i) the agreement executed under section 10701(a)(2) of the Navajo Settlement Act;

(ii) this Contract; and

(iii) any other applicable law.

(d) If the Navajo Nation proposes to change the place or purpose of use or the point of diversion in the exercise of its rights to use water for the uses described in Part II Article 6(b) or 6(c) of this contract, in addition to providing notice to the New Mexico State Engineer as required by Paragraph 18 of the Partial Final Judgment and Decree of the Water Rights of the Navajo Nation, notice shall be provided to the United States pursuant to Part VI Article 56 of this contract.

(e) The Navajo Nation shall be solely responsible for the construction, operation, maintenance and replacement specific to all modifications and additions to NIIP facilities that are necessary to use NIIP water for the purposes provided in Part II Article 6(b)(i) through (iv) and 6(c) above. As long as title to NIIP facilities is held by the United States, the Navajo Nation shall obtain the approval of the United States prior to the construction of any modification or addition to the NIIP facilities.

(f) The Navajo Nation under this Contract shall have no holdover storage rights in Navajo Reservoir from year to year. Any water at Navajo Reservoir subject to delivery hereunder not called for by the end of each calendar year shall become integrated with the water supply for all purposes of the reservoir at that time.

(g) The Navajo Nation must notify the Contracting Officer and the Project Operator of its scheduled locations, amounts and timings of anticipated deliveries or diversions prior to any delivery of water from Navajo Reservoir under State Engineer File No. 2849. The requested delivery or change in delivery shall be made by the Contracting Officer or the Project Operator in a reasonable time within the ability to manage the operation of Navajo Dam or the NIIP intake, as appropriate, or as otherwise agreed to between the Navajo Nation and the Contracting Officer .

(h) Nothing in this Contract is intended to impose on the United States any obligation to maintain Navajo Dam and Reservoir or the NIIP beyond their useful lives, or to take extraordinary measures to keep these facilities operating.

(i) The points of delivery of water made available for use pursuant to this section from Navajo Reservoir and from inflows to the San Juan River arising below the reservoir shall be as specified in Part II Article 6(a) unless changed consistent with the Partial Final Decree and pursuant to agreement of the Contracting Officer and the Navajo Nation. Water made available at Navajo Dam to make the diversions and depletions described in subparagraphs 3(d), 3(e) and 3(f) of the Partial Final Decree that are supplied under this Contract pursuant to the alternate water source provisions of subparagraph 9.2 of the Settlement Agreement shall be accounted under the contract rights for delivery of water under the NIIP described in Part II herein.

(j) To the extent that delivery of water is made through or from federal facilities, the Navajo Nation will reimburse costs associated with this delivery in accordance with the provisions of Part II Article 8 of this Contract.

7. WATER SUPPLY AND SHORTAGE

(a) Notwithstanding any other provisions of this Contract, in times of shortage in the Navajo Reservoir water supply to meet demands under contracts for delivery of water from said supply, taking into account water available from inflows below Navajo

Dam to help meet the demands, the Navajo Nation will share in the available water supply in the manner set forth in Section 11 of the Act of June 13, 1962 (76 Stat. 96) as amended by Section 10402(b) of the Navajo Settlement Act.

(b) On account of drought or other causes outside the control of the United States, there may occur at times during any year a shortage in the quantity of water available for use by the Navajo Nation pursuant to this Contract. In no event shall any liability accrue against the United States or any of its officers, agents, or employees, for any damage, direct or indirect, arising out of any such shortage, and payments due the United States provided for herein shall not be reduced because of such shortage.

8. COST PROVISIONS

Charges for water made available pursuant to Part II Article 6 will be as follows:

(a) The Navajo Nation's construction cost obligation for the NIIP within the ability of the land to repay shall be allocated and payment deferred under the provisions of the Leavitt Act (47 Stat. 564), as authorized in subsection 4(d) of the Colorado River Storage Project Act (70 Stat. 105). The Navajo Nation's construction cost obligation for the NIIP beyond the ability of the land to repay shall be non-reimbursable as authorized in subsection (6) of the Colorado River Storage Project Act (70 Stat. 105).

(b) The Navajo Nation's OM&R obligation for the NIIP for the delivery of water made available pursuant to Part II Article 6(b)(i) and (ii) will be based on the incremental increase in OM&R costs associated with the conveyance and delivery of that water. Provisions for payment of these costs shall be made in a future agreement between the Navajo Nation and the United States pursuant to Section 4 of the 1962 Act.

(c) The Navajo Nation shall pay the United States or its designee if some organization other than the United States is operating Navajo Dam and Reservoir, the Navajo Nation's proportionate share of the OM&R costs for Navajo Dam and Reservoir assignable to the amount of water made available pursuant to Section 10402(d) of the Navajo Settlement Act. The Navajo Nation's obligation for Navajo Dam and Reservoir OM&R costs shall be triggered by either a Subcontract or the notice provided by the Navajo Nation to the United States, as described in Part II Article 6(c) and (d), respectively. The Navajo Nation's obligation for Navajo Dam and Reservoir OM&R

costs shall be paid on the basis of annual cost estimates made by the United States, or its designee, based upon the quantity of the NIIP water that is made available under Subcontracts authorized by Section 10402(d). The estimates will be sent annually to the Navajo Nation on or before May 1 for the next Federal Fiscal year, which begins October 1 of the same calendar year and ends September 30 of the next calendar year. The Navajo Nation shall advance its annual share of the Navajo Dam and Reservoir OM&R costs for the next Federal fiscal year on or before September 30. The first such billing will be issued based upon the effective date NIIP water is provided under Subcontracts and in the event this effective date shall be for costs of service of less than a full year, such costs shall be prorated for the period covered.

9. LIMITED RESPONSIBILITY FOR DISTRIBUTION

(a) Upon delivery, as specified under Part II Article 6(a) herein, the Navajo Nation shall hold the United States, its officers, agents, employees, and successors or assigns, harmless from every claim for damages to persons or property, direct or indirect, and of whatever nature, arising out of or in any manner connected with the control, carriage, handling, distribution or use of such water beyond the point of delivery; except to the extent that such responsibilities are placed on the United States by Act of Congress.

PART III. **ALP**

10. WATER DELIVERY PROVISIONS

(a) Pursuant to the Colorado Ute Settlement Act Amendments of 2000, the United States agrees to deliver or make available for delivery to the Navajo Nation a municipal and industrial water allocation with an average annual depletion not to exceed 2,340 acre-feet from the ALP water supply under New Mexico State Engineer File No. 2883, subject to the provisions of the Navajo Settlement Act, the Settlement Agreement, the Partial Final Decree and this Contract. Water delivered pursuant to this article shall be measured utilizing measuring facilities installed by the United States as a part of the ALP at the following points of delivery:

(i) The outlet works of Ridges Basin Dam; or

(ii) Bypassed at the Durango Pumping Plant; or

(iii) Both in combination.

(b) The Navajo Nation may divert its ALP water at the points of diversion for use by the Navajo Nation under its water rights for the ALP, consistent with the Navajo Settlement Act, the Settlement Agreement, the Partial Final Decree and this Contract. Sufficient water will be delivered from ALP water released from Lake Nighthorse or bypassed at the Durango Pumping Plant to meet the annual water allocation requirements of the Navajo Nation up to its Statutory Water Allocation.

(c) If the IGA is in effect, the Navajo Nation shall have the right to receive water from storage from Lake Nighthorse in accordance with the Joint Storage Pool as described in the IGA.

(d) If the IGA is voided or otherwise terminated, the Navajo Nation under this Contract shall have 869 acre-feet of storage capacity space allocated for its exclusive use in Lake Nighthorse to support use of the ALP water supply as described in Part III Article 10(a). The United States, or the Project Operator, shall fill and refill the Navajo Nation's storage capacity space as often as direct flow is available from the Animas River to fill said space under the ALP diversion right issued in the State of Colorado and the Animas-La Plata Project Compact (82 Stat. 898). The Navajo Nation shall have holdover storage rights in Lake Nighthorse from year to year to the extent that water stored in the Navajo Nation's storage capacity space may be held for exclusive delivery to the Navajo Nation in future years as necessary to meet the delivery demands of the Navajo Nation in accordance with Part III Article 10(a) and 13(a). Nothing in this Contract shall prohibit the Navajo Nation from acquiring additional storage capacity space in Lake Nighthorse if additional space becomes available.

(e) The Navajo Nation must notify the Contracting Officer and the Project Operator of any requests for or changes in delivery of water from the ALP under State Engineer File No. 2883. The requested delivery or change in delivery shall be made by the Project Operator in a reasonable time within its ability to manage the operation of the project and in accordance with the IGA if the IGA is in effect, or as otherwise agreed to between the Navajo Nation, the Contracting Officer, and the Project Operator.

(f) Nothing in this section is intended to impose on the United States any obligation to maintain Ridges Basin Dam and Lake Nighthorse and related facilities or the NNMP beyond their useful lives, or to take extraordinary measures to keep these facilities operating

(g) The points of delivery of water made available for use pursuant to this section from the ALP shall be as specified in Part III Article 10(a) unless changed consistent with the Partial Final Decree and pursuant to written agreement of the Contracting Officer and the Navajo Nation.

(h) To the extent that delivery of water is made through or from federal facilities, the Navajo Nation will reimburse costs associated with this delivery in accordance with the provisions of Part III Article 15 of this Contract.

11. ALP PROJECT WORKS

Subject to the terms and conditions of this and other applicable contracts related to the ALP, the United States has constructed the following ALP Project Works and appurtenant facilities, has acquired lands, and shall provide certain moveable property and equipment to the Project Operator needed for ALP operation and maintenance as, in the opinion of the United States in consultation with the Association, are necessary for ALP purposes, without being limited by enumeration and within the limit of funds made available by the Congress and the contracting parties.

(a) The Project Works consist of the following:

(i) Ridges Basin Dam and Lake Nighthorse and appurtenant facilities, the storage facility for the Project, are located on Basin Creek in Ridges Basin approximately 3 miles southwest of Durango, Colorado. The reservoir has a capacity of approximately 120,000 acre-feet.

(ii) Durango Pumping Plant and appurtenant facilities are located adjacent to the Animas River and pumps water from the Animas River for storage in Lake Nighthorse.

(iii) Ridges Basin Inlet Conduit and appurtenant facilities extend from the Durango Pumping Plant to Lake Nighthorse.

(iv) Operation and Maintenance Facilities will be constructed as determined necessary by the United States, after consultation with the Project Construction Coordinating Committee, for the required operation and maintenance of ALP Project Works.

(b) In addition to the ALP Project Works identified in Part III Article 11(a) above, the United States is constructing the Navajo Nation Municipal Pipeline to augment the existing system that conveys municipal water supplies, in an amount not less than 4,680 acre-feet per year, to the Navajo Indian Reservation at or near Shiprock, NM as a facility of the ALP authorized under Section 15(b) of the Colorado Ute Settlement Act Amendments of 2000.

(c) The United States, after consultation with the Navajo Nation, shall have the right at any time to increase the capacity of the ALP Project Works or any unit or feature thereof for other than currently authorized project purposes without additional capital or operation and maintenance cost to the Navajo Nation; provided, that the Navajo Nation's use of the Statutory Water Allocation shall not be impaired thereby. The right of use of such increased capacity is reserved to the United States.

(d) Any additions, changes to, or operation of ALP Project Works or changes in use of the water allocations pursuant to Sec. 6(a)(1)(A)(ii) of the Colorado Ute Settlement Act Amendments of 2000, as amended, from that stated in the Animas-La Plata Final Supplemental Environmental Impact Statement (FSEIS) dated July 2000 and subsequent Record of Decision dated September 25, 2000, shall, as required by law, be subject to further compliance with applicable environmental statutes, which shall include an analysis of potential impacts on other project Sponsors.

(e) Construction and operation of the ALP will be in accordance with the Environmental Commitments in Chapters 4 and 5 of the FSEIS, which are attached as Exhibit A to this Contract.

12. CONSTRUCTION AND OPERATION OF FACILITIES

(a) Nothing in this Contract shall be construed to obligate the United States to construct, install, operate or maintain dams, pumps, pipelines, storage tanks, distribution lines or other facilities required to take, measure, convey or distribute water for use

beyond agreed upon points of delivery; except, that the United States shall have such obligations as conferred upon the Secretary by the authorities to construct, maintain and operate the ALP in accordance with the Colorado River Storage Project Act (70 Stat. 105), the Act of June 13, 1962 (76 Stat. 96), and the Colorado Ute Settlement Act Amendments of 2000 (114 Stat. 2763A-258). The ALP shall be operated in a manner consistent with applicable law.

(b) Coordination of construction, operation and maintenance of the ALP shall be accomplished through the following two committees:

(i) The Project Construction Coordination Committee, which consists of representatives of the Bureau of Reclamation and Project contractors, including the Navajo Nation, provides coordination and consultation on the construction activities among all ALP sponsors, seeking common understanding and consensus on decisions associated with final plans, construction schedules and costs for ALP facilities, and shall dissolve upon completion of ALP construction.

(ii) The Association consists of representatives of those entities which have been identified by the Colorado Ute Settlement Act Amendments of 2000, as amended, to receive a water allocation. This Association has contracted with Reclamation for the operation and maintenance of ALP multipurpose facilities and developed, among the ALP sponsors, a common understanding of the appropriate level of OM&R activities to be performed on the ALP multipurpose facilities to assure the long-term operational integrity of ALP and public safety. Ultimately, the Association will oversee the ongoing OM&R activities of ALP, providing consultation and coordination among the Association members and Reclamation on such items as annual OM&R funding, maintenance schedules, and public safety issues.

(iii) Failure of the committees to reach common understandings or to otherwise coordinate with the Bureau of Reclamation on construction, operation and maintenance of the ALP shall in no way nullify or reduce the obligation of the United States to construct, operate and maintain ALP facilities, including the NNMP, or to deliver water to the Navajo Nation as

authorized by the Colorado Ute Settlement Act Amendments of 2000 (114 Stat. 2763A-258), the Navajo Settlement Act, the Settlement Agreement, and this Contract.

13. WATER SUPPLY SHORTAGE

(a) With respect to water made available from the ALP under the terms of this Contract, during periods when the Contracting Officer, or the ALP Operator finds that the direct flow of the Animas River is insufficient to supply 100 percent of the water deliveries under contracts for ALP water, the Navajo Nation shall share in the available direct flow consistent with Article 1 of the Animas-La Plata Project Compact (82 Stat. 898).

(b) In any year in which there may occur a shortage in the Statutory Water Allocation from any cause at the points of delivery, the ALP Operator reserves the right to make a conclusive determination of shortage and to apportion the available ALP water allocation among the ALP sponsors subject to the Colorado Ute Settlement Act Amendments of 2000, as amended, the IGA, and applicable laws, including the Animas-La Plata Project Compact.

(c) On account of drought or other causes outside the control of the United States, there may occur at times during any year a shortage in the quantity of water available for delivery to the Navajo Nation pursuant to this Contract. In no event shall any liability accrue against the United States or any of its officers, agents, or employees, for any damage, direct or indirect, arising out of any such shortage, and payments due the United States provided for herein shall not be reduced because of such shortage.

14. BLOCK NOTICE FOR ALP WATER DELIVERY

(a) When the ALP Project Water becomes available for use by the Navajo Nation, the United States shall, after consultation, give the Navajo Nation written notice, referred to herein as the "ALP Block Notice". The ALP Block Notice shall contain: (1) the quantity of Project Water available to the Navajo Nation from the ALP, and (2) the effective date that water is available for delivery to the Navajo Nation.

(b) The ALP Block Notice and any amendments thereto shall become a part of this Contract.

15. COST PROVISIONS

The Navajo Nation's cost obligations for the ALP will be as follows:

(a) Prior to water becoming available for use by the Navajo Nation, pursuant to Part III Article 14(a) above, the OM&R costs allocated to the Navajo Nation's ALP Project Water shall be paid by Reclamation. Upon water becoming available for use by the Navajo Nation, pursuant to Part III Article 14(a) above, the Contracting Officer will notify the Navajo Nation of the transfer of responsibility for the Navajo Nation's ALP OM&R costs at least sixty (60) days prior to the effective date of the transfer.

(b) The OM&R costs allocated to the Navajo Nation's Statutory Water Allocation will be comprised of:

(i) the Navajo Nation's share of Fixed OM&R costs of the multipurpose facilities as defined in the IGA. The Navajo Nation's share, as identified in the IGA is 2.5% of the total Fixed OM&R costs. If the IGA is voided or otherwise terminated, the Navajo Nation's share of Fixed OM&R costs will be defined by the final cost allocation;

(ii) the Navajo Nation's share of Variable OM&R costs of the multipurpose facilities, which are actual costs of replacing water released from storage in Lake Nighthorse by request of the Navajo Nation, as defined in the IGA, which contains provisions for a Variable OM&R fund, designed to pay all or part of the ALP Variable OM&R costs;

(iii) all OM&R costs associated with the NNMP during the period in which title to the pipeline is held by the United States. In addition, the Navajo Nation shall be responsible for providing OM&R of the NNMP and for funding the OM&R costs of the pipeline when title of the pipeline is transferred to the Navajo Nation. The Navajo Nation's OM&R responsibilities associated with the NNMP shall be further identified and provisions for payment made in the NNMP operations agreement identified in Section 10605(b) of the Navajo Settlement Act. If title is not conveyed, the

OM&R responsibilities and the Navajo Nation's share of OM&R costs associated with the NNMP shall be further identified and provisions for payment made in a separate OM&R contract that will be required between Reclamation and the NNMP operator.

(c) The Navajo Nation agrees to pay, in advance, its share of the ALP Fixed and Variable OM&R costs. Payment of the Navajo Nation's, or its assignee's, allocated OM&R costs shall be made annually in advance, within 60 days of receipt of the annual charge notice issued by the Project Operator based on the Association's annual estimate of ALP OM&R costs. If the Navajo Nation's allocated OM&R costs exceed the sum paid in advance, then a supplemental charge notice will be issued and the Navajo Nation will pay the sum required within 60 days of receipt. If the Navajo Nation's allocated OM&R costs are less than the sum advanced, then the Navajo Nation shall receive a credit for the overpayment upon its next annual charge notice.

(d) In the event either the ALP OM&R cost estimate falls short of the actual costs in any period, or whenever it is anticipated by the Contracting Officer that a deficit will occur during the year, supplemental notices may be issued by the Contracting Officer requesting additional funds. OM&R funds not spent during one calendar year will be carried over for use during the next calendar year with funds required for that year being reduced accordingly. An itemized statement of actual costs incurred during each year shall be furnished to the Navajo Nation.

(e) Billings from the Contracting Officer or the Project Operator, and payments by the Navajo Nation of the OM&R costs outlined under this section shall be made on the basis of Part III Articles 15(b) and 15(c). For project operation purposes, the Navajo Nation will provide an annual notice to the Contracting Officer, or the Project Operator, identifying the amount of water estimated to be used by the Navajo Nation, the estimated period and point of diversion for each intended purpose and a listing of all executed Subcontracts with third parties, including those Subcontracts anticipated to be executed during the year of applicability. The Navajo Nation shall send this notice on or before February 1 of the year preceding the year of use described in the notice. Upon receipt of such notice, the Contracting Officer, or the Project Operator, will bill the Navajo Nation for payment of costs as prescribed herein. Billing adjustments will be made to correct for

differences in the estimated and actual use of water, as well as, the estimated and actual costs during the preceding year.

16. TITLE TRANSFER

Title to NNMP facilities shall remain in the name of the United States, until transferred to the Navajo Nation pursuant to Section 10605(b) of the Navajo Settlement Act.

17. LIMITED RESPONSIBILITY FOR DISTRIBUTION

(a) Upon delivery, as specified under Part III Article 10(a) herein, the Navajo Nation shall hold the United States, its officers, agents, employees, and successors or assigns, harmless from every claim for damages to persons or property, direct or indirect, and of whatever nature, arising out of or in any manner connected with the control, carriage, handling, distribution or use of such water beyond the point of delivery. Section 10605(b) of the Navajo Settlement Act acknowledges the City of Farmington's role for the diversion, treatment and conveyance of water made available under this Contract.

PART IV. **NGWSP**

18. WATER DELIVERY PROVISIONS

(a) The United States agrees to deliver, or make available for delivery, to the Navajo Nation a diversion of not more than 22,650 acre-feet, or the quantity of water necessary to supply a depletion of 20,780 acre-feet from the San Juan River, whichever is less, in any one year, water allocated to the Navajo Nation under its water rights for the NGWSP uses in New Mexico from Navajo Reservoir or from the points of diversion from the San Juan River as authorized by Section 10603 of the Navajo Settlement Act, under State Engineer File Nos. 2849 and 3215, subject to the provisions of the Navajo Settlement Act, the Settlement Agreement, the Partial Final Decree, and this Contract.

(b) Nothing in this section is intended to impose on the United States any obligation to maintain the NGWSP beyond its useful life or to take extraordinary measures to keep the facilities operating.

(c) The points of delivery of water made available for use pursuant to this section from Navajo Reservoir and the San Juan River shall be as specified in Part IV Article 18(a) unless changed as allowed by the Partial Final Decree and pursuant to written agreement of the Contracting Officer and the Navajo Nation.

(d) To the extent that delivery of water is made through or from federal facilities, the Navajo Nation will reimburse costs associated with this delivery in accordance with the provisions of Part IV Article 26 of this Contract.

(e) The Navajo Nation must notify the Contracting Officer, the NIIP Project Operator, and the NGWSP Project Operator of its scheduled locations, amounts and timings of anticipated diversions prior to any delivery of water from the NGWSP under State Engineer File Nos. 2849 and 3215. The requested delivery or change in delivery shall be made by the Contracting Officer, the NIIP Project Operator, and the NGWSP Project Operator in a reasonable time within their abilities to manage the operation of Navajo Dam and the NIIP intake, as appropriate, or as otherwise agreed to between the Navajo Nation, the Contracting Officer, the NIIP Project Operator, the NGWSP Project Operator.

19. NGWSP FACILITIES

Subject to the terms and conditions of this and other applicable contracts related to the NGWSP, the United States will construct the following NGWSP facilities and appurtenant facilities without being limited by enumeration and within the limit of funds made available pursuant to the Navajo Settlement Act.

(a) The NGWSP facilities consist of two laterals, the San Juan Lateral and the Cutter Lateral, as generally described in the Navajo-Gallup Water Supply Project Final Environmental Impact Statement (FEIS) dated July 2009 and subsequent Record of Decision dated October 1, 2009.

(b) Operation and maintenance facilities will be constructed as determined necessary by the United States, after Consultation with the Project Construction Committee, for the required operation and maintenance of NGWSP facilities.

(c) As a condition of construction of the facilities authorized under Section 10602 (b) of the Navajo Settlement Act, the Project Participants shall provide all land or

interest in land, as appropriate, that the United States identifies as necessary for acquisition under Section 10602 (c) of the Navajo Settlement Act at no cost to the United States.

(d) Any additions, changes to, or operation of NGWSP facilities or changes in use of the water allocations pursuant to Section 10603(b)(1)(B) of the Settlement Act from that stated in the Navajo-Gallup Water Supply Project FEIS dated July 2009 and subsequent Record of Decision dated October 1, 2009, will, as required by law, be subject to further compliance with applicable environmental statutes, which shall include an analysis of potential impacts on other Project Participants.

(e) Construction and operation of the NGWSP will be in accordance with the Environmental Commitments in Chapter VI of the FEIS, which are attached as Exhibit B to this Contract.

20. CONSTRUCTION AND OPERATION OF FACILITIES

(a) Nothing in this Contract shall be construed to obligate the United States to construct, install, operate or maintain dams, pumps, pipelines, storage tanks, distribution lines or other facilities required to take, measure, convey or distribute water for use beyond agreed upon points of delivery; except, that the United States shall have such obligations as conferred upon the Secretary by the authorities to construct, maintain and operate Navajo Dam and Reservoir, the NIIP and the NGWSP in accordance with the Colorado River Storage Project Act (70 Stat. 105), the Act of June 13, 1962 (76 Stat. 96), and the Navajo Settlement Act

(b) Coordination of construction, operation and maintenance of the NGWSP shall be accomplished through the establishment of a Project Construction Committee which will consist of representatives of the Bureau of Reclamation and the Project Participants, and may include the State of New Mexico.

(i) The Project Construction Committee shall:

(A) review cost factors and budgets for construction and operation and maintenance activities; and

(B) improve construction management through enhanced communication; and

(C) seek additional ways to reduce overall NGWSP costs.

(ii) Failure of the committee to reach common understandings or to otherwise coordinate with the Bureau of Reclamation on construction, operation and maintenance of the NGWSP shall in no way nullify or reduce the obligation of the United States to construct, operate and maintain NGWSP facilities or to deliver water to the Navajo Nation as authorized by the Navajo Settlement Act, the Settlement Agreement, and this Contract.

21. WATER SUPPLY AND SHORTAGE

(a) Notwithstanding any other provisions of this Contract, during times of shortage in the Navajo Reservoir water supply to meet demands under contracts for delivery of water from said supply, taking into account water available from inflows below Navajo Dam to help meet the demands, the Navajo Nation will share in the available water supply in the manner set forth in Section 11 of the Act of June 13, 1962 (76 Stat. 96), and Section 10402 (b) of the Navajo Settlement Act.

(b) On account of drought or other causes outside the control of the United States, there may occur at times during any year a shortage in the quantity of water available for use by the Navajo Nation pursuant to this Contract. In no event shall any liability accrue against the United States or any of its officers, agents, or employees, for any damage, direct or indirect, arising out of any such shortage, and payments due the United States provided for herein shall not be reduced because of such shortage.

22. NOTIFICATION OF SUBSTANTIAL COMPLETION

When features or reaches of the NGWSP have been declared to be substantially complete and water can be made available to the Navajo Nation, the United States shall, after consultation, give the Navajo Nation written notice, referred to herein as the “Notice of Substantial Completion”. The Notice of Substantial Completion shall contain: (1) a description of the NGWSP facilities that have been determined to be substantially complete and can generate water delivery, (2) a list of the feature(s) or reach(es) which are completed, (3) the effective date of that substantial completion declaration, and (4) the

proportionate share of OM&R costs associated with the completed NGWSP facilities that are allocated to the Navajo Nation pursuant to Article 26 of this Contract.

23. BLOCK NOTICE FOR NGWSP WATER AVAILABILITY

(a) When NGWSP water can be made available to the Navajo Nation, the United States shall, after consultation, give the Navajo Nation written notice, referred to herein as the "NGWSP Block Notice". The NGWSP Block Notice shall contain: (1) the effective date that NGWSP water is made available, (2) the quantity of NGWSP water available to the Navajo Nation from the block, (3) the designation of the lateral, either Cutter Lateral or San Juan Lateral, that will be used to convey the available block of NGWSP water under notice, and (4) a description of the feature(s) or reach(es) which can receive NGWSP water.

(b) The NGWSP Block Notice and any amendments thereto shall become a part of this Contract.

24. CARRIAGE OF NON-PROJECT WATER

(a) During the period where Title to NGWSP facilities is held by the United States, the Secretary may enter into a contract for the treatment and carriage of non-Project water through the NGWSP if, after consultation with the Navajo Nation, it is determined that capacity is available without impairing delivery to a Project Participant. Any contract for treatment and carriage of non-Project water shall include the following terms:

(i) the beneficiary shall pay the OM&R costs associated with treatment and carriage of the non-Project water;

(ii) the beneficiary shall pay an appropriate fee that may be established by the Secretary to assist in the recovery of any capital cost allocable to that use; and

(iii) the contract for treatment and carriage of non-Project water shall terminate if delivery to a Project Participant is impaired.

(b) Following transfer of Title to an NGWSP facility to the Navajo Nation pursuant to Article 27, the Navajo Nation may enter into a contract for the treatment and

carriage of non-Project water through that NGWSP facility if capacity is available without impairing delivery to a Project Participant. Any contract for treatment and carriage of non-Project water shall include the following terms:

(i) the beneficiary shall pay the OM&R costs associated with treatment and carriage of the non-Project water;

(ii) the beneficiary shall pay an appropriate fee that may be established by the Secretary to assist in the recovery of any capital cost allocable to that use; and

(iii) the contract for treatment and carriage of non-Project water shall terminate if delivery to a Project Participant is impaired.

25. ADDITIONAL CAPACITY

(a) During the period where Title to NGWSP facilities is held by the United States, the Navajo Nation may request of the Secretary the use of additional capacity in an NGWSP facility for treatment and carriage of water if capacity is available without impairing delivery to a Project Participant. The Secretary shall approve or disapprove the request within 180 days of receipt of the request. Prior to use of any additional capacity, the Navajo Nation must agree to the following terms:

(i) pay the OM&R costs associated with the additional capacity to be used;

(ii) pay any fee established by the Secretary to assist in recovering capital costs relating to the additional use; and

(iii) use of additional capacity shall be terminated if delivery to a Project Participant is impaired.

(b) Following transfer of Title to an NGWSP facility pursuant to Article 27, the Navajo Nation may request of the owner of the NGWSP reach or facility the use of additional capacity in an NGWSP facility for treatment and carriage of water if capacity is available without impairing delivery to a Project Participant. The owner of the NGWSP reach or facility shall approve or disapprove the request within 180 days of receipt of the request. Prior to use of any additional capacity, the Navajo Nation must agree to the following terms:

(i) pay the OM&R costs associated with the additional capacity to be used;

(ii) pay any fee established by the owner of the NGWSP reach or facility relating to the additional use; and

(iii) use of additional capacity shall be terminated if delivery to a Project Participant is impaired.

26. COST PROVISIONS

(a) The Navajo Nation shall pay the United States or its designee if some organization other than the United States is operating Navajo Dam and Reservoir, the Navajo Nation's proportionate share of the OM&R costs for Navajo Dam and Reservoir assignable to the amount of water made available to the Navajo Nation through Part IV Article 23 of this Contract. The Navajo Nation's proportionate share of Navajo Dam and Reservoir OM&R costs will be based upon 100 percent of the water supply available under NGWSP Block Notice and designated for the Cutter Lateral and 50 percent of the water supply available under NGWSP Block Notice and designated for the San Juan Lateral.

(b) The Navajo Nation shall pay the United States or its designee if some organization other than the United States is operating the NIIP, a proportionate share of OM&R costs for the NIIP facilities that are used to convey NGWSP water made available to the Navajo Nation through Part IV Article 23 of this Contract. The proportionate share of OM&R costs for the NIIP facilities used to convey NGWSP water shall be identified and provisions for payment made in the OM&R contract that will be required between Reclamation and the NGWSP operator. The Navajo Nation's construction cost obligation for the NGWSP shall be allocated, waived and declared non-reimbursable by the Secretary.

(c) The Navajo Nation's OM&R cost obligation for the NGWSP shall be paid to the United States, or its designee if some organization other than the United States is operating the NGWSP facilities, as follows:

(i) For any feature or reach of the NGWSP, declared substantially complete under Part IV Article 22, through or by which water can only be delivered to

the Navajo Nation, the Navajo Nation shall pay all OM&R costs associated with water delivery, until such time water can be delivered through or by that feature or reach to other Project Participants, at which time Part IV Article 26(d)(ii) below shall apply.

(ii) For any feature or reach of the NGWSP through or by which water delivery is a benefit to the Navajo Nation and any other Project Participant, the Navajo Nation's OM&R cost obligation will be comprised of:

(A) the Navajo Nation's share of Fixed OM&R costs based upon its proportionate share of the design capacity for all NGWSP facilities, or reaches of those facilities, which have been declared substantially complete through Part IV Article 22 of this Contract.

(B) the Navajo Nation's share of Variable OM&R costs.

(d) Billing and payment for the Navajo Nation's OM&R cost obligations shall be conducted as follows:

(i) The Navajo Nation's obligation for Navajo Dam and Reservoir OM&R, as provided under Part IV Article 26(a) above, shall be paid on the basis of annual cost estimates made by the Contracting Officer, or its designee. An estimate from the Contracting Officer will be sent annually to the Navajo Nation on or before May 1 for the next Federal fiscal year, which begins October 1 of the same calendar year and ends September 30 of the next calendar year. The Navajo Nation shall advance its annual share of the Navajo Dam and Reservoir OM&R costs for the succeeding Federal fiscal year on or before September 30. The first such billing will be issued based upon the effective date stated in the NGWSP Block Notice and in the event this effective date shall be for costs of service of less than a full year, such costs shall be prorated for the period covered.

(ii) Fixed OM&R costs for the NGWSP shall be paid on the basis of annual cost estimates made by the Contracting Officer, or the NGWSP Operator, based upon the proportionate share of the design capacity for those NGWSP facilities which have been declared substantially complete through Part IV Article 22 of this Contract. An estimate from the Contracting Officer,

or the NGWSP Operator, will be sent to the Navajo Nation on or before May 1 for the next Federal fiscal year, which begins October 1 of the same calendar year and ends September 30 of the next calendar year. The Navajo Nation shall advance its share of the OM&R costs for each Federal fiscal year in quarterly payments which will be due on September 30, December 31, March 31, and June 30 of the Federal fiscal year of applicability. The first such billing will be issued immediately following a notice of substantial completion as provided in Part IV Article 22 of this Contract. In the event the first notice shall be for costs of service of less than a full year, such costs shall be prorated for the period covered. An itemization of the estimated Fixed OM&R costs will accompany the billing.

(iii) Variable OM&R costs for the NGWSP shall be paid on the basis of an annual notice provided by the Navajo Nation to the Contracting Officer, or the NGWSP Operator, on or before May 1 for the next Federal fiscal year, which begins October 1 of the same calendar year and ends September 30 of the next calendar year. The annual notice will provide an estimate of the Navajo Nation's anticipated water delivery requirements on a quarterly basis. Based upon these anticipated water delivery requirements, the Contracting Officer, or the NGWSP Operator, will bill the Navajo Nation quarterly on September 30, December 31, March 31, and June 30 of the Federal fiscal year of applicability. An itemization of the estimated Variable OM&R costs will accompany the billing.

(e) In the event either the OM&R cost estimates fall short of the actual costs in any period, or whenever it is anticipated by the Contracting Officer that a deficit will occur during the fiscal year, supplemental notices may be issued by the Contracting Officer requesting additional funds. OM&R funds not spent during one fiscal year will be carried over for use during the next fiscal year with funds required for that year being reduced accordingly. An itemized statement of actual costs incurred during each year shall be furnished to the Navajo Nation. Billing adjustments will be made to correct for differences in the estimated and actual costs at the beginning of the next fiscal year, and

in the case of Variable OM&R costs, for differences in the Navajo Nation's estimated water delivery requirements and the actual metered flow.

(f) The Fixed OM&R costs and Variable OM&R costs of the NGWSP allocated to the Navajo Nation for the NGWSP facilities that have been determined to be substantially complete for water delivery under Part IV Article 22 of this Contract, that the Secretary determines are in excess of the ability of the Navajo Nation to pay, may be waived and declared non-reimbursable by the Secretary for not more than ten (10) years from the effective date established by the notice of substantial completion, pursuant to Sec. 10604(f)(1) of the Navajo Settlement Act. This waiver authority shall terminate on the date on which title to a facility is transferred to the Navajo Nation pursuant to Sec. 10604(f)(5).

(g) OM&R responsibilities and the Navajo Nation's share of OM&R costs associated with the NGWSP shall be further identified and provisions for payment made in the NGWSP operations agreement identified in Section 10602(f) of the Navajo Settlement Act. If title is not conveyed on a feature or reach, the OM&R responsibilities and the Navajo Nation's share of OM&R costs associated with NGWSP features and reaches shall be further identified and provisions for payment made in a separate OM&R contract that will be required between Reclamation and the NGWSP project operator.

27. CONVEYANCE OF TITLE

Title to NGWSP facilities shall remain in the name of the United States, until conveyed pursuant to Section 10602(f) of the Navajo Settlement Act.

28. LIMITED RESPONSIBILITY FOR DISTRIBUTION

(a) Upon delivery, as specified under Part IV Article 18(a) herein, the Navajo Nation shall hold the United States, its officers, agents, employees, and successors or assigns, harmless from every claim for damages to persons or property, direct or indirect, and of whatever nature, arising out of or in any manner connected with the control, carriage, handling, distribution or use of such water beyond the point of delivery. Section 10602(f) of the Navajo Settlement Act acknowledges the City of Gallup's role for the conveyance and distribution of water made available under this Contract for the NGWSP.

PART V. **GENERAL**

29. TERM OF CONTRACT

The water delivery rights recognized by this Contract shall be perpetual unless limited by a term of years, canceled, terminated, or rescinded by an Act of Congress.

30. TRANSPORTATION LOSSES

No conveyance losses beyond the points of delivery as specified in Part II Article 6(a), Part III Article 10(a), and Part IV Article 18 shall be borne by the United States. In the event that points of delivery are changed, transportation of water from the original points of delivery to other points of delivery shall be the sole responsibility of the Navajo Nation, so that no conveyance losses, including channel losses, shall be borne by the United States.

31. UNCONTROLLABLE FORCES

Neither party shall be considered to be in default in respect to any obligation hereunder if prevented from fulfilling such obligation by reason of uncontrollable forces. The term uncontrollable forces shall mean, for the purposes of this Contract, any cause beyond the control of the party affected, including but not limited to, drought, failure of facilities, flood, earthquake, storm, lightning, fire, epidemic, war, riot, civil disturbance, labor disturbance, sabotage, and restraint by court or public authority, which by exercise of due diligence and foresight, such party could not reasonably have been expected to avoid. Either party rendered unable to fulfill any obligation by reason of uncontrollable forces shall exercise due diligence to remove expeditiously such inability.

32. SUBCONTRACTS

(a) When water made available under this Contract is not being used by the Navajo Nation, the Navajo Nation may subcontract with third parties, subject to the provisions of the Navajo Settlement Act, the Settlement Agreement, the Partial Final Decree, and approval of the Contracting Officer in accordance with this section, to supply water for beneficial use on or off Navajo Lands in the State of New Mexico, subject to

and consistent with the same requirements and conditions of State law, and any applicable Federal law, interstate compact, and international treaty as apply to the exercise of water rights held by non-federal, non-Indian entities. Such Subcontracts shall not be considered subcontracts for purposes of Articles 44 and 46 of this Contract. Nothing in this Contract shall be construed to establish, address, or prejudice whether, or to prevent any party from litigating whether, or to the extent to which, any of the aforementioned laws do or do not permit, govern, or apply to the use of the Navajo Nation's water outside the State.

(b) Water identified in this Contract that is transferred or otherwise made available to entities other than the Navajo Nation shall require a Subcontract.

(c) Subcontracts made by the Navajo Nation with third parties shall be subject to the provisions of the Navajo Settlement Act, the Settlement Agreement, the Partial Final Decree, and this Contract, and must include terms of use, purchase, measurement, operations and default. A copy of each proposed Subcontract shall be filed with the New Mexico Interstate Stream Commission at least 30 days prior to being executed by the Navajo Nation; provided, that proposed emergency Subcontracts may be filed with less than 30 days notice. A copy of each executed Subcontract shall be filed with the New Mexico Interstate Stream Commission.

(d) Prior to approving any Subcontract, the Contracting Officer shall comply with subsection 102(2)(C) of the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. § 4332(2)(C). The Navajo Nation will furnish any data and information as may be required by the Contracting Officer for NEPA compliance documentation. The Contracting Officer has the authority under the Contributed Funds Act of 1921 (43 USC §395) to charge any Subcontractor for the costs associated with this compliance documentation. The Contracting Officer will coordinate with the Navajo Nation and the Subcontractor throughout the NEPA process, including furnishing copies of all related documentation.

(e) The Contracting Officer shall approve any Subcontract submitted by the Navajo Nation if the Contracting Officer determines that:

(i) the diversion and use of water under the Subcontract would comply with the Settlement Agreement, the Partial Final Decree, and other applicable

law, including any applicable permitting requirements and permit conditions of the New Mexico State Engineer, and the provisions of this Contract;

(ii) the sum of the term of the Subcontractor plus all renewals is no more than 99 years;

(iii) the use of water under the Subcontract is not inconsistent with the provisions of the Endangered Species Act or other provisions of federal law designed to protect the environment;

(iv) the Subcontract is sufficiently specific as to the amount of water and points of diversion to enable the Contracting Officer to account for the water as it is diverted; or, in the alternative, that the Subcontract reserves the Contracting Officer's right to review and approve future diversions sought under the Subcontract, such review and approval to be consistent with this Contract;

(v) the delivery obligations under the Subcontract are not inconsistent with other obligations of the Contracting Officer to deliver water under preexisting contracts.

(f) The annual OM&R assessments specified in Part III Article 15, and Part IV Article 26 above shall be charged to the Navajo Nation for all water contracted to third parties.

(g) The Secretary shall approve or disapprove a Subcontract submitted to the Secretary not later than the later of:

(i) the date that is 180 days after the date on which the Subcontract is submitted to the Secretary; and

(ii) the date that is 60 days after the date on which the Subcontractor complies with subsection 102(2)(C) of the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. § 4332(2)(C) and any other requirement of Federal law.

33. SEVERABILITY

If any provisions of this contract shall be held, by a court of competent jurisdiction, to be invalid, illegal, unenforceable or in conflict with the law of any

jurisdiction, the parties intend that the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.

34. TERMINATION

In the event that the Settlement Agreement is terminated pursuant to Section 10701(e)(2) of the Navajo Settlement Act, the parties agree that this Contract terminates and further agree to reinstate and continue in full force and effect those portions of the Contract for which separate authority is provided other than pursuant to the Navajo Settlement Act.

35. CONTRACT AMENDMENTS

Any modifications to this Contract necessitated by future negotiations between the parties can be accomplished by amending this Contract to the extent such amendments are consistent with the provisions of the Partial Final Decree and the Navajo Settlement Act, including any future amendments.

36. SAVINGS CLAUSES

(a) Nothing in this Contract shall be construed as an admission, or be used by any party as evidence, that the Navajo Nation is or is not legally entitled to reserved water rights in the San Juan River stream system.

(b) Nothing contained in this Contract shall be construed to alter, amend, repeal, construe, interpret, modify, or be in conflict with the provisions of: the Boulder Canyon Project Act (45 Stat. 1057); the Boulder Canyon Project Adjustment Act (54 Stat. 774); the Colorado River Compact, proclaimed on June 25, 1929 (46 Stat. 3000); the Upper Colorado River Basin Compact (63 Stat. 31); the 1944 Treaty with the United Mexican States, Treaty Series 994 (59 Stat. 1219); the Act of June 13, 1962 (76 Stat. 96); the Colorado River Basin Project Act (82 Stat. 885); the Colorado River Storage Project Act (70 Stat. 105); the Animas-La Plata Project Compact (82 Stat. 898); the Jicarilla Apache Tribe Water Rights Settlement Act (106 Stat. 2237); the Colorado Ute Settlement Act Amendments of 2000 (114 Stat. 2763A-258); or the Navajo Settlement Act.

(c) The uses of water in the State of New Mexico through works constructed under the authority of the Colorado River Storage Project Act (70 Stat. 105), the Act of June 13, 1962 (76 Stat. 96), the Colorado Ute Settlement Act Amendments of 2000 (114 Stat. 2763A-258) and the Navajo Settlement Act shall be subject to and controlled by the Colorado River Compact, the Upper Colorado River Basin Compact, the Animas-La Plata Project Compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act, the Colorado River Storage Project Act, the Colorado River Basin Project Act, the Mexican Water Treaty (Treaty Series 994), the Colorado Ute Settlement Act Amendments of 2000 and the Navajo Settlement Act, and shall be included within and shall in no way increase the total quantity of water to the use of which the State of New Mexico is entitled under said compacts, statutes, and treaty.

(d) Nothing in this Contract shall be construed in any way to quantify or otherwise adversely affect the land and water rights, claims or entitlements to water of any Indian tribe or community other than those of the Navajo Nation in, to and from the San Juan River Basin in New Mexico; except, that the right of the Navajo Nation to use water under water rights it may have in other river basins in New Mexico shall be forborne only so long as and to the extent that the Navajo Nation supplies the uses for which said water rights may exist by diversions of water from the San Juan River Basin under this Contract consistent with subparagraph 9.11 of the Settlement Agreement.

37. ENVIRONMENTAL COMPLIANCE AND COORDINATION

(a) The Navajo Nation, the United States Fish and Wildlife Service, the Bureau of Reclamation and the Bureau of Indian Affairs agree to cooperate and coordinate in the planning and construction of projects, diversions and changes in water management associated with the water made available to the Navajo Nation under the terms of this agreement as required by federal law, including, but not limited to, the Bald and Golden Eagle Protection Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the Clean Water Act, and the National Environmental Policy Act.

(b) The Navajo Nation and the Department of the Interior agree to work with the State of New Mexico and affected water users to assure that Navajo Dam and Reservoir,

the NIIP, the ALP and the NGWSP are operated in compliance with applicable laws while meeting water delivery obligations.

(c) Any modifications to project works, changes in operation of project works, or changes in use of the water from that stated in the respective NEPA documents of the three projects identified in this Contract, as well as the Final Environmental Impact Statement for Navajo Reservoir Operations dated April, 2006 shall be subject to the review and approval of the Contracting Officer for the sole purpose of ensuring that such uses are consistent with the operational capacities of the respective projects and all applicable laws, including ensuring that appropriate environmental review has been conducted.

PART VI. **STANDARD ARTICLES**

38. AIR AND WATER POLLUTION CONTROL

The Navajo Nation agrees that in taking delivery of water under this contract, it will comply with federal air and water pollution control laws, now or hereafter in force, that may be applicable or relevant to the use being made of the water. Also, the Navajo Nation agrees that any subcontract it may enter into for the furnishing of water pursuant to this contract will contain similar air and water pollution control provisions including state and local requirements, where applicable. The Navajo Nation further agrees that any such subcontract it may enter into will require that its designs and plans for air and water pollution control facilities or equipment which are necessary parts of any design, facility, plant or process which utilizes water delivered pursuant to this contract will be submitted to the Secretary for his review and written comments prior to contracting for said facilities, their installation or major modification thereof.

39. ADMINISTRATION OF FEDERAL PROJECT LANDS

The lands and interests in lands acquired, withdrawn, or reserved and needed by the United States for the purposes of care, operation, and maintenance of Federal project works may be used by the Navajo Nation for such purposes. The Navajo Nation shall ensure that no unauthorized encroachment occurs on Federal project lands and rights-of-way needed for the care, operation, and maintenance of Federal project works that the Navajo Nation has responsibility for. The Nation does not have the authority to issue any land-use agreement or grant that conveys an interest in Federal real property, nor to lease or dispose of any interest of the United States.

40. BOOKS, ACCOUNTS AND RECORDS

The Navajo Nation shall furnish to the Contracting Officer, as requested, information pertaining to land use and crop census, water supply, water use, changes in project works, and to other matters relating to the NIIP, the ALP, the NGWSP, and other

projects that may utilize the Navajo Nation's water rights supplied under this contract for miscellaneous municipal, industrial, commercial and domestic uses. The Secretary and the Navajo Nation shall jointly establish and maintain accounts and other books and records such as are necessary to enable the Secretary to operate the subject facilities. Reports thereon shall be furnished to the Contracting Officer in such form and on such date or dates as the Contracting Officer may require. Subject to applicable Federal laws and regulations, each party shall have the right during office hours to examine and make copies of the other party's books and records relating to matters covered by this contract. Records of diversions of water for use by the Navajo Nation pursuant to this contract shall be supplied to the New Mexico State Engineer.

41. CONTAMINATION OR POLLUTION OF FEDERAL PROPERTY

(a) The Navajo Nation shall not allow contamination or pollution of Federal project lands, project waters, or project works of the United States or administered by the United States and for which the Navajo Nation has the responsibility for care, operation, and maintenance by its employees or agents. The Navajo Nation shall also take reasonable precautions to prevent such contamination or pollution by third parties.

(b) The Navajo Nation shall comply with all applicable Federal laws and regulations and Reclamation policies and instructions existing, or hereafter enacted or promulgated, concerning any hazardous material that will be used, produced, transported, stored, released, or disposed of on or in Federal project lands, project waters, or project works.

(c) "Hazardous material" means (1) any substance defined as hazardous, a pollutant, or a contaminant under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9601 (14) and (33); (2) oil as defined by the Clean Water Act, 33 U.S.C. § 1321 (a) and the Oil Pollution Act, 33 U.S.C. § 2701 (23); (3) thermal pollution, refuse, garbage, sewage effluent, industrial waste, mine or mill tailings, mineral salts, pesticides, and other solid waste, and (4) any other substance regulated as hazardous or toxic under Federal or Navajo Nation law.

(d) Upon discovery of any event which may or does result in contamination or pollution of Federal project lands, project water, or project works, the Navajo Nation shall immediately undertake all measures necessary to protect public health and the environment, including measures necessary to contain or abate any such contamination or pollution and shall report such discovery with full details of the actions taken to the Contracting Officer. Reporting shall be within a reasonable time period but shall not exceed 24 hours from the time of discovery if it is an emergency and the first working day following discovery in the event of a non-emergency.

(e) If violation of the provisions of this Article occurs and the Navajo Nation does not take immediate corrective action as determined by the Contracting Officer, the Navajo Nation may be subject to remedies imposed by the Contracting Officer, which may include termination of this contract.

(f) The Navajo Nation shall be liable for any response action or corrective measure necessary to protect public health and the environment or to restore Federal project lands, project waters, or project works that are adversely affected as a result of such violation, and for all costs, penalties or other sanctions that are imposed for violation of any Federal or Tribal laws and regulations concerning hazardous material. At the

discretion of the Contracting Officer, the United States may also terminate this Contract as a result of such violation.

(g) The Navajo Nation shall defend, indemnify, protect and save the United States harmless from and against any costs, expenses, claims, damages, demands, or other liability arising from or relating to Navajo Nation's violation of this article.

(h) Reclamation agrees to provide information necessary for the Navajo Nation, using reasonable diligence, to comply with the provisions of this Article.

42. CLEAN AIR AND WATER

(a) The Navajo Nation agrees as follows:

(i) To comply with all the requirements of Section 114 of the Clean Air Act, as amended (42 U.S.C. 7414), and Section 308 of the Federal Water Pollution Control Act, as amended by Public Law 92-500 (33 U.S.C. 1318), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in Section 114 of the Air Act and Section 308 of the Water Act, respectively, and all regulations and guidelines issued thereunder before the execution of this contract.

(ii) That no portion of the work required by this contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this contract was executed unless and until the Environmental Protection Agency eliminates the name of such facility or facilities from such listing.

(iii) To use its best efforts to comply with clean air standards and clean water standards at the facility where the contract work is being performed.

(iv) To insert the substance of the provisions of this article into any nonexempt subcontract, including this paragraph (a)(4).

(b) The terms used in this article have the following meanings:

(i) The term "Air Act" means the Clean Air Act, as amended (42 U.S.C. 7401 *et seq*.).

(ii) The term "Water Act" means the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 *et seq*.).

(iii) The term "clean air standards" means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in Section 110 of the Air Act (42 U.S.C. 7410), an approved implementation procedure or plan under Section 111(c) or Section 111(d), respectively, of the Air Act (42 U.S.C. 7411(c) or (d)), or an approved implementation procedure under Section 112(d) of the Air Act (42 U.S.C. 7412(d)).

(iv) The term "clean water standards" means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a state under an approved program, as authorized by Section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with

pretreatment regulations as required by Section 307 of the Water Act (33 U.S.C. 1317).

(v) The term "comply" means compliance with clean air or water standards. Comply shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency, or an air or water pollution control agency in accordance with the requirements of the Air Act or Water Act and regulations issued pursuant thereto.

(vi) The term "facility" means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations owned, leased, or supervised by a contractor or subcontractor to be utilized in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

43. PEST MANAGEMENT

The Navajo Nation shall take appropriate steps to prevent the introduction and spread of, and to otherwise control undesirable plants and animals, as defined by the Contracting Officer, on Federal project lands, project waters, and project works for which the Navajo Nation has operation and maintenance responsibility. The Navajo Nation is responsible for inspecting its vehicles and equipment for reproductive and vegetative parts, foreign soil, mud or other debris that may cause the spread of weeds, invasive species and other pests, and for removing such materials before moving its vehicles and equipment onto any Federal land or out of any area on Federal project land where work is performed. Where decontamination is required prior to entering Federal project land, it shall be performed at the point of prior use, or at an approved offsite facility able to process generated cleaning wastes. Upon the completion of work, decontamination shall be performed within the work area before the vehicles and equipment are removed from Federal project lands. Programs for the control of these undesirable plants and animals on Federal project lands, project waters, and project works for which the Navajo Nation has operation and maintenance responsibility will incorporate Integrated Pest Management (IPM) concepts and practices. IPM refers to a systematic and environmentally compatible program to maintain pest populations within economically and environmentally tolerable levels. In implementing an IPM program, the Navajo Nation will adhere to applicable Federal and State laws and regulations and Department of the Interior and Bureau of Reclamation policies, directives, guidelines, and manuals.

44. INDIAN EMPLOYMENT - EQUAL EMPLOYMENT OPPORTUNITY

(a) In accordance with the provisions of Title 42 U.S.C. 2000-e-2(i), the Navajo Nation shall, during the performance of this contract, give preference in employment to Indian members of the Navajo Nation Indian Reservation. The Bureau of Indian Affairs Office of Employment Assistance shall be notified of employment opportunities 48 hours before any positions are advertised to the general public. Nothing in this section shall be

read as prohibiting the Navajo Nation from giving preferential employment to members of the Navajo Nation.

(b) Except as provided above, during the performance of this contract the Navajo Nation agrees as follows:

(i) The Navajo Nation will not discriminate against any employee or applicant for employment because of race, color, religion, sex, disability, or national origin. The Navajo Nation will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, disability, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Navajo Nation agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(ii) The Navajo Nation will, in all solicitations or advertisements for employees placed by or on behalf of the Navajo Nation, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, disability, or national origin.

(iii) The Navajo Nation will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising the labor union or workers' representative of the Navajo Nation's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(iv) The Navajo Nation will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(v) The Navajo Nation will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the Contracting Agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(vi) In the event of the Navajo Nation's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the Navajo Nation may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965 or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(vii) The Navajo Nation will include the provisions of paragraphs (i) through (vii), modified to refer to the party to be bound, in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Navajo Nation will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance: *Provided*, *however*, that in the event the Navajo Nation becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Navajo Nation may request the United States to enter into such litigation to protect the interests of the United States.

45. COMPLIANCE WITH CIVIL RIGHTS LAWS AND REGULATIONS

(a) The Navajo Nation shall comply with Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d), Section 504 of the Rehabilitation Act of 1973 (P.L. 93-112, as amended), the Age Discrimination Act of 1975 (42 U.S.C. 6101, *et seq*.), Americans with Disabilities Act of 1990, as applicable, and any other applicable civil rights laws, as well as with its respective implementing regulations and guidelines imposed by the U.S. Department of the Interior and/or Bureau of Reclamation.

(b) These statutes require that no person in the United States shall be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving financial assistance from the Bureau of Reclamation on the grounds of race, color, national origin, disability, or age. By executing this contract, the Navajo Nation agrees to immediately take any measures necessary to implement this obligation, including permitting officials of the United States to inspect premises, programs, and documents.

(c) The Navajo Nation makes this agreement in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property discounts, or other Federal financial assistance extended after the date hereof to the Navajo Nation by the Bureau of Reclamation, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Navajo Nation recognizes and agrees that such Federal assistance will be extended in reliance on the representations and agreements made in this article and that the United States reserves the right to seek judicial enforcement thereof.

(d) Complaints of discrimination against the Navajo Nation shall be investigated by the Contracting Officer's Office of Civil Rights.

46. CERTIFICATION OF NONSEGREGATED FACILITIES

The Navajo Nation hereby certifies that it does not maintain or provide for its employees any segregated facilities at any of its establishments and that it does not permit its employees to perform their services at any location under its control where segregated facilities are maintained. It certifies further that it will not maintain or provide for its employees any segregated facilities at any of its establishments and that it will not permit its employees to perform their services at any location under its control where segregated

facilities are maintained. The Navajo Nation agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, disability, or otherwise. The Navajo Nation further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Employment Opportunity clause; that it will retain such certifications in its files; and that it will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

47. NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

A Certification of Nonsegregated Facilities must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually). Note: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

48. COMPLIANCE WITH RECLAMATION LAWS

The parties agree that the delivery of irrigation water or the use of federal facilities pursuant to this contract is governed by applicable Reclamation law, except that this delivery or use is not subject to the Reclamation Reform Act of 1982, as amended.

49. RULES, REGULATIONS, AND DETERMINATIONS

(a) The United States or its assigns shall take all prudent and ordinary measures to operate and maintain all existing facilities necessary to this contract, but nothing in this section shall be construed to require the United States to operate such facilities beyond the useful life of the existing facilities. These facilities will be operated for multiple benefits of the project in accordance with project authorization and contracts, including this contract. The Contracting Officer, in consultation with the Navajo Nation, shall have the right to make determinations necessary to administer this contract that are consistent with the express and implicit conditions of this contract, the laws of the United States and rules and regulations promulgated by the Secretary of the Interior.

(b) Where the terms of this contract provide for action to be based upon the opinion or determination of either party to this contract, whether or not stated to be conclusive, said terms shall not be construed as permitting such action to be predicted upon arbitrary, capricious, or unreasonable opinions or determinations.

50. GENERAL OBLIGATION – BENEFITS CONDITIONED UPON PAYMENT

(a) The obligation of the Navajo Nation to pay the United States as provided in this contract is a general obligation of the Navajo Nation notwithstanding the manner in which the obligation may be distributed among the Navajo Nation's water users and notwithstanding the default of individual water users in their obligation to the Navajo Nation.

(b) The payment of charges becoming due hereunder is a condition precedent to receiving benefits under this contract. The Navajo Nation shall not have the right to the use of water supplied from any project facilities during any period in which the Navajo Nation may be in arrears in the payment of any operation, maintenance, and replacement charges due the United States or in arrears for more than 12 months in the payment of any construction and interest installments due the United States. The Navajo Nation shall not deliver water under the terms and conditions of this contract for lands or parties that are in arrears in the advance payment of water rates or OM&R charges or in arrears more than 12 months in the payment of construction charges as levied or established by the Navajo Nation.

51. MEDIUM FOR TRANSMITTING PAYMENTS

All payments from the Navajo Nation to the United States under this contract shall be by the medium requested by the United States on or before the date payment is due. The required method of payment may include checks, wire transfers, or other types of payment specified by the United States.

52. CHARGES FOR DELINQUENT PAYMENTS

(a) The Navajo Nation shall pay penalty charges on delinquent installments or payments. When payment is not received by the due date, the Navajo Nation shall pay an interest charge for each day the payment is delinquent beyond the due date. When a payment becomes 60 days delinquent, the Navajo Nation shall pay an administrative charge to cover additional costs of billings and processing the delinquent payment. When a payment is delinquent 90 days or more, the Navajo Nation shall pay an additional penalty charge of 6.0 percent per year for each day the payment is delinquent beyond the due date. Further, the Navajo Nation shall pay any fees incurred for debt collection services associated with the delinquent payment.

(b) The interest charge rate shall be the greater of the rate prescribed quarterly in the Federal Register by the Department of the Treasury for application to overdue payments or the interest rate of 0.5 percent per month prescribed by section 6 of the Reclamation Project Act of 1939, 53 Stat. 1191. The interest charge rate shall be determined as of the due date and remain fixed for the duration of the delinquent period.

(c) When a partial payment for a delinquent account is received, the amount received shall be applied first to the penalty, second to the administrative charges, third to the accrued interest and finally to the overdue payment.

53. WATER QUALITY

The operation and maintenance of project facilities shall be performed in such manner as is practicable to maintain the quality of raw water made available through such facilities at the highest level reasonably attainable, as determined by the United States.

The United States does not warrant the quality of water and is under no obligation to construct or furnish water treatment facilities to maintain or better the quality of water; except as provided for by Section 10602 of the Navajo Settlement Act.

54. WATER CONSERVATION

Prior to the delivery of water to the Navajo Nation provided from or conveyed through federally constructed or federally financed facilities pursuant to this contract, the Navajo Nation shall develop an effective water conservation program which shall contain definite water conservation objectives, appropriate economically feasible water conservation measures, and time schedules for meeting those objectives. At subsequent three-year intervals, the Navajo Nation shall submit a report on the results of the program to the Contracting Officer for review. Based on the conclusions of the review, the Contracting Officer and the Navajo Nation shall consult and agree to continue or to revise the existing water conservation program. This paragraph shall be included in all subcontracts, and such measures shall be required for all water purchasers.

55. CONTINGENT UPON APPROPRIATIONS OR ALLOTMENTS OF FUNDS

The expenditure of any money or the performance of any obligation by the United States under this contract shall be contingent upon appropriations or allotments of funds. Absence of appropriation or allotment of funds shall not relieve the Navajo Nation from any obligations under this contract. No liability shall accrue against the United States in case funds are not appropriated or allotted.

56. NOTICES

Any notice, demand, or request authorized or required by this contract shall be deemed to have been given on behalf of the Navajo Nation when mailed, postage prepaid, or delivered to the Regional Director, Upper Colorado Region, Bureau of Reclamation, 125 South State Street, P.O. Box 11568, Salt Lake City, Utah 84111, and on behalf of the United States when mailed, postage prepaid, or delivered to the President, Navajo Nation, Post Office Box 9000, Window Rock, Navajo Nation (Arizona) 86515, and the Director of Water Resources, Navajo Nation, Post Office Box 678, Fort Defiance, Arizona 86504. The designation of the addressee or the address may be changed by notice given in the same manner as provided in this section for other notices.

57. OFFICIALS NOT TO BENEFIT

No Member of or Delegate to Congress or Resident Commissioner or official of the Navajo Nation shall benefit from this contract or any subcontract other than as a water user or landowner in the same manner as other water users or landowners.

In witness whereof, the parties hereto have duly executed this contract the day and year first above written.

Approved:

Solicitor's Office

UNITED STATES OF AMERICA

Commissioner
Bureau of Reclamation

Approved as to form:

for

Attorney General

THE NAVAJO NATION

Joe Shirley, Jr., President, Navajo Nation

EXHIBIT 10

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead






June 11, 2024

Commissioner Camille Calimlim Touton
Bureau of Reclamation
1849 C Street NW
Washington, DC 20240-0001

VIA ELECTRONIC MAIL
mtouton@usbr.gov

RE: Reclamation's Consideration of 602(a) Storage in the No Action Alternative

Dear Commissioner Touton:

The Upper Division States of Colorado, New Mexico, Utah, and Wyoming ("Upper Division States") appreciate the opportunities the Bureau of Reclamation ("Reclamation") has provided for engagement in the National Environmental Policy Act ("NEPA") process related to the post-2026 guidelines for operation of Lake Powell and Lake Mead ("Post-2026 Guidelines").

Recently, Reclamation presented the proposed No Action Alternative for the Post-2026 NEPA analysis. The presentations raised questions and concerns for the Upper Division States related to: (1) Reclamation's determination of the volume of water stored pursuant to § 602(a)(3) of the Colorado River Basin Project Act (P.L. 90-537) ("§ 602(a) Storage"); and (2) Reclamation's implementation of the long - range operating criteria pursuant to P.L. 90-537 ("LROC") under the proposed No Action Alternative. We request that these issues be addressed prior to undertaking further NEPA analysis in relation to the Post-2026 Guidelines.

Reclamation has made it clear that the proposed No Action Alternative does not meet the purpose and need for the Post-2026 Guidelines nor does it represent future operations in the absence of an action alternative. In the NEPA process, no action alternatives are intended to represent current conditions and reasonably foreseeable actions that could occur during the life of the project absent an action alternative being implemented. The No Action Alternative is therefore the "baseline," against which the Action Alternatives are compared.

Section 602(a) Storage is intended to allow the Upper Division States to continue to meet their obligations under the 1922 Colorado River Compact ("Compact") without impairing their ability to consumptively use the waters of the Colorado River System apportioned to them in perpetuity by the Compact. Therefore, § 602(a) storage is of profound importance to both the Upper and the Lower Basins.

Reclamation's initial presentation of the No Action Alternative on March 18, 2024, did not specifically address the annual determination of § 602(a) Storage. However, at a meeting on May 9, 2024, Reclamation expanded the discussion of the proposed No Action Alternative to state that § 602(a) Storage was reasonably represented by extension of the Equalization Line used in the 2007 Interim Guidelines.

It is unclear how extension of one aspect of the expiring 2007 Interim Guidelines can be incorporated into the No Action Alternative. Instead, an extension of the Equalization Line arguably is an action that should be evaluated as an independent action alternative in this NEPA process.

Additionally, the Federal Register Notice for the Post-2026 Operations dated October 20, 2023, states that the Draft Environmental Impact Statement will consider the best scientific information currently available. Relying on data used to create the Equalization Line developed prior to 2007, and which operations have shown to be inadequate to determine § 602(a) Storage, does not reflect the best available scientific information.

Moreover, in addressing implementation of the LROC, both Reclamation No Action presentations characterized fixed releases each year of 8.23 maf and equalization as mandates. This is not consistent with P.L. 90-537 or other governing law and undermines the purposes and requirements of § 602(a).

To ensure consistency with the law that will remain operative and enforceable upon expiration of the 2007 Interim Guidelines, § 602(a) Storage must be appropriately addressed in the proposed No Action Alternative. This should include the following principles:

1. The Secretary of the Interior ("Secretary"), using the best available science, annually determines the quantity of water necessary for § 602(a) Storage, as required by § 602(a) and the LROC.

2. Determining the § 602(a) Storage quantity is one of the pillars of the Annual Operating Plan ("AOP"), forms the basis for other determinations in the LROC, and would render the AOP incomplete without such determination each year.

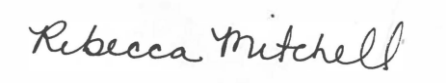
3. Under the LROC, the Secretary's determination of the § 602(a) Storage quantity is a prerequisite to determining the appropriate annual release amount from Lake Powell.

4. Releases from Lake Powell are not fixed at or above 8.23 maf each year. In fact, 8.23 maf is not mentioned in § 602(a). Rather, it is included in the LROC as an "objective." However, annual releases from Lake Powell under the LROC may be less than 8.23 maf per year to operate Lake Powell and Lake Mead consistent with the governing laws and compacts.

5. Determination of releases from Lake Powell to Lake Mead greater than 8.23 maf may only be made each year after the calculation of § 602(a) Storage and when it has been determined that the other requirements of § 602(a)(3) have been met.

The Upper Division States appreciate Reclamation's consideration of these concerns and commitment to a diligent and comprehensive NEPA analysis in relation to the Post-2026 Guidelines. We request that Reclamation work with the Upper Division States as it considers appropriate assumptions related to § 602(a) Storage, and assumptions related to the No Action Alternative generally, to be included in that analysis.

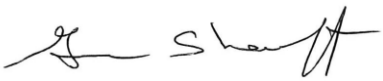
Sincerely,



Rebecca Mitchell
Governor's Representative,
State of Colorado



Estevan Lopez
Governor's Representative,
State of New Mexico



Gene Shawcroft
Governor's Representative
State of Utah



Brandon Gebhart
Governor's Representative
State of Wyoming

Cc:
David Polumbo
Jacklyn Gould
Wayne Pullan
Sarah Krakoff
Rod Smith

EXHIBIT 11

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

"We Have to Judge the Future by the Past": The 1931–40 Drought, the Upper Basin Compact, and the Colorado River Storage Project

Scott A. Miltenberger, Ph.D.*

This essay explores the relationship of the 1931–40 drought in the Colorado River Basin to the development of the 1948 Upper Colorado River Basin Compact ("Upper Basin Compact") and the Colorado River Storage Project ("CRSP"), authorized by Congress in 1956. Building on prior historical assessments, it considers the influence of this period of stream flow record on Bureau of Reclamation planning for Upper Basin development in the 1940s; the formulation of the Upper Basin Compact; and the design of CRSP. The purpose of both the Upper Basin Compact and CRSP was to enable the Upper Basin to make full development of its allocation under the Colorado River Compact of 1922 while simultaneously meeting its 75 million acre-feet over 10 years obligation to the Lower Basin at Lee Ferry during a period comparable to 1931–40. The essay argues that the historical significance of the 1931–40 drought for the present day "Law of the River" lies in the way that the collective response to the drought by federal reclamation engineers and the Upper Basin states not only contributed to the operational regime that governs the administration of Colorado River waters, but also laid the groundwork for disputes over the 1922 Compact and use of the Colorado River.

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* Scott A. Miltenberger, Ph.D. is a principal historian with JRP Historical Consulting, LLC ("JRP"), in Davis, California. Since joining JRP in 2006, Dr. Miltenberger has undertaken historical investigations of alleged riparian and appropriative surface water rights, federal reserved water rights, historical groundwater use, and interstate water compacts for private parties, water districts, state and local governments, and federal agencies throughout the West. He has also testified as an expert historian in proceedings in Arizona and California state courts, in federal district courts, and in the United States Supreme Court original action, State of Texas v. State of New Mexico and State of Colorado (No. 141, Original)—a dispute over the waters apportioned by the 1938 Rio Grande Compact. Dr. Miltenberger is a member of the American Historical Association, the American Society for Environmental History, and the National Council of Public History. He may be reached at smiltenberger@jrphistorical.com.

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INTRODUCTION

On December 2, 1947, during the fifth meeting of the Upper Colorado River Basin Compact Commission ("Commission"), federal reclamation engineer and chair of the Commission's Engineering Advisory Committee J.R. Riter made a frank admission to the commissioners from the "Upper Basin" states of Colorado, New Mexico, Utah, and Wyoming who had gathered to work out a compact for the allocation of Colorado River water above Lee Ferry. H. Melvin Rollins, Wyoming's Assistant Interstate Streams Commissioner, questioned Riter as to whether analyses by the United States Bureau of Reclamation ("Reclamation") regarding Upper Basin development made sufficient provision for future drought conditions. "Well, Mr. Rollins," the engineer replied,

> as engineers we have to judge the future by the past. If we hold down our uses of water to the residual over and above the downstream obligations, yes. Now the question always comes up, what is the proper period of study? I recall in 1929 when I first became engaged in the study of the Colorado River, we went back and fabricated records through the drought centering around 1902 and 1904. We thought we had a pretty low period selected. So we went ahead and planned Hoover Dam on that basis. About the time we got it built and started operating, Nature demonstrated to us that there was a lower ten-year period, 1931 to 1940. I don't know what the future is going to hold; whether 1931 to 1940 is a proper basis I don't know.[1]

Riter's uncertainty about the future possibility of a "lower ten-year period" notwithstanding, as this essay argues, the period of recorded Colorado River flows between 1931 and 1940 helped shape the Upper Colorado River Basin Compact of 1948 ("Upper Basin Compact"). The essay also contends that this stream flow period functioned as an essential planning benchmark for the Colorado River Storage Project ("CRSP"), authorized by Congress in 1956, which provided for the construction of physical works that would support Upper Basin Compact goals of meeting the obligation to the Lower Basin and funding consumptive use projects in the Upper Basin.

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1. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 5 (Dec. 1–4, 1947), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 102 (1948) (on file at Water Resources Collections and Archives, University of California, Riverside). The page numbers will reflect the pagination for the individual meeting minutes, not the entire volume.

The Upper Basin Compact negotiation minutes consist of two volumes of minutes and a third volume containing the report of the Engineering Advisory Committee and the first "inflow-outflow manual."

Both the Upper Basin Compact and the Colorado River Storage Project Act ("CRSPA") are elements of what has come to be known as "The Law of the River." This body of agreements, laws, judicial decrees, policies, guidelines, and plans—now more than a century old, having originated with the Colorado River Compact of 1922 ("1922 Compact")—governs the administration of the waters of the Colorado River Basin waters among the Upper Basin states, the "Lower Basin" states of Arizona, California, and Nevada, as well as the Republic of Mexico and Native American tribes within the United States.[2] Figure 1 is a map of the Colorado River Basin, ca. 1946.[3] As many as 40 million people in the United States rely upon the waters of the Colorado River today.[4]

Norris Hundley, Jr. was the first historian to recognize implications of the 1931–40 "dry decade,"[5] and more recent scholarship has further discussed the ramifications of "the drought of the 1930s." Animated by contemporary concerns over the sustainability of the Colorado River, Eric Kuhn and John Fleck observe in their book *Science Be Dammed: How Ignoring Inconvenient Science Drained the Colorado River* that the period reshaped knowledge about the river's hydrology and informed "policy decisions in the late 1940s

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2. A précis of "The Law of the River," inclusive of descriptions of the two compacts, the 1944 Mexican Treaty, and pertinent federal legislation since the 1920s, may be found in KATHERINE OTT VERBURG, U.S. DEP'T OF THE INTERIOR, THE COLORADO RIVER DOCUMENTS 2008, at xxxvii–xli (2010), https://coloradoriverscience.org/The_Colorado_River_Documents_2008 [https://perma.cc/EHQ8-H84D]. This reference work, part of a larger series of document compendiums first issued in the 1930s, also contains contracts, operational/management guidelines and other documentation concerning the Colorado River into the first decade of the 21st century.

Reclamation also has a dedicated "Law of the River" section on its "Colorado River Storage Project" website. *See Colorado River Storage Project*, BUREAU OF RECLAMATION, https://www.usbr.gov/uc/rm/crsp/index.html [https://perma.cc/C8AD-ZSGR] (Aug. 19, 2021).

3. BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, THE COLORADO RIVER 8 (1946), https://images.archives.utah.gov/digital/collection/p17010coll70/id/8793/rec/1 [https://perma.cc/8EFQ-3EJQ].

4. Estimate of the number of people relying on the Colorado River may be found at *Colorado River Basin*, BUREAU OF RECLAMATION, https://www.usbr.gov/ColoradoRiverBasin [https://perma.cc/5H2M-NGV6] (Aug. 5, 2025).

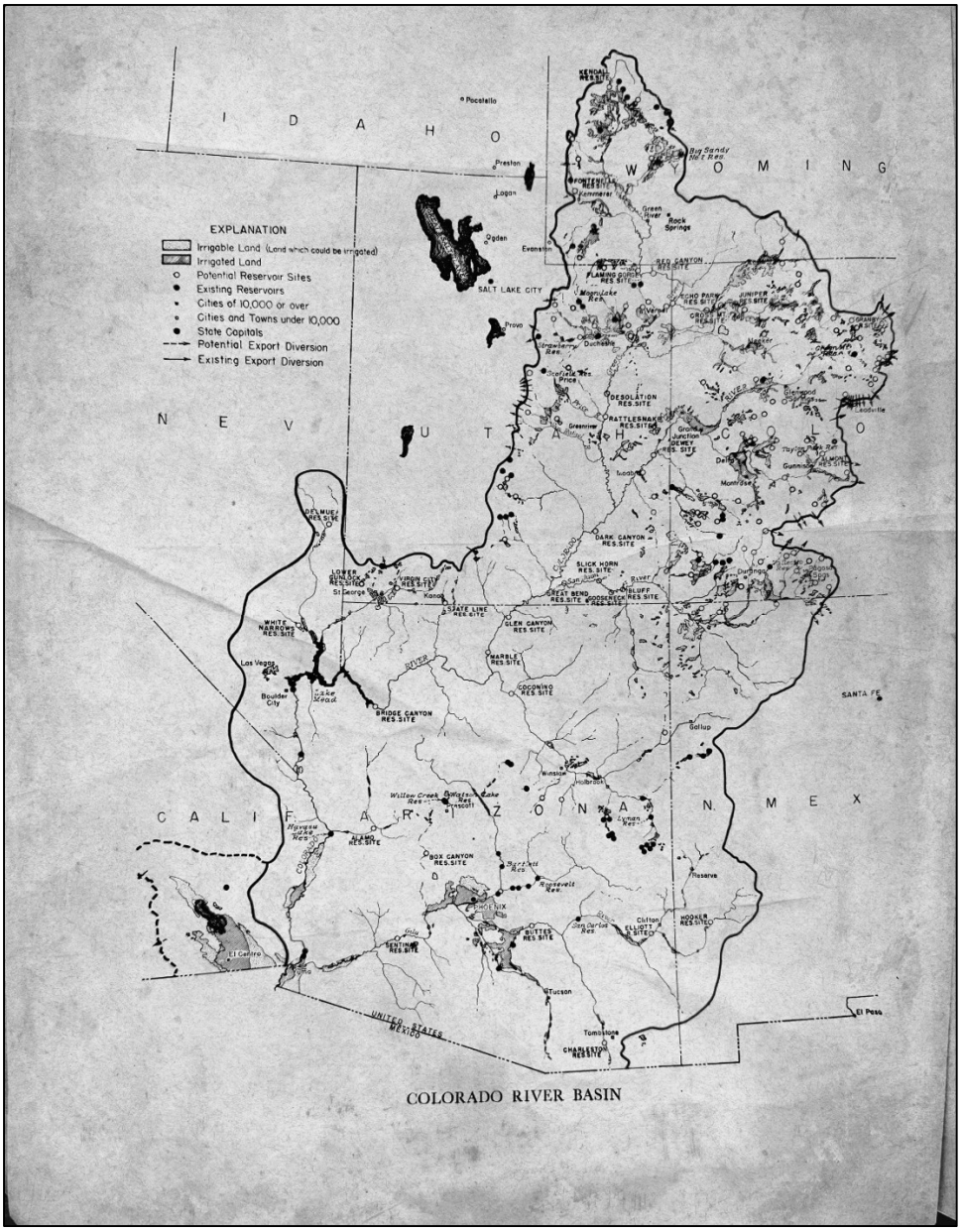
5. NORRIS HUNDLEY, JR., WATER AND THE WEST: THE COLORADO RIVER COMPACT AND THE POLITICS OF WATER IN THE AMERICAN WEST 297 (2d ed. 2009).

The scholarship concerning the Colorado River, historical and otherwise, is vast. Key works that helped frame the subject for discussion are HUNDLEY, JR., *supra*; ERIC KUHN & JOHN FLECK, SCIENCE BE DAMMED: HOW IGNORING INCONVENIENT SCIENCE DRAINED THE COLORADO RIVER (2019); and Eric Kuhn, Katherine H. Tara, & John Fleck, *A Horse Named "Stream Depletion Theory": The History and Negotiation of the Upper Colorado River Basin Compact*, 65 NAT. RES. J. (2025), http://digital repository.unm.edu/nrj/vol65/iss1/5 [https://perma.cc/HJC9-2BDX]. As appropriate, other works are cited throughout.

through the late 1960s."[6] Yet, Kuhn and Fleck argue this dry cycle did not prevent ill-advised Upper Basin development driven by political and economic considerations. Reclamation and the Upper Basin's failure to heed what the 1930s drought portended about the river's future supply, in their view, is another example of the hydrological myopia that began with the 1922 Compact.[7] In an article published this past year (2025) in the University of New Mexico's *Natural Resources Journal*, Kuhn and Fleck, together with Katherine H. Tara, once more highlighted the role "the 1931–40 drought" in the negotiations leading to the Upper Basin Compact.[8]

6. KUHN & FLECK, *supra* note 5, at 112–113.
7. KUHN & FLECK, *supra* note 5, at 98, 109–10, 151–54.
8. Kuhn, Tara, & Fleck, *supra* note 5, at 87, 89, 90, 100, and 103-104.

Figure 1. Map of the Colorado River Basin



Note: Map is a photograph of the map from the author's copy of THE COLORADO RIVER: A NATURAL MENACE BECOMES A NATIONAL RESOURCE.[9]

9. BUREAU OF RECLAMATION, *supra* note 3, at 8.

Building on this prior scholarship, this essay explores in further detail the consequences of the 1931–40 period of stream flow record for water development, regulation, and use by the Upper Basin states. It seeks to take the past on its own historical (rather than legal) terms, delving not only into published historical documents but also archival records to investigate the influence of the 1931–40 drought on Reclamation's initial planning for the Upper Basin in the early 1940s, the Upper Basin Compact negotiations in the mid-to-late 1940s, and the design and intent of CRSP in the early 1950s. Placing this decadal dry cycle nearer to the center of the story of the Upper Basin Compact and CRSP, it aims to shed greater light on not only the origins and assumptions underlying that compact and the federal undertaking that are central to present-day Colorado River administration but also the tensions between the Upper and Lower Basin states over the river's waters.

Opening with a discussion of the historical context of the 1931–40 "dry decade," the essay proceeds chronologically through the passage of CRSPA, touching on key documents and decisions. It relates how in October 1940 Riter recognized that the 1931–40 streamflow conditions made "holdover storage capacity" in the Upper Basin necessary for the Upper Basin "to meet its [1922] Compact obligation at Lee Ferry [Article III(d)] and to concurrently utilize water allocated to it under the terms of the Compact."[10] Reclamation subsequently adopted the period as a "yardstick" for assessing a plan of development for the Upper Basin.[11] The essay next discusses how this "lower ten-year period, 1931 to 1940" influenced the Upper Basin Compact negotiations, contributing to the development of a method and means by which the Upper Basin could satisfy its 1922 Compact obligation to the Lower Basin and simultaneously make full use of its 7.5 million acre-feet (AF) 1922 Compact allocation (Article III[a]).[12] It goes on to describe how Reclamation, with direct input from the Upper Basin, designed CRSP to accomplish the aim of facilitating increased Upper Basin use through construction of reservoirs and power "units" that would hold water in the Upper Basin for delivery to meet the Lee Ferry obligation during dry periods and generate power revenues to fund the construction of water-consuming "participating projects."[13] In closing, the essay offers an appraisal of the

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10. Letter from J. R. Riter, Chief Dev. Eng'r, Bureau of Reclamation, to Ival V. Goslin, Eng'r-Sec'y, Upper Colorado River Comm'n (November 10, 1959).

11. BUREAU OF RECLAMATION, PROCEEDINGS OF THE COMMITTEES OF FOURTEEN AND SIXTEEN OF THE SEVEN STATES OF THE COLORADO RIVER BASIN AND THE POWER ALLOTTEES 13 (1944).

12. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 103.

13. Letter from Fred G. Aandahl, Assistant Sec'y of the Interior, to Joseph W. Martin, Jr., Speaker, House of Representatives (Mar. 31, 1954), H.R. Doc. No. 83-364, at 69 (2d Sess. 1954).

historical significance of the 1931–40 "drought period," its importance to the "Law of the River" and the operational regime by which the Lower Basin receives its 1922 Compact allocation, and the effect that the Upper Basin response to this dry cycle had on relations with the Lower Basin.

I. THE 1931–40 "DRY DECADE" IN CONTEXT

Hundley, in his seminal work on the Colorado River Compact, *Water and the West: The Colorado River Compact and the Politics of Water in the American West*, was the first academic to address the 1931–40 "dry decade."[14] As part of a broader discussion of the aftermath of the 1922 Compact and in the context of Senate consideration of the 1944 Mexican Treaty, *Water and the West* calls attention to the fact that Reclamation analysis of river flows for this 10-year period indicated that the water supply available below Hoover Dam for Arizona, California, and Nevada and Mexico could be insufficient in a comparable drought in later years.[15]

Although neither is a historian, Kuhn and Fleck in *Science Be Dammed* extend the analysis of Colorado River history presented in Hundley's work.[16] They take as their starting point "Hundley's criticism" about the 1922 Compact, that "[t]he drafters of the [1922] compact . . . failed to determine with reasonable accuracy the long-term annual flow of the Colorado River."[17] *Science Be Dammed* acknowledges—referencing Marc Reisner's influential

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14. HUNDLEY, JR., *supra* note 5, at book cover.

15. *See id.* at 297. In discussing the circumstances that prompted negotiations for the Upper Basin Compact, *Water and the West* makes no mention of the 1931–40 period nor the effect that it had on Reclamation plans for the Upper Basin in the 1940s, the Upper Basin Compact, or CRSP. The Upper Basin Compact, also known as the "supplementary agreement of 1948," is only briefly discussed because as the preface to the second edition of Hundley's book states, "it did not involve the heated and prolonged controversy over the meaning of the compact that characterized the lower-basin embroilment [i.e., the *Arizona v. California* litigation]." *See id.* at xv, 300–01. As will become clear in the discussion that follows on the pages below, the possible future deficiency for the Lower Basin states and Mexico during a similar dry cycle would be a consequence of full Upper Basin development.

16. Kuhn is the former general manager of the Colorado River Water Conservation District, while Fleck was previously a journalist, and is now a Professor of Practice at the University of New Mexico and Writer in Residence at the university's Utton Transboundary Resources Center. *See Eric Kuhn*, COMMON SENSE INST. COLO., https://www.commonsenseinstituteus.org/colorado/about/experts/eric---kuhn [https://perma.cc/4ZKZ-PZRW]; *Utton Center Welcomes John Fleck*, UTTON TRANSBOUNDARY RES. CTR. (Jan. 20, 2022), https://uttoncenter.unm.edu/news/2022/01/utton-welcomes-john-fleck.html [https://perma.cc/B58J-AFYH].

17. HUNDLEY, JR., *supra* note 5, at 352; KUHN & FLECK, *supra* note 5, at 3.

Cadillac Desert: The American West and Its Disappearing Water[18]—that the 1922 Compact was predicated on limited knowledge of the Colorado River's hydrology.[19] However, Kuhn and Fleck argue "decision-makers actually had available, had they chosen to use it, a relatively thorough, complete, and almost modern picture of the river's hydrology," and throughout their book they marshal evidence in support of this analysis.[20]

"[T]he drought of the 1930s," *Science Be Dammed* contends, was a crucial hydrological data point that "forced a reckoning with two important implications" but did not dampen the pace of Colorado River development, particularly for the Upper Basin.[21] The first implication was that Lower Basin storage at Lake Mead (Hoover Dam) below Lee Ferry did nothing to help the Upper Basin meet the 1922 Compact's "delivery requirements" under Article III(d). The Upper Basin needed "as much as 28 million acre-feet of carry over storage" above Lee Ferry.[22] The second was that the "drought of the 1930s had intruded on the record the river's managers were using to estimate its flows" and consequently less water existed for Colorado River projects than was previously thought.[23] Although the Colorado River Storage Project aimed to "meet the Upper Basin's obligations under Article III of the 1922 compact" in the face of a comparable drought,[24] an "iron triangle" of "Reclamation engineers and planners . . . boosters and politicians" pushed through an unrealistic and economically dubious plan to develop the water allocated to the Upper Basin by the 1922 Compact under Article III(a).[25]

Kuhn and Fleck are critical that Reclamation and Upper Basin policy makers did not respond to the drought period by scaling down plans for future projects to reflect new hydrological information.[26] They see this as among several "missed opportunities"[27] to make more sustainable choices for the river's future use, and in particular, "to imbue the institutions for allocating and using the Colorado's waters with the flexibility to respond when there is less water than . . . planned."[28]

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18. *See generally* MARC REISNER, CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER (1993) (examining the political, economic, and environmental consequences of federal water policy and reclamation projects in the American West).
19. *Id.* at 271.
20. KUHN & FLECK, *supra* note 5, at 5.
21. *Id.* at 109.
22. *Id.* at 109–10.
23. *Id.* at 110.
24. *Id.* at 152.
25. *Id.* at 110, 144–46, 152–154.
26. *Id.* at 110. 144-49, 152–56, 225.
27. *Id.* at 224.
28. *Id.* at 225.

In their article *A Horse Named 'Stream Depletion Theory: The History and Negotiation of the Upper Colorado River Basin Compact*, Kuhn, Tara, and Fleck focus on narrating the events, discussions, and debates leading to the Upper Basin Compact. They nevertheless note the 1931–40 drought as among the contributing factors shaping the compact.[29] The authors insist that "[a] careful and nuanced understanding of the Upper Basin Compact is necessary for interpreting the Law of the River in a way that is both faithful to the intention of the Compact and cognizant of the constraints of subsequent legislation and current hydrology."[30]

Further historicization of the "dry decade" of 1931–40—which this essay seeks to provide—is a step toward that "careful and nuanced understanding." Close attention to the historical record in fact indicates that Reclamation and the Upper Basin pursued development above Lee Ferry in the 1940s and 1950s not despite this 10-year low stream-flow period but because of it.

The concept of "drought," at least in a legal context, has been likened to the proverbial story of the blind men describing the elephant—a recognition that "drought" has a "perceptual nature."[31] It may in fact be "the only natural disaster we experience without initially realizing it," attorney Sarah Klahn has written.[32] Klahn's observations are as instructive to the historian as the lawyer: a reminder that human experiences of climatic conditions vary in time and place and may be best understood after the fact. This is especially true for the Colorado River Basin in the 1930s.

Reduced Colorado River stream flows between 1931 and 1940 were neither the only nor the most reported upon manifestation of dry conditions in the United States in the 1930s.[33] The "Dust Bowl" in the Midwest has been the subject of considerable scholarly attention,[34] but "drought" in some form prevailed throughout the nation during the decade. Writing in 1936, United States Geological Survey ("USGS") hydrologist John C. Hoyt observed that "[t]he humid States were seriously affected in 1930 and to a lesser extent in 1931 and 1934. The semiarid States underwent minor droughts in 1931 and

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29. Kuhn, Tara, & Fleck, *supra* note 5, at 87, 89, 90, 100, 103–104.

30. *Id.* at 121.

31. Sarah Klahn, *The Blind Man and the Elephant: Describing Drought in Colorado*, 6 U. DENV. WATER L. REV. 519, 520 (2003).

32. *Id.*

33. *The Dust Bowl*, NAT'L DROUGHT MITIGATION CTR., https://drought.unl.edu/dustbowl [https://perma.cc/U799-KAJH].

34. A search of JSTOR, an online repository of secondary scholarship (journals and monographs) and primary sources maintained by the non-profit ITHAKA, identified approximately thirty articles in history journals over the past fifty years that address the 1930s drought on the Great Plans either wholly or in part.

1933, which added to the catastrophe of 1934."[35] The year 1934 was in fact "the second driest year in the twentieth century" for the Colorado River Basin.[36]

The effects of the 1930s drought, like many droughts historically, were unevenly distributed. Although California as a whole was among the "arid states" reportedly spared the severity of dry conditions that afflicted other states,[37] its Imperial Valley nevertheless suffered from diminished Colorado River flows in 1934. Imperial Valley relied on a river that did not yet have upstream main stem dams for regulation,[38] and groundwater was little developed in the area at the time.[39] According to the *Los Angeles Times* on July 15, 1934, officials with the Imperial Irrigation District were worried that the "Colorado River will be completely dry within ten days if it continued to drop at its present alarming rate."[40] Domestic water was being trucked in that same month.[41] A subsequent *Times* article in August 1934 noted that irrigation facilities largely off-set the dry conditions in every part of California, except Imperial Valley.[42]

In his analysis of the "Drought of 1934," Hoyt attributed the "extremely low run-off of the Colorado River" that impacted this part of Southern California "to drought conditions in the upper basin States."[43] The Upper Basin states, however, had yet to develop the Colorado River as the Imperial Valley(located in the Lower Basin) had.[44] In fact, both Reclamation and Upper Basin engineers later assessed Upper Basin use of the waters of the Colorado River system as approximately 2 million acre-feet between 1914

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35. JOHN C. HOYT, U.S. DEP'T OF THE INTERIOR, DROUGHTS OF 1930–34, at 1 (1936).

36. KUHN & FLECK, *supra* note 5, at 109.

37. HOYT, *supra* note 35, at 46.

38. Boulder Dam, also known as Hoover Dam, would begin filling in 1935 but would not be completed until 1936. *See* HUNDLEY, JR., *supra* note 5, at 296, 300; KUHN & FLECK, *supra* note 5, at 109–12.

39. *Colorado River Flow for 1934 Set All-Time Low*, L.A. TIMES, January 12, 1935. According to the *Nevada State Journal*, the 1934 Colorado River flow was "4,72,200 acre feet compared to a normal of approximately 16,000,000 – a 75 per cent drop." *See Colorado's Flow Is 75% Below Normal*, NEV. ST. J., January 11, 1935.

40. *Dry Colorado River Looming*, L.A. TIMES, July 15, 1934, at 6.

41. *Water Shipped into Imperial*, L.A. TIMES, July 11, 1934, at 4.

42. *See Irrigation Facilities Offset Lack of Rain*, L.A. TIMES, Aug. 26, 1934, at 5.

43. HOYT, *supra* note 35, at 46; *see also* E.O. Larson, *Regional Director's Report*, *in* BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, INTERIM REPORT COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS 11 (1949).

44. Joe Gelt, *Sharing Colorado River Water: History, Public Policy, and the Colorado River Compact*, UNIV. ARIZ. WATER RES. RSCH. CTR. (Aug. 1, 1997), https://wrrc.arizona.edu/publication/sharing-colorado-river-water-history-public-policy-and-colorado-river-compact [https://perma.cc/85JP-9MR9].

and 1945.[45] In June 1934, as water supply conditions worsened in the Imperial Valley, the Upper Basin states took their first major step towards additional Colorado River development since ratification of the 1922 Compact. In a meeting with Reclamation officials, representatives from the states agreed to each state pursuing its own projects for the waters of the Colorado River system, subject to an eventual compact amongst themselves. This agreement helped pave the way for congressional authorization of the trans-basin diversion Colorado-Big Thompson Project ("C-BT") for Colorado in 1937.[46] Throughout the 1930s, Colorado also pursued smaller federal and "'nonfederal' projects" on its Taylor, Los Pinos, and Arkansas rivers.[47]

Water supply conditions began improving in 1935 in the Colorado River Basin. River flows rebounded that year, and Boulder (also known as Hoover) Dam began filling, promising more regularity in deliveries to Imperial Valley lands.[48] Parker Dam, a diversion for the Metropolitan Water District of Southern California to bring domestic water to growing communities, was under construction by Reclamation and would be completed in three years.[49]

Any potential long-term impacts to lands and communities in Southern California were ultimately blunted by the fact that the average flows passing Lee Ferry—the 1922 Compact point of measurement between the Upper and Lower basins—exceeded the 7.5 million acre-feet allocated to the Lower Basin by the 1922 Compact (Article III[a]) during most years between 1931

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45. BUREAU OF RECLAMATION, *supra* note 3, at 151; Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission (July 7, 1948) (on file with Colorado State University).

46. This resolution was made along with others recommending terms for a future treaty with Mexico regarding the waters of the Colorado River, urging federal funding for additional studies of Colorado River development, and calling for Arizona to ratify the 1922 Compact before contracting for water from Boulder Dam. *See* BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, RESOLUTIONS ADOPTED AT A CONFERENCE OF REPRESENTATIVES OF THE STATES OF COLORADO, NEW MEXICO, UTAH AND WYOMING, AND THE BUREAU OF RECLAMATION, CALLED BY THE SECRETARY OF THE INTERIOR, AT DENVER, COLORADO, ON JUNE 29 AND 30, 1934, at 3–5 (1934); *see also Meeting 4 Upper Basin States Is Harmonious One*, DAILY PRESS, July 2, 1934; *States of Upper Basin Offer Plan*, DAILY PRESS, July 3, 1934; DANIEL TYLER, THE LAST WATER HOLE IN THE WEST 66–96 (1992); STEVEN C. SCHULTE, AS PRECIOUS AS BLOOD: THE WESTERN SLOPE IN COLORADO'S WATER WARS, 1900–1970, at 53–65 (2016); KUHN & FLECK, *supra* note 5, at 141.

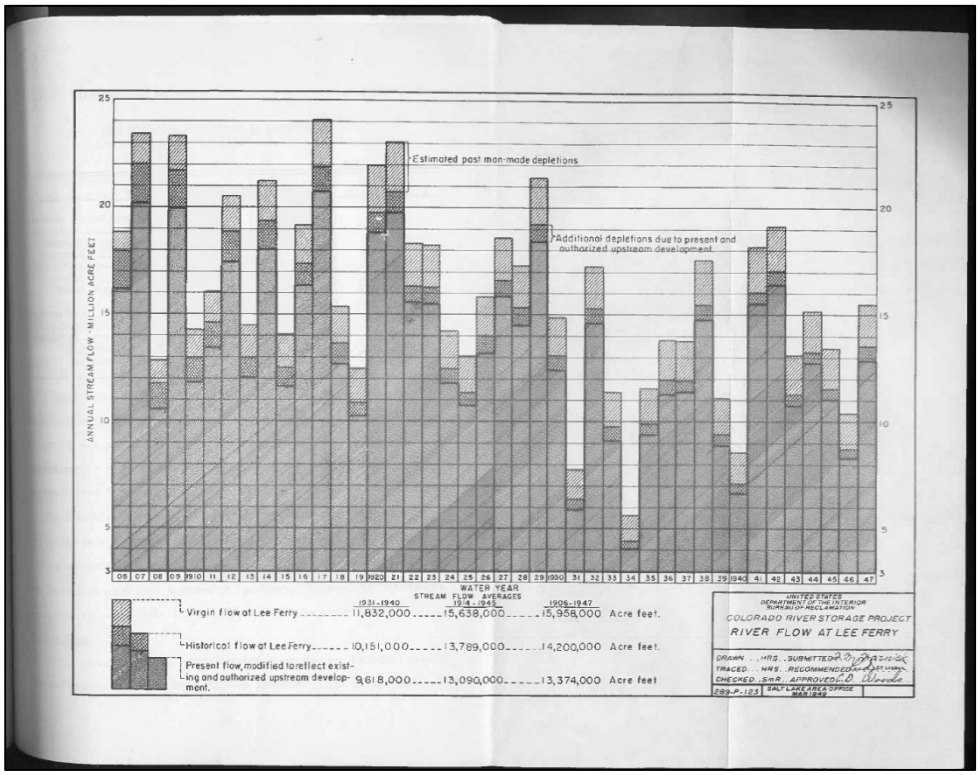
47. *See* HUNDLEY, JR., *supra* note 5, at 76–78, 300; KUHN & FLECK, *supra* note 5, at 109–12.

48. *Boulder Lake Now Reality; Water Stored*, NEV. ST. J., Feb. 5, 1935. Later Reclamation assessment found that approximately 9.5 million acre-feet reached Lee Ferry in 1935. *See* BUREAU OF RECLAMATION, *supra* note 43, at 30–31.

49. *See* 1 JOHN UPTON TERRELL, WAR FOR THE COLORADO RIVER, THE CALIFORNIA-ARIZONA CONTROVERSY 26 (1965); *see also* U.S. DEP'T OF THE INTERIOR, WATER AND POWER RESOURCES SERVICE: PROJECT DATA 770 (1981); HUNDLEY, JR., *supra* note 5, at 294, 300.

and 1940. As depicted in Figure 2, a 1949 Reclamation analysis of the period indicated that an annual average of 10,151,00 acre-feet ("Historical Flow") reached Lee Ferry during this decade—exceeding the 75 million acre-feet over 10 years required by the 1922 Compact under Article III(d).[50]

Figure 2. Reclamation Graph of "River Flow at Lee Ferry," Prepared March 1949



The critical importance of the 1931–40 "drought" in light of subsequent events, addressed below, is that the dry cycle revealed that the Upper Basin's aspirations for future full development of its 1922 Compact-allocated water could be constrained. The Upper Basin would have been unable to increase direct diversions from the uncontrolled Colorado River above Lake Mead (the reservoir created by Boulder Canyon/Hoover Dam) up to its full 7.5 million acre-feet allocation and simultaneously meet the 10-year Lee Ferry obligation to the Lower Basin during a comparable dry decade.

The Upper Basin Compact and CRSP were thus direct responses to the 1931–40 stream-flow period. Operating under the widely held assumption of

50. BUREAU OF RECLAMATION, *supra* note 43, at 14.

this period that western water discharged into the ocean was "wasted," Reclamation and the Upper Basin states developed a plan to capture such waters from the Colorado River in large reservoirs.[51] Through the use of holdover storage, the compact and the federal undertaking promised that despite the prospect of another 10-year "low period" akin to 1931–40, the Lower Basin "obligation" could be met even as the Upper Basin fully developed and used its 1922 Compact allocation.[52] These twin historical responses to the 1930s drought nonetheless laid bare the possibility of further and greater conflict between the two basins over the administration of the Colorado River.

II. 1931–40 AS A "YARDSTICK": RECLAMATION PLANNING FOR THE UPPER BASIN IN THE EARLY 1940S

Development of the Upper Basin Compact can be traced directly back to a March 1946 report prepared jointly by Reclamation's Region III (Lower Colorado River Region) and Region IV (Upper Colorado River Region), which was included in a much larger publication, *The Colorado River: A Natural Menace Becomes a Natural Resource"—A Comprehensive Departmental Report on the Development of Water Resources of the Colorado River Basin for Review Prior to Submission to the Congress."*[53] The "Regional Directors' Report" was the culmination of nearly two decades of study of the Colorado River and planning for its development, and it featured the 1931–40 drought period as a central factor for future Upper Basin projects.

The Boulder Canyon Project Act of 1928, which provided congressional ratification of the 1922 Compact and approved construction of Hoover Dam, and the Boulder Canyon Project Adjustment Act of 1940 authorized investigations for the development of the Colorado River.[54] In the context of these studies, undertaken principally by Reclamation, the effects of the 1931–

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51. *See* DONALD J. PISANI, WATER AND THE AMERICAN GOVERNMENT: THE RECLAMATION BUREAU, NATIONAL WATER POLICY, AND THE WEST, 1902–1935, at xiii–xv (2002).

52. Letter from Michael W. Straus, Comm'r, Bureau of Reclamation, to Oscar L. Chapman, Sec'y of the Interior, at 2 (Dec. 22, 1950) (on file with author).

53. JEAN S. BREITENSTEIN, COLO. WATER CONSERVATION BD., THE UPPER COLORADO RIVER BASIN COMPACT 4–5 (1949). This larger work contains comments by the Colorado River Basin states as well as letters of transmittal to Congress by Interior Department officials. Colloquially, it is known as is "The Blue Book." *See* RUSSELL MARTIN, A STORY THAT STANDS LIKE A DAM: GLEN CANYON & THE STRUGGLE FOR THE SOUL OF THE WEST 48 (1999).

54. 42 Stat. 1065 § 15 (1928); 643 Stat. 774 § 2 (1940); BUREAU OF RECLAMATION, *supra* note 3, at 26.

40 dry period on Colorado River development became apparent, perhaps first to J. R. Riter.

Hundley's *Water and the West*, as noted above, observed that data presented by Reclamation during the Senate hearings on the 1944 Mexican Treaty indicated that Colorado River stream flows for 1931–40 portended deficits in the future water supply to the Lower Basin states as well as Mexico. This data was prepared by Riter in response to questions from Nevada Senator Pat McCarran in 1945.[55]

The engineer's own knowledge of the ramifications of the 10-year dry cycle, however, appears to date back to the fall of 1940 and was focused on the implications of this cycle for the Upper Basin—not the Lower Basin. In an October 1940 internal Reclamation memorandum assessing Colorado River power possibilities and operations of Lake Mead, Riter noted that "generally low run-off . . . has prevailed since 1934."[56] More importantly, as he later acknowledged to Ival Goslin, the Engineer-Secretary for the Upper Colorado River Commission in 1959, his analysis with this data indicated that by 1988 "the minimum 10-year inflow" at Lee Ferry would be less than the 75 million acre-feet obligated to the Lower Basin by the 1922 Compact (Article III[d]).[57] "It was the awareness of that situation," Riter wrote Goslin, "that prompted me to realize the necessity for holdover storage capacity in the Upper Basin to permit the Upper Basin to meet its Compact obligation at Lee Ferry and to concurrently utilize water allocated to it under the terms of the Compact."[58] As addressed in the sections below, yoking holdover storage in the Upper Basin with utilization of water in the Upper Basin was an essential element of the Upper Basin Compact and was reflected in CRSP.

Riter, in his role as the Acting Director of Project Planning for Reclamation, communicated his "awareness of the situation" posed by the 1931–40 period of record to Reclamation Commissioner Harry Bashore (later the federal chair to the Upper Basin Compact Commission) in an April 1944 memorandum. Noting the potential impact to developments downstream of

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55. Letter from Harry W. Bashore, Comm'r of Reclamation, Bureau of Reclamation, to John R. Riter, Dir. of Project Plan., Bureau of Reclamation (Mar. 19, 1945) (on file at the Bureau of Reclamation Library); Letter from John R. Riter, Dir. of Project Plan., Bureau of Reclamation (Mar. 22, 1945) (on file at the Bureau of Reclamation Library); *See* HARRY W. BASHORE, WATER SUPPLY BELOW BOULDER DAM, S. DOC. NO. 89 (1st Sess. 1945).

56. Memorandum from J. R. Riter, Chief Dev. Eng'r, Bureau of Reclamations, to Hydraulic Engineer (Oct. 25, 1940) (on file with author).

57. Letter from J. R. Riter to Ival V. Goslin, *supra* note 10.

58. Letter from J. R. Riter to Ival V. Goslin, *supra* note 10.

Lee Ferry as a consequence of 1931–40 stream flows,[59] the engineer "assumed that holdover storage would be provided above Lees Ferry to permit an ultimate average annual depletion of 7,500,000 acre-feet in the upper basin and also insure an average annual flow of 7,500,000 acre-feet at Lees Ferry in the 10-year critical period 1931 to 1940, inclusive."[60] Put another way, Riter thought that "holdover storage" above Lee Ferry was necessary to ensure that the Lower Basin received its 1922 Compact allocation and thereby permit the Upper Basin to utilize its allocation (both allocations given in Article III[a]) in the event of a "critical period" of streamflow like 1931–40.

By 1944, Reclamation was using the 1931–40 period as a "yardstick in measuring the water supply available for individual projects" throughout the Colorado River Basin.[61] "In other words," as Riter informed Upper and Lower basin representatives during a presentation on Reclamation's progress in investigating further developments in July 1944, "new projects that must be developed would have to live through this drought period in order to be sound."[62]

Reclamation project planning into the fall of 1945 was predicated on "the decade 1931–40, inclusive" as the "critical period for determination of available water supply for present and proposed initial development."[63] This was essential because that decade had exposed the possibility that the yield of the Colorado River, as Riter's 1959 letter to Goslin indicated, was insufficient to enable the Upper Basin to make use of its 1922 Compact allocation and meet its 1922 Compact-required flow obligation at Lee Ferry.[64] "[I]f the Upper Basin is going to realize the use of 7,500,000 acre feet of water," the engineer told the Upper Basin Compact commissioners when they met in 1947, "some schemes have got to be devised so that water will be

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59. Riter specifically referenced the proposed "Bridge Canyon Project," a reservoir facility above Hoover Dam and below Lee Ferry that was never built. Memorandum from John R. Riter, Acting Dir., Branch of Project Planning, Bureau of Reclamation, to Harry W. Bashore, Comm'r, Bureau of Reclamation (Apr. 12, 1944) (on file at the Bureau of Reclamation Library).

60. *Id.* "Lees Ferry" and "Lee Ferry" denote the same division point identified in the 1922 Compact. The terms were often used interchangeably in the early 20th century, particularly during the negotiations of the 1922 Compact, as Hundley has noted. *See* HUNDLEY JR., *supra* note 5, at 192 n.52.

61. BUREAU OF RECLAMATION, *supra* note 11, at 13.

62. *Id.*

63. Memorandum from Dir., Branch of Project Planning, Bureau of Reclamation, to Reg'l Dir., Salt Lake City, Utah, Bureau of Reclamation (Sept. 7, 1945) (on file at the Bureau of Reclamation Library).

64. Letter from J. R. Riter to Ivan V. Goslin, *supra* note 10.

available to us [i.e., the Upper Basin states] and still meet the obligation at Lee Ferry."[65]

Project Planning Report No. 34-8-1, a draft of the Regional Directors' Report presented to Bashore in October 1945, reflected Reclamation's focus on the 1931–40 period as a planning baseline to devise such "schemes." For tributary watersheds in the basin, the streamflow data for this "driest period of record" and "critically dry decade" was presented along with available longer periods of record.[66] The report identified potential reservoir sites in both the Lower Colorado and Upper Colorado regions and signified the potential function of each, many having multiple possible purposes.[67] In the Upper Colorado Region's articulation of the "general plan" for the Upper Basin, a limited number of "main-stem reservoirs"[68] for holdover storage were included, in part, to solve the drought problem by saving water in the Upper Basin for later release to the Lower Basin.[69] The holdover storage reservoirs were to "be operated on a long-time hold-over basis, being filled during a succession of wet years and emptied to provide firm power and to satisfy [1922] Compact requirements for water at Lee Ferry during dry periods, such as the 1931–40 decade."[70] Other reservoirs for irrigation, flood control, silt management, and domestic water would be funded by power revenues generated principally by the holdover reservoirs.[71]

The October 1945 draft of the Regional Directors' Report noted that development of "all of the projects" for the Upper Basin "exceed[ed] the Colorado River Compact allocation to the Upper Basin,"[72] and identified the Colorado River water supply overall as inadequate "for full expansion of

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65. UPPER COLO. RIVER COMPACT COMM'N, Official Record of Meeting No. 3 (Oct. 30, 1946), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 32 (1948).

66. BUREAU OF RECLAMATION, U.S. DEP'T. OF THE INTERIOR, THE COLORADO RIVER: "A NATURAL MENACE BECOMES A NATIONAL RESOURCE" 104, 128, 150, 172, 181, 189, 206 (1945), https://www.google.com/books/edition/The_Colorado_River/VgoZAAAAIAAJ?hl=en&gbpv=0 [https://perma.cc/RBH9-CT72]. Some of the tip-out figures, however, were not scanned with accuracy, so these were obtained separately from the National Archives at Denver: Box 4, Entry 93-001, RG 115, NARA D.

67. *Id.* at 8, 42.

68. Proposed Upper Basin storage reservoirs are variously described in the historical record as "main stem," or "main stream." *Id.* at 9.

69. *Id.* at 6.

70. *Id.* at 167.

71. *Id.* at 167–68. The "Elkhorn Unit" of the Sublette Project located on the Green River in Wyoming and the Ouray Project on the Uncompahgre River in Colorado—neither of which were identified for holdover storage for Lee Ferry flows—were also contemplated as generating power.

72. *Id.* at 167.

existing and authorized projects and for all potential projects."[73] "At present," however, "more than sufficient water is available physically . . . for all projects listed in the proposed initial program" in both the Upper and Lower basins.[74] The report consequently called "for a determination of the rights of the respective States in Colorado River water under the Colorado River Compact."[75]

The March 1946 Regional Directors' Report, later released by Congress along with supporting material as House Document 419 in July 1947,[76] elaborated on Reclamation plans for the Upper and Lower basins. In doing so, the report further emphasized "[t]he need for a determination of the rights of the respective States to deplete the flow of the Colorado River consistent with the Colorado River Compact and its associated documents."[77]

Notably, although the March 1946 Regional Directors' Report asserted that "[t]here is not enough water available in the Colorado River system for full expansion of existing and authorized projects and for all potential projects outlined [therein]"—100 for the Upper Basin alone—it observed that there would be sufficient water for "within-basin projects or units of projects if no further exportation of water is made [i.e., from the Colorado River Basin]."[78] The report raised the prospect "that the States may elect to forgo construction of some irrigation projects within the natural drainage basin in order to make water available for exportation," and pointed out that "some States may be unable to use their full amount [of apportioned water] unless part is exported."[79]

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73. *Id.* at 20.

74. *Id.*

75. *Id.* at 20–21.

76. As House Document 419, *The Colorado River: "A Natural Menace Becomes a Natural Resource"* was subtitled, *Interim Report on the Status of the Investigations Authorized to Be Made by the Boulder Canyon Project Act and the Boulder Canyon Project Adjustment Act*. This latter version included not only letters of transmittal to Congress from Reclamation Commissioner Michael Straus and Secretary of Interior J. A. Krug, but also comments by state and federal agencies, as well as by the Colorado River Basin states themselves, appended to the front of the March 1946 version. *See* BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, THE COLORADO RIVER: "A NATURAL MENACE BECOMES A NATIONAL RESOURCE," H.R. Doc. No. 80-419, at 1–95 (1947); *see also* MARTIN, *supra* note 53, at 48–50; KUHN & FLECK, *supra* note 5, at 130–31.

77. BUREAU OF RECLAMATION, *supra* note 3, at 21.

78. *Id.* at 7, 13.

79. *Id.* at 13–14. Trans-basins diversions were discussed during the subsequent negotiation of the Upper Basin Compact. Wyoming was especially concerned for the impact of such diversions in formulating a compact. In December 1946, in the midst of Upper Basin Compact negotiations, Wyoming State Engineer and Upper Basin Compact commissioner L. C. Bishop

Given these considerations, two principal recommendations were offer:

> "That the States of the Colorado River Basin acting separately or jointly, recommend for construction . . . a group of projects, the stream-flow depletions of which will assuredly fall within the ultimate allocation of Colorado River water," and
>
> "That the States of the Colorado River Basin determine their respective rights to deplete the flow of the Colorado River consistent with the Colorado River Compact."[80]

While none of the identified projects subsequently constructed were endorsed by all seven Colorado River Basin states, these recommendations galvanized the longstanding effort among the Upper Basin states to formulate a compact—one influenced by the 1931–40 period of record.[81]

III. THE 1931–40 "LOW PERIOD," THE LEE FERRY OBLIGATION, AND THE UPPER BASIN COMPACT

Work toward an Upper Basin interstate agreement dated to the late 1920s. In November 1929, Delph Carpenter, Colorado's commissioner for the 1922

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shared with Bashore that the Wyoming delegate saw "that the practical solution of meeting the obligation at Lee Ferry [i.e., Article III(d) of the 1922 Compact] was to close all transmountain diversions until the obligation is meet." Bishop and his advisors believed that Reclamation should, in turn, "plan our reservoir system so it will never be necessary to close any diversions." *See* Letter from L.C. Bishop, State Eng'r & Interstate Streams Comm'r for Wyo., to Harry W. Bashore, Chairman, Upper Colo. River Compact (Dec. 27, 1946) (on file with author); *see* Letter from Reid Jerman, Planning Engineer, on Progress of Investigations (Mar. 8, 1949) (on file at Wyo. State Archives, RG 0037, Box 1).

Before his fellow commissioners at the fifth meeting, Bishop identified "transmountain diversion[s]" as "the most troublesome item that confronts this Commission." He believed that Upper Basin advocacy for transmountain diversions during the 1922 Compact negotiations led to the Article III(d) requirement "a mistake that can well wreck the entire plan of the development of the Upper Basin unless we face the facts and keep the amount of water to be transported from the Basin within reasonable limits." He expressed Wyoming's willing to take "about 200,000 acre feet of water for transmountain diversion [*sic*] and we will sign on the dotted line to scale ours down to take care of the obligation at Lee Ferry . . . it is our position that it is morally wrong to take water from a basin which is needed within that basin." UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 27.

No such provision or any provision relating to transmountain or transbasin diversions was adopted in the Upper Basin Compact.

80. BUREAU OF RECLAMATION, *supra* note 3, at 21.

81. By contrast, in the late 1940s, Lower Basin states of Arizona and California were moving toward interstate adjudication that culminated in the landmark decision in *Arizona v. California*, 373 U.S. 546, 579–85 (1963) which has subsequently shaped Lower Basin water administration by the federal government. *See* HUNDLEY, *supra* note 5, at 299–306; KUHN & FLECK, *supra* note 5, at 157–68.

Compact, prepared a "Preliminary Suggestion for an Upper Colorado River Compact" that became the basis of initial negotiations before the Upper Basin states reached an impasse.[82] As noted above, in June 1934, representatives of the Upper Basin states adopted a resolution that endorsed negotiation for an Upper Basin compact. This resolution declared that "each state should go ahead with its development without objection, as contemplated by the Colorado River Compact," provided it did not "approach[] too nearly the equitable share of water that under compact might eventually be apportioned to such state out of the waters involved."[83]

As Colorado attorney and Upper Basin Compact legal advisor Jean Breitenstein later recalled, the Regional Directors' Report spurred the Upper Basin to move forward with formal compact negotiations in July 1946.[84] Talks were initiated at a meeting of the Upper Basin state governors in Cheyenne, Wyoming that month, and the Upper Colorado River Basin Compact Commission would meet eight times before agreeing to an Upper Basin Compact in October 1948.[85] The compact was signed into law in April 1949,[86] but the commission held "Post-Compact Meetings" in December 1948, February 1949, and August 1949 before formally adjourning with the organization of the Upper Colorado River Commission that oversees compact administration today.[87]

"[T]wo primary problems" confronted the Upper Basin Compact commissioners, as articulated by Utah State Engineer and Upper Basin Compact commissioner Edward Watson in December 1947: "(1) to divide the water equitably [among the Upper Basin States], and (2) allocate the

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82. PRELIMINARY SUGGESTION FOR AN UPPER COLORADO RIVER COMPACT (1929); PRELIMINARY SUGGESTION FOR AN UPPER COLORADO RIVER COMPACT (1930); REMARKS IN RE PRELIMINARY DRAFT OF UPPER COLORADO RIVER COMPACT (1930); DANIEL TYLER, SILVER FOX OF THE ROCKIES: DELPHUS E. CARPENTER AND WESTERN WATER COMPACTS 261–63 (2003); *see also* KUHN & FLECK, *supra* note 5, at 141.

83. As also noted above, this resolution facilitated congressional authorization of C-BT. *See* BUREAU OF RECLAMATION, *supra* note 46, at 5–6; *Meeting 4 Upper Basin States Is Harmonious One*, *supra* note 46; *States of Upper Basin Offer Plan*, *supra* note 46; *see also* TYLER, *supra* note 46, at 66–96; SCHULTE, *supra* note 46, at 53–65; KUHN & FLECK, *supra* note 5, at 141.

84. BREITENSTEIN, *supra* note 53, at 3.

85. UPPER COLO. RIVER BASIN COMPACT COMM'N, Foreword, *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE i, i–ii (1948) [hereinafter UPPER COLO. RIVER BASIN COMPACT COMM'N, Foreword]; UPPER COLO. RIVER BASIN COMPACT COMM'N, Explanatory Note, *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE (1948) [hereinafter UPPER COLO. RIVER BASIN COMPACT COMM'N, Explanatory Note].

86. 43 U.S.C. § 620.

87. UPPER COLO. RIVER BASIN COMPACT COMM'N, Foreword, *supra* note 85, at ii; UPPER COLO. RIVER BASIN COMPACT COMM'N, Explanatory Note, *supra* note 85.

obligation at Lee Ferry."[88] In demonstrating that the available supply from the Colorado River could be lower than previously thought, the 1931–40 dry cycle complicated resolution of these "primary problems." Yet, the experience of that period also provided a context for the solutions articulated and embraced by the Upper Basin Compact. During the negotiations, Riter pointed that "during a low ten-year period" like 1931–40, to meet the Lower Basin's "bottom right . . . to 7,500,000 acre feet" and release sufficient water "for the benefit of the Mexican Treaty," the Upper Basin would have "something less than 5,000,000 acre feet for use . . . probably 4,000,000 acre feet."[89] The Upper Basin understood that in order to utilize their 1922 Compact allocation (Article III[a]), an agreement between the Upper Basin states as well as physical storage solutions had to ensure the states could meet their Compact obligation to make future deliveries to Lee Ferry under comparable dry conditions.

Future droughts, moreover, likely could not absolve the Upper Basin of its "obligation" to the Lower Basin, in the view of Judge Clifford Stone. President of the Colorado Water Conservation Board and Colorado's Upper Basin Compact commissioner, Stone doubted that an "unprecedented drought" would be a sufficient excuse for the Upper Basin states individually to fail to deliver water at Lee Ferry.[90] He opined: "I would assume that the defense of drought would not be a complete defense. . . . We can't control Mother Nature. Neither can we go back and revamp the Colorado River Compact. The Colorado River Compact does make it [i.e., the Lee Ferry delivery] a joint and several obligation."[91]

Meeting the "obligation," determining how to ensure reliable deliveries to the Lower Basin under the 1922 Compact, was the Upper Basin Compact

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88. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 129. Although the focus of this essay is on the Upper Basin's obligation to the Lower Basin under the 1922 Compact, the Lee Ferry obligation by the late 1940s included not only the 1922 Compact's Article III(d) provision for the Lower Basin but also deliveries to Mexico under Article 10(a) of the 1944 Mexican Treaty. Additionally, under the treaty's Article 10(b), "[i]n the event of extraordinary drought or serious accident to the irrigation system in the United States, thereby making it difficult for the United States to deliver the guaranteed quantity of . . . water allotted to Mexico [would] . . . be reduced in the same proportion as consumptive uses in the United States are reduced." *See* Treaty With Mexico Relating to the Utilization of the Waters of Certain Rivers: Message from the President of the United States, Transmitting A Treaty Between the United States of America and the United Mexican States, Signed at Washington on February 3, 1944, Relating to the Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande from Fort Quitman, Tex., to the Gulf of Mexico, 78th Cong., 2d sess. 14 (1944).

89. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 6 (Feb. 17–21, 1948), *in* 2 RECORD OF COMMISSION MEETINGS NO. 6–11, INCLUSIVE 48 (1948).

90. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 109.

91. *Id.* at 110.

negotiators' top priority—a prerequisite to apportioning the water remaining in the river after satisfying the Lee Ferry obligation. As Breitenstein observed about the Upper Basin Compact negotiations:

> [W]hile the 1922 Compact by its paragraph III (a) apportions to the Upper Basin the beneficial consumptive use of 7,500,000 acre-feet annually, such use is subject to the availability of water. The States of the Upper Division [i.e., the Upper Basin] . . . are required by the 1922 Compact to maintain certain flows at Lee Ferry. The water available for use [i.e., by the Upper Basin] is that remaining after the Lee Ferry delivery requirements are satisfied.[92]

Acknowledgment that the Upper Basin commissioners were not going "to revamp the [1922] Compact" (in Stone's words) applied both to their recognition of the Lee Ferry "obligation" and to their understanding of their rights to develop fully waters allocated to them by the 1922 Compact.[93]

At the outset of the negotiations, Stone was the first to call attention to "the obligation" imposed on the Upper Basin states "to make deliveries to Lee Ferry."[94] When commissioners began discussing how they might apportion the 7.5 million acre-feet allocated to the Upper Basin by the 1922 Compact's Article III(a), he reminded them: "We are not concerned here solely with the question of dividing the water."[95] "These states [i.e., Colorado, New Mexico, Utah, and Wyoming]," the Colorado commissioner maintained, "have assumed an obligation in the Colorado River Compact to deliver a specified amount at Lee Ferry, and that is going to be a very important phase of these negotiations."[96]

Noting the importance of the Lee Ferry delivery "obligation" in the face of drought periods, the Upper Basin commissioners and their advisors further conceded that Upper Basin use could be curtailed to ensure compliance with the 1922 Compact as well as the recently negotiated treaty with Mexico.[97] For example, Charles L. Patterson, a Colorado engineer who initially served on the Engineering Advisory Committee, observed that the states could very well apportion their 1922 Compact Article III(a) waters, but "when you

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92. BREITENSTEIN, *supra* note 53, at 8.

93. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 110.

94. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Preliminary Governors' Meeting (July 22, 1946), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 8 (1948).

95. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 1 (July 31, 1946), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 33 (1948).

96. *Id.*

97. *Id.*

consider the delivery obligation along with it you may finally conclude that it won't be possible for you collectively to reach that amount."[98]

Upper Basin engineers conceptualized holdover storage reservoirs on the main stem of the Colorado River and its major tributaries as the physical solution that would eventually allow for full development of the 7.5 million acre-feet allotted by the 1922 Compact (Article III[a]), even during a period of drought like 1931–40. "In order to beneficially consume as much as possible all of the water allocated to the Upper Basin and still meet the obligation of not depleting the flow at Lee Ferry in a low ten-year period such as from 1931 to 1940 inclusive," Riter told the Commission, "it becomes necessary to consider main stem storage."[99]

Water stored in reservoirs located downstream from most Upper Basin irrigation projects would be released to meet the Lee Ferry obligation during low-water years, preserving inflows of headwaters for use by the Upper Basin's own diversion projects. As Patterson opined, the "purpose" of building reservoirs was "instead of shutting off projects, we are going to rely on these reservoirs to make good on the obligations at Lee Ferry."[100] Operationally, he envisioned releases of holdover storage water from the reservoirs as occurring in a future eleventh hour—at the end of a ninth year of drought to prevent missing the 1922 Compact Article III(d) obligation to deliver 75 million acre-feet to the Lower Basin in a 10-year period.[101]

The "concept of holdover reservoirs" furthermore, as Riter explained when questioned by Rollins as to whether "sufficient water can be stored to take care of our [i.e., the Upper Basin's] obligation" was not limited to meeting a comparable set of flow conditions as 1931–40 "just . . . once."[102] The federal engineer could not be sure "whether 1931 to 1940 [was] a proper basis" or whether there would not be "a lower ten-year period" in the future, but he did believe that sufficient water could be stored to meet the 1931–40 conditions.[103] More to the point, Riter believed that such reservoirs

> must be planned so they can be filled with the ultimate development you plan to make. In other words, I don't envision these holdover reservoirs as just emptying them once. I envision after they are emptied they have got to be refilled again to prepare for another

98. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 79.

99. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 2 (Sept. 17–18, 1946), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 9 (1948).

100. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 30.

101. *Id.* at 78.

102. *Id.* at 102–03.

103. *Id.* at 102.

> drought cycle. . . . I have in mind a cyclic operation following complete development.[104]

The alternative (as Patterson suggested) was "curtailment" of Upper Basin water use—or at least by individual Upper Basin states' projects—to meet the Lee Ferry obligation. Breitenstein, for his part, believed that curtailment should only come into play in the event of deficient Lee Ferry flows: "[T]here should be no question of curtailment arise [*sic*] unless there is a deficiency at Lee Ferry."[105] He moreover insisted that "no state should be called upon to shut down any of its uses to supply a deficiency unless the main stem reservoirs have failed in the test."[106]

An Engineering Advisory Committee letter, presented at the July 1948 Vernal, Utah meeting, which formed the basis for the final report of the committee in November 1948, recommended "main stem reservoir[s]" as a centerpiece for an Upper Basin Compact.[107] The committee acknowledged that "[t]he flow of the Colorado River is not uniform but varies from year to year."[108] The lowest known year was 1934, during the 1931–40 period, when the flow at Lee Ferry was approximately 4.4 million acre-feet; the greatest year was 21.9 million acre-feet in 1917.[109] For 1931 to 1940, the engineers calculated that the average annual flow at Lee Ferry was 10,151,000 acre-feet.[110] In their analysis, without "replacement reservoirs," the Upper Basin's use of 1922 Compact Article III(a) water would be limited to 4.3 million acre-feet (as Riter had warned).[111] This was an amount that was far more than the basin was annually using in the 1930s (as noted above)[112] but less than the 1922 Compact allocation (Article III[a]). "To permit full use of the Upper Basin allocation of 7,500,000 acre-feet annually during drought cycles," the Engineering Advisory Committee concluded,

> holdover reservoirs must be constructed in the Upper Colorado River Basin to impound water in years of high runoff and to release

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104. *Id.* at 103.

105. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 77.

106. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 101.

107. Letter from Engineering Advisory Committee to the Upper Colorado River Basin Compact Commission, *supra* note 45, at 8.

108. *Id.*

109. *Id.*

110. *Id.*

111. *Id.*; UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 99, at 9.

112. BUREAU OF RECLAMATION, *supra* note 3, at 151; Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, *supra* note 45, at 6–7.

> such stored water in critical periods of low runoff, such as 1931-40, to help meet the Upper Basin obligation at Lee Ferry.[113]

"Operation studies . . . assuming that all holdover storage would be provided at the Glen Canyon site on the Colorado River"[114]—identified above Lee Ferry by USGS hydrologist E. C. LaRue in 1916,[115] preliminarily surveyed by him in 1922,[116] and proposed for development in the Regional Directors' Report[117]—indicated that "storage capacity of 34,200,000 acre-feet (live capacity 29,200,000 acre-feet) [to accommodate 'power head and sediment']" would be sufficient.[118] Figure 3 is an excerpt from the 1916 "Map of Colorado River Drainage Basin," prepared by LaRue, depicting Glen Canyon (the "Colorado-San Juan Res. Site").[119]

As suggested above, satisfaction of the Lee Ferry "obligation" went hand-in-hand with divvying up the waters apportioned by the 1922 Compact. Stone expressed his openness to a proposal for a "specific formula" for the utilization of the Upper Basin's 7.5 million acre-feet 1922 allocation (Article III[a]), "together with a formula with respect to the deliveries of water at Lee Ferry."[120] As negotiations advanced, the Colorado commissioner continued to push for "the determination of the respective obligations of the states to make deliveries at Lee Ferry," along with "the apportionment of water."[121]

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113. Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, *supra* note 45, at 8.

114. *Id.* at 9.

115. E.C. LA RUE, COLORADO RIVER AND ITS UTILIZATION 214–15 (1916).

116. Letter from E.C. La Rue, Hydraulic Eng'r, U.S. Geological Surv., to Clarence C. Stetson, Assistant to Herbert Hoover, Sec'y of Com. (Oct. 6, 1922) (on file with author).

117. BUREAU OF RECLAMATION, *supra* note 3, at 146–47.

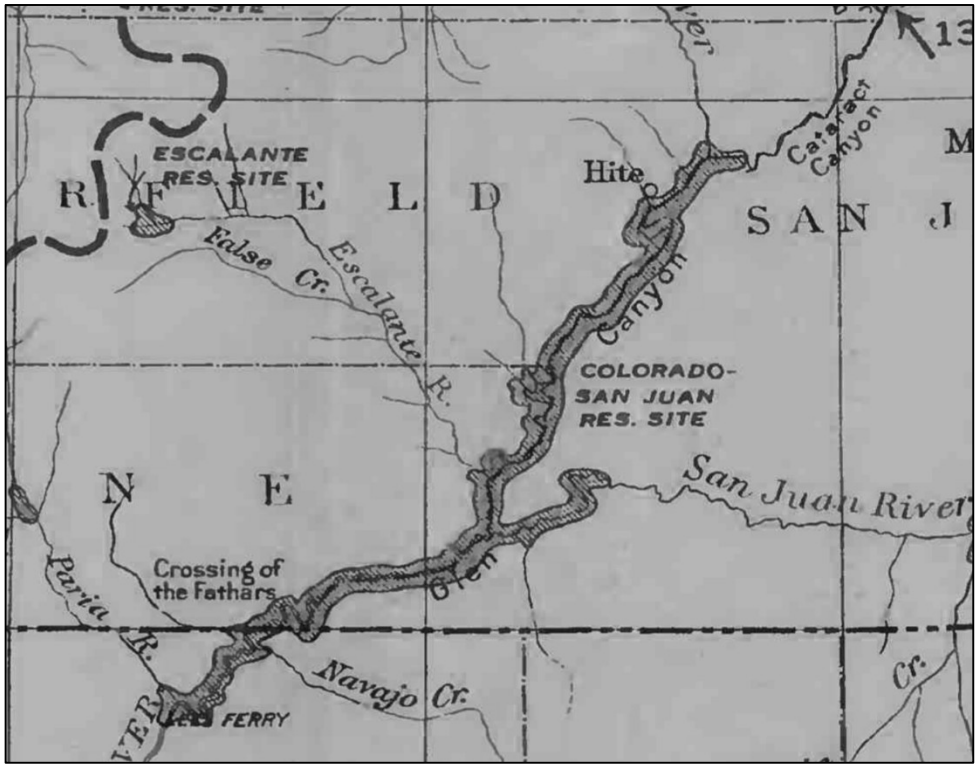
118. Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, *supra* note 45, at 9. Although the operational studies assumed that Glen Canyon Dam would provide all holdover storage to meet the Lee Ferry obligation during a 1931–40 drought period, as discussed above, the CRSP envisioned multiple reservoirs providing this holdover storage.

119. E.C. LaRue, *supra* note 115, Plate XIII "Map of Colorado River Drainage Basin."

120. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 4 (Sept. 8, 1947), *in* 1 RECORD OF PRELIMINARY GOVERNORS' MEETING, AND FOR COMMISSION MEETINGS NO. 1–5, INCLUSIVE 6 (1948).

121. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 89, at 68.

Figure 3. The Glen Canyon Reservoir Site[122]



Note: The Glen Canyon Reservoir Site is identified by E.C. LaRue in this map as the "Colorado-San Juan Res. Site."

This latter issue was largely worked out during the same Vernal meeting at which the engineers endorsed holdover storage.[123] At this "marathon seventh meeting," lasting two weeks in July 1948,[124] Breitenstein later recalled "a tentative compact draft was hammered out."[125] The Upper Basin states not only agreed to a percentage apportionment of the Upper Basin's 1922 Compact Article III(a) allocation but also adopted the "stream depletion theory" and the "'inflow-outflow' method," as presented by Colorado's engineering advisor Royce Tipton.[126] As discussed below, both the stream depletion theory and the inflow-outflow method of measurement would come

122. E.C. LaRue, *supra* note 115, Plate XIII "Map of Colorado River Drainage Basin."
123. KUHN & FLECK, *supra* note 5, at 144–45.
124. *Id.* at 145, 248 n.13.
125. BREITENSTEIN, *supra* note 53, at 6.
126. KUHN & FLECK, *supra* note 5, at 144–46, 148.

under Lower Basin scrutiny during congressional hearings on the Upper Basin Compact.

The Upper Basin Compact Commission, as memorialized by Breitenstein, proceeded on the basis that it was dividing the water remaining after the Lee Ferry obligation was met.[127] The resulting compact emphasized the obligation to the Lower Basin under the 1922 Compact to ensure that 75 million acre-feet passed Lee Ferry in ten years (Article III[d]),[128] an emphasis that the recent 1931–40 dry cycle had underscored.[129] In line with Patterson's conceptualization of using regulatory storage to avoid missing the delivery of 75 million acre-feet during a tenth year of drought, the Upper Basin Compact specifically addressed a scenario whereby curtailments to meet the Lee Ferry obligation would be based on the ten years preceding the shortfall (Upper Basin Compact Article IV[b]).[130]

To maximize their permitted utilization of Colorado River water under the 1922 Compact, the Upper Basin adopted the "stream depletion theory" as the measure of their "consumptive use" of Colorado River flows and the "'inflow-outflow' method" to account for those depletions.[131] Colorado's engineering advisor Royce Tipton laid these ideas out in detail to the commissioners, with reference to data from other watersheds, the Rio Grande and the South Platte River.[132] The "stream depletion theory" defined "consumptive use . . . in terms of man-made depletions of the virgin flow at Lee Ferry."[133] "Virgin flow," according to Tipton, "in 1922 was called 'reconstructed flow.' Both terms mean the flow of the river as it was in the state of nature before man entered the picture."[134] To assess depletion, the engineer in turn proposed, "measur[ing] . . . the change in relation between the runoff at certain key gaging stations location around the rim of the basin

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127. BREITENSTEIN, *supra* note 53, at 3.

128. *Id.*

129. *See* KUHN & FLECK, *supra* note 5, at 108.

130. *See* UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 81; KUHN & FLECK, *supra* note 5, at 147.

131. BREITENSTEIN, *supra* note 53, at 10–11; *see also* KUHN & FLECK, *supra* note 5, at 144–46.

132. UPPER COLO. RIVER BASIN COMPACT COMM'N, Official Record of Meeting No. 7 (July 7–21, 1948), *in* 2 RECORD OF COMMISSION MEETINGS NO. 6–11, INCLUSIVE 42–63 (1948).

133. BREITENSTEIN, *supra* note 53, at 10.

The origins of the "stream depletion theory" are complex, and while Tipton emerged in the context of the Upper Basin Compact negotiations as the architect of the idea, Arizona employed the idea in advocating for its exclusive use of the Gila River in the 1940s. *See, e.g.*, 2 JOHN UPTON TERRELL, WAR FOR THE COLORADO RIVER, ABOVE LEE'S FERRY—THE UPPER BASIN 11–12 (1965); KUHN & FLECK, *supra* note 5, at 132–37, 144–45.

134. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 132, at 43.

above the major development and the outflow from the basin as measured at Lee Ferry."[135]

Lower Basin stakeholders—especially California's representatives—questioned the "stream depletion theory," the "inflow-outflow method," and the contemplated use of storage reservoirs, as the Upper Basin Compact moved toward congressional approval in the spring of 1949. During Breitenstein's appearance before the House Subcommittee on Irrigation and Reclamation, in particular, California's Clair Engle expressed his concern that under "the depletion theory, the amount of water passing Lee Ferry [and into the Lower Basin] would be less" than under the theory of "diversions less return to the river" (espoused by California) and that the Upper Basin would gain more water under this theory.[136] Colorado's Upper Basin Compact legal advisor, having already expressed the Upper Basin's "intent to live up to the [1922] Colorado River compact" and the "opinion [that] the depletion theory is a correct interpretation of the Colorado River compact," deferred to Tipton.[137] Tipton's view was that if the "California theory" of "diversion minus return to the stream . . . had been adopted by the upper basin States when it wrote its compact, there would be less water passing Lee Ferry than there will be under the theory that is set forth in the upper basin compact."[138]

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135. *Id.*

136. *The Upper Colorado River Basin Compact: Hearings Before the Subcomm. on Irrigation and Reclamation of the Comm. on Pub. Lands*, 81st Cong. 93–94 (1949) [hereinafter *The Upper Colorado River Basin Compact Hearings*] (statement of Rep. Clair Engle, Member, Comm. on Pub. Lands).

The "California theory," as Tipton pointed out, found expression in the Boulder Canyon Act but "diversions less return" was not mentioned in the 1922 Compact. *See id.* at 94. In its comments on *The Colorado River Report*, California argued that "consumptive use" was "[t]he only proper measure of water requirements on the Colorado River," was "used in the Colorado River compact and related legislation," and "should be measured at actual or potential places of use." H.R. Doc. No. 80-419, at 39 (1947). Kuhn and Fleck point out, that this question of how to measure use was a central argument between California and Arizona in the 1940s, leading into the *Arizona v. California* litigation. KUHN & FLECK, *supra* note 5, at 133–37, 157–60.

Notably, following Tipton's presentation to the Upper Basin Compact commissioners, Wyoming's legal advisor William J. Wehrli expressed the opposite concern of Engle's – that the Upper Basin would have less water relative to the Lower Basin under this theory. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 132, at 57–60; *see also* KUHN & FLECK, *supra* note 5, at 145.

137. *The Upper Colorado River Basin Compact Hearings*, *supra* note 136, at 93.

138. *Id.* at 94. Kuhn and Fleck point out that under the "stream depletion theory," using the "inflow-outflow" method to assess "the impact of human water use to the natural flow at Lee Ferry . . . the Upper Basin could, at least during wet cycles, collectively consume 600,000 acre-feet more than 7.5 million acre-feet per year and, under its 1922 compact apportionment, a total of 8.1 million acre-feet." KUHN & FLECK, *supra* note 5, at 144.

When Engle pressed further about the potential impact of the Upper Basin Compact on the Lower Basin, stressing the Lower Basin's "interest[]" in the method of "measurement," Breitenstein conceded the issue of "the measurement of water" could require adjudication by the Supreme Court:

> if at times of ultimate development when we [i.e., the Upper Basin] are up to near the maximum of our use, or when the question is whether or not we are meeting our delivery obligations, there is disagreement between the two basins as to how beneficial consumptive use is to be measured and it cannot be settled amicably, I assume that at that time, some uncertain date in the future, there may have to be a decision of the United States Supreme Court determining as between these two basins, which method is discussed here, or perhaps some other method that one of us have thought of yet, is the correct method of measuring beneficial consumptive use.[139]

As for storage reservoirs, in reviewing Article IV of the Upper Basin Compact before the House Subcommittee, Tipton highlighted the need for these facilities "along the main stream of the Colorado River and some of its tributaries . . . in order to enable the upper basin to make use of its apportioned water."[140] The Upper Basin in the 1940s and early 1950s, as noted above and below, was utilizing neither its full 7.5 million acre-feet 1922 Compact allocation (Article III[a]) nor an amount that threatened the Lower Basin's allocation (which speaks to Engle's concern). The engineer acknowledged that the reservoirs would be constructed "long before" they were going to be needed to satisfy the Lee Ferry obligation, so they would be used "for the generation of hydroelectric energy" in the interim.[141] Tipton's rationale was that operating the reservoirs for hydroelectric power generation, an activity that demands a steady supply of water, would regulate the river such that the Upper Basin obligation at Lee Ferry would be "taken care of."[142] He maintained that operating the reservoirs for the purposes of satisfying the obligation and for power generation were compatible.[143]

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139. *The Upper Colorado River Basin Compact Hearings*, *supra* note 136, at 94–95. Breitenstein went on to observe that California had very few diversions from the Colorado River and those were large and simple to measure whereas in Colorado, there were "between four and five thousand of diversions on the west slope," which are onerous to gage and difficult from which to assess return flow. *Id.*

140. *Id.* at 37.

141. *The Upper Colorado River Basin Compact Hearings*, *supra* note 136, at 37.

142. *Id.* at 38.

143. *Id.*

Under questioning from Arizona's representative John R. Murdock as to whether the Upper Basin "will ultimately be able to use its apportionment of 7,500,000 acre-feet of water annually and, at the same time, be able to deliver . . . an average of 7,500,000 acre-feet for the lower basin," Tipton was unsure of the former but confident of the latter. "I am not sure that the upper basin can utilize 7 ½ million acre-feet," the engineer told Murdock, but "[i]n any event, it will always make its required delivery at Lee Ferry." [144] Moreover, Tipton stated,

> The very development of the basin itself by the construction of the substantial hold-over reservoirs for the direct use of the upper basin above the points of use, the effect of that will be to equate to some extent the flow of the river at Lee Ferry. That always happens, but in addition to those reservoirs, and the effect they will have upon the flow at Lee Ferry there will be required additional reservoirs with an aggregate substantial capacity below our points of use to complete the balance of the equation that is necessary to take care of our obligation...[145]

This idea of storage reservoirs below Upper Basin points of use for the purposes of meeting the Lee Ferry obligation and generating power to fund Upper Basin irrigation projects was the blueprint for the CRSP "units" and "participating projects" that followed the Upper Basin Compact's ratification.[146]

IV. "TO PERMIT THE STATES OF THE UPPER DIVISION TO MEET LEE FERRY FLOW OBLIGATIONS AND UTILIZE THE FULL CONSUMPTIVE USE APPORTIONED THEM": THE DESIGN OF THE COLORADO RIVER STORAGE PROJECT

Even before the Upper Basin Compact was signed, Reclamation Region IV, encompassing the Upper Basin states and based in Salt Lake City, was working toward a proposal for Upper Basin development. Investigation of projects above Lee Ferry had been ongoing since 1946,[147] and in March 1949, Region IV released for internal review a preliminary and draft "Interim Report Colorado River Storage Project and Participating Projects, States of

144. *Id.* at 49.

145. *Id.* at 49.

146. KUHN AND FLECK, *supra* note 5, at 152.

147. H.R. Doc. No. 83-364, at 102 (1954); *see, e.g.*, BUREAU OF RECLAMATION, *supra* note 43; *see also* Correspondence from U.S. Dept. of Interior, Bureau of Reclamation, to Upper Colo. River Comm'n 10 (Mar. 8, 1949) (on file with author).

the Upper Division, Upper Colorado River Basin." This was the first iteration of the report that became the basis of the CRSP bill approved by Congress in 1956.[148] Although CRSP drew on elements presented in the Regional Directors' Report, it embodied ideas reflected in the Upper Basin Compact.

Region IV finalized the CRSP report for transmittal to the Reclamation Commissioner and the Secretary of the Interior in December 1950. The agency prepared a supplemental report in 1953 and submitted both the 1950 and 1953 reports to Congress in 1954.[149] Reclamation assumed full authorship of the CRSP reports but acknowledged that both the Upper Basin states and the Upper Colorado River Compact Commission contributed to the report and the substantiating materials.[150] Upper Basin legislators introduced the first versions of the legislation to Congress in 1953.[151]

Upper Basin recognition that its water resources could not be fully developed while meeting the Lee Ferry obligation during a future decade of flow conditions similar to those of 1931–40 framed the problem that CRSP was intended to address. Water development in the Upper Basin had been accomplished primarily through "numerous small private enterprises and 13 projects of various sizes undertaken by the Bureau of Reclamation" at the least expensive and most convenient locations.[152] The Upper Basin's uses in 1950 were estimated to deplete the flow of the Colorado River at Lee Ferry by slightly more than 2.5 million acre-feet annually.[153] "Present flows in the upper basin," were therefore "adequate to meet the 10-year Lee Ferry obligation."[154] In fact, Reclamation concluded that at the 1950 rate of Upper Basin use, no curtailment of water would be required "[u]nless future droughts are much more severe than that of 1931–40."[155] "Within 20 or 25 years, however," Reclamation anticipated that "curtailment of consumptive uses will be necessary in protracted dry periods unless some storage water is available for delivery to the lower basin."[156] In essence, CRSP was intended to address a future problem resulting from a drought like that of 1931–40.

Similarly, as noted above, the Lower Basin was not on the receiving end of multiple shortfalls of 1922 Compact water deliveries between 1931 and 1940. Rather, the decade was marred by one particular year (1934) when the

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148. BUREAU OF RECLAMATION, *supra* note 43, at 10–12.
149. H.R. Doc. No. 83-364, at III (1954).
150. *Id.* at 70.
151. 1 TERRELL, *supra* note 49, at 263.
152. BUREAU OF RECLAMATION, *supra* note 43, at 6.
153. H.R. Doc. No. 83-364 at 47, 86 (1954).
154. *Id.* at 105.
155. *Id.* at 148.
156. *Id.* at 105.

"Virgin Flow" of water passing Lee Ferry was approximately 5.6 million acre-feet.[157] In fact, when the CRSP report was drafted, the Lower Basin was in a comparatively good position on the river. As noted above, Hoover Dam was providing storage, regulation, and flood control below Lee Ferry and water annually passing Lee Ferry typically exceeded the Lower Basin's 1922 Compact allocation (Article III[a]).[158] With no storage reservoirs on the main stem above Lake Mead, the Lower Basin did not have to contend with an upstream release schedule for its supply. Unsurprisingly then, opposition to the CRSP legislation came from the Lower Basin and from outside the Upper Basin–especially with regard to the proposed Echo Park Dam in Dinosaur National Monument.[159] As discussed further below, Lower Basin opponents of the legislation, especially Californians, disputed fundamental components of the Upper Basin's implementation and interpretation of its obligations under the 1922 Compact.[160]

Reclamation, working with the Upper Basin, designed CRSP to meet the theoretical inability of a fully developed Upper Basin to meet its downstream obligations during the 1931–40 conditions.[161] Calculating that the virgin flow of the Colorado River during this decadal dry cycle was approximately 118,320,000 acre-feet, Reclamation concluded that during that time, the Upper Basin "could have depleted the river flow during the 10-year drouth [*sic*] period by only 43,320,000 acre-feet in terms of man-made depletions at Lee Ferry" and still met the obligation.[162] As discussed above, the Upper Basin had not reached a stage of infrastructure development that utilized such a quantity of water. Looking to the future, however, Reclamation and the Upper Basin recognized that without river regulation, new projects in the Upper Basin would be limited to those that did not consume more water than required to meet the 10-year Lee Ferry obligation and the U.S. commitment to Mexico.[163] The aim of the storage project first and foremost was "to permit the States of the upper division to meet Lee Ferry flow obligations and utilize

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157. *See* BUREAU OF RECLAMATION, *supra* note 43, at 32.

158. *Id.*

159. In 1965, Terrell provided a detailed account of this opposition, especially to Echo Park. *See* 2 TERRELL, *supra* note 133, pts. 2–7. For an interpretive history of the origins of this fight and its relationship to the post-World War II conservation movement, see MARK W. T. HARVEY, A SYMBOL OF WILDERNESS: ECHO PARK AND THE AMERICAN CONSERVATION MOVEMENT (Univ. Wash. Press, 2000) (1994).

160. H.R. Doc. No. 83-364, at 52–58 (1954).

161. *See id.* at 2, 105.

162. BUREAU OF RECLAMATION, *supra* note 43, at 38.

163. *Id.* at 38–39.

the full consumptive use apportioned them under the terms of the Colorado River Compact."[164]

The CRSP report proposed congressional authorization for a plan of development that would finance irrigation development (through power revenues) in the Upper Basin and provide for regulatory storage capacity in the Upper Basin to allow it to meet its downstream delivery obligations at Lee Ferry during periods of drought like 1931–40.[165] Despite a name that suggests a Colorado River Basin-wide undertaking, CRSP was an Upper Basin/Region IV project whose works were located exclusively in the Upper Basin.[166] From the geographical perspective of the Lower Basin, the "storage" component of the project was upstream on the Colorado River and its major tributaries. The plan of development within the Upper Basin notably placed most of this storage too far downstream to provide water directly to irrigable lands and industrial centers in the Upper Basin at the time.[167]

The plan provided for two classes of reservoirs that reflected the conceptualization offered by Tipton during the Upper Basin Compact hearings. Ten "units"—mostly downstream from Upper Basin points of use—would each include a dam, reservoir, and hydroelectric power generating facilities.[168] Eight of the units would provide for river regulation.[169] The total storage capacity of the storage units was 48,555,000 acre-feet, with 37,530,000 acre-feet of active storage capacity.[170] These units "constitute[d] the Colorado River storage project."[171] The other class of reservoirs that Reclamation Commissioner Michael Straus identified as an "element[] in the plan" were participating irrigation projects.[172] Participating projects generally consisted of reservoirs, diversion, and distribution works—all intended to facilitate Upper Basin consumption of Colorado River waters.[173]

The 1931–40 period of record figured prominently in both setting the design criteria for CRSP and in developing recommendations for the initial authorization of units. Region IV posited that 23 million acre-feet "of active

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164. *Id.* at 39.

165. *Id.* at 1–11; H.R. Doc. No. 83-364, at 105, 148–49 (1954); Letter from Michael W. Straus, Comm'r, Bureau of Reclamation, to Oscar L. Chapman, Sec'y of the Interior, at 2 (Dec. 22, 1950) (on file with author).

166. *See* H.R. Doc. No. 83-364, at 104–05 (1954).

167. *Id.* at 105.

168. *Id.* at 71.

169. *Id.*

170. *Id.* at 72.

171. *Id.* at 71.

172. *See* Straus, *supra* note 165, at 2.

173. *Id.* at 107.

hold-over storage capacity" would be required for the Upper Basin to meet the Lee Ferry obligation during a future drought event comparable to the drought recorded between 1931 and 1940.[174] Operationally, Reclamation envisioned a system much as suggested by Riter during the Upper Basin Compact negotiations, a system whereby:

> water stored would be released as needed in drought periods to meet the compact obligation at Lee Ferry. The reservoirs would be refilled during years of favorable water supply. In a dry decade such as that of 1931–40, release of the entire 23 million acre-feet would be necessary to meet the Lee Ferry obligation.[175]

To maintain the 23 million acre-feet necessary for hold-over storage—reflecting the need pointed out by the 1931–40 period—additional capacity would be required for sediment encroachment.[176] Reclamation made future projections about sediment encroaching into storage and projected that in 200 years, 18 million acre-feet of sediment would be captured by project reservoirs, 12 million acre-feet of which would be retained in the active storage capacity.[177] Region IV suggested that future generations could ameliorate the problem by "controlling some sediment at its source and by developing remaining upstream sediment storage sites."[178]

In preparing a request for initial authorization of components of CRSP, Reclamation drew a distinction between known and unknown factors. Straus wrote that "[i]t is possible at this time to foresee rather clearly the needs of the Upper Basin in terms of storage requirements for purposes of river regulation, although facilities for utilization of the last drops of water cannot be seen with any clarity."[179]

Between the 1950 CRSP report and the 1956 passage of CRSPA, various combinations of units and participating projects for initial authorization were considered.[180] Every major proposal had one thing in common: the recommendation of the Glen Canyon Dam. The dam site, as noted above, had long been considered a suitable one for the overall development of the Colorado River Basin.[181] Situated just 17 miles upstream from Lee Ferry (and far downstream from Upper Basin points of use), Glen Canyon Dam had the

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174. E.O. Larson, *Regional Director's Report*, *supra* note 43, at 16; H.R. Doc. No. 83-364, at 105 (1954).

175. H.R. Doc. No. 83-364, at 105 (1954).

176. *See id.* at 163.

177. *Id.* at 72; E.O. Larson, *Regional Director's Report*, *supra* note 43, at 17.

178. E.O. Larson, *Regional Director's Report*, *supra* note 43, at 17–18.

179. *See* Straus, *supra* note 165, at 1.

180. 2 TERRELL, *supra* note 133, apps. C & D.

181. *See* discussion *supra* Part III.

potential to create "more initial storage capacity than all others combined."[182] It was the only one of the 10 units identified in the CRSP report that was on the Colorado River; all others were sited on major tributaries.[183] Initial designs for the dam set its capacity at 26 million acre-feet, inclusive of 20 million acre-feet active capacity—less than what the Upper Basin Compact Engineering Advisory Committee had analyzed, but nearly enough to satisfy a future drought scenario like 1931–40, according to that analysis.[184]

Department of Interior officials spoke favorably of the project during the 1953–1955 congressional hearings for the proposed CRSP legislation, highlighting how it provided for a system that served both the Upper and Lower basins. Region IV Director, E.O. Larson likened the project to other mid-century Reclamation projects, describing it as a "replacement practice quite common on western streams where water is diverted upstream in exchange for storage water releases from downstream reservoirs."[185] Both Larson and Ralph Tudor, the Undersecretary of the Interior, promoted the idea of future authorizations of additional storage reservoirs following the initially authorized units.[186]

Regardless of the touted benefits of CRSP to the Colorado River Basin as a whole, detractors such as Northcutt Ely, an attorney for the Colorado River Board of California, raised concerns in Congress about how Reclamation and the Upper Basin were interpreting the 1922 Compact with CRSP.[187] Ely believed that there were "erroneous interpretations of the Colorado River compact built into the planning of the Colorado River storage project."[188]

The two most "intolerable" aspects of the proposed legislation, in Ely's estimation, were how Reclamation intended to measure beneficial consumptive use in the Upper Basin and Reclamation's endorsement of the idea of treating the 7.5 million acre-feet apportionment as an annual average

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182. H.R. Doc. No. 83-364, at 104 (1954).

183. *Id.*

184. *Id.* at 118; Letter from Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, *supra* note 45, at 9.

185. *Colorado River Storage Project: Hearings Before the Subcomm. on Irrigation and Reclamation of the Comm. on Interior and Insular Affs. on S. 500: A Bill to Authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects, and For Other Purposes*, 84th Cong. 47 (1955) [hereinafter *S. 500 Hearings*].

186. *Colorado River Storage Project: Hearings Before the Subcomm. on Irrigation and Reclamation of the Comm. on Interior and Insular Affs. on S. 1555: A Bill to Authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects, and For Other Purposes*, 83d Cong. 41, 43–44 (1954) [hereinafter *S. 1555 Hearings*].

187. *Id.* at 584, 592.

188. *Id.*

rather than an annual maximum.[189] Ely believed that those interpretations would deprive the Lower Basin of access to surplus water and compromise the ability to meet the 1944 Mexican Treaty obligation.[190] Harkening back to Engle's exchange with Breitenstein and Tipton during the Upper Basin Compact hearings, the attorney pointed out that "there is sharp controversy over the meaning of the term 'beneficial consumptive use'" and opposed the depletion theory adopted by the Upper Basin.[191]

Ely further objected to CRSP plans for construction of storage reservoirs on operational grounds, arguing that holdover storage would not be necessary for many years (as Tipton himself had conceded during the Upper Basin Compact hearings) because it would take decades of Upper Basin development before the flow at Lee Ferry was reduced below 75 million acre-feet over 10 years.[192] The attorney maintained that it would be wasteful to begin filling reservoirs before they were needed because of evaporative losses, and alleged that proponents of the holdover storage were seeking to subsize irrigation projects with power revenues.[193]

189. *S. 500 Hearings*, *supra* note 185, at 587.
190. *Id.* at 587–95.
191. *S. 1555 Hearings*, *supra* note 186, at 588.
192. *Id.* at 585–87.
193. *Id.*; *S. 500 Hearings*, *supra* note 185, at 573.

Figure 4. "Colorado River Storage Project Map," from Reclamation's Interior Region 7, Upper Colorado Basin Website[194]



Californians like Ely together with conservationists led by David Brower were the primary objectors to CRSP during the hearings concerning the project in the 1950s, but in the end they stood little chance against the Upper Basin's unified front, supported by the Eisenhower Administration.[195] Engle himself—an early opponent of CRSP—eventually relented and voted in favor of the bill along with 10 of California's 35 representatives.[196] After multiple

194. *Interior Region 7: Upper Colorado Basin*, BUREAU OF RECLAMATION, https://www.usbr.gov/uc/rm/crsp/index.html (Aug. 19, 2021) [https://perma.cc/45Y9-23ZX].

195. KUHN & FLECK, *supra* note 5, at 153–54.

196. Terrell, Kuhn, and Fleck all argue that Engle's support was obtained through a political trade: his vote for CRSP in exchange for Upper Basin support for the long-contemplated Trinity Dam Division of California's Central Valley Project. 2 TERRELL, *supra* note 133, at 25–26; KUHN & FLECK, *supra* note 5, at 154.

hearings, revisions, and amendments, Congress approved a House-Senate conference report on the bill in March 1956 and President Eisenhower signed Public Law 84-485 on April 11, 1956.[197] Just as all iterations of the bill had done, the final bill provided for construction of Glen Canyon Dam as one of four units authorized for initial construction.[198] Eleven participating projects were part of the initial authorization, including the first phase of the large Central Utah project that was operationally linked to the Flaming Gorge unit.[199] The bill further authorized priority planning for another storage reservoir and an additional twenty-four participating projects.[200]

Several of these participating projects were authorized in the 1960s, but most were scaled back or never developed because of the absence of economic feasibility or challenges with bringing more land under irrigation.[201] No new CRSP storage reservoirs, moreover, have been constructed in the Upper Basin since the completion Morrow Point Dam in 1968, an element of the Curecanti Unit, today known as the Aspinall Unit.[202] Figure 4 is a present-day map of the CRSP "units."[203]

V. UNDERSTANDING THE PAST ON ITS OWN TERMS: AN APPRAISAL OF THE HISTORICAL SIGNIFICANCE OF THE 1931–40 DROUGHT

While engineers may have to "judge the future by the past," as Riter asserted to Rollins in December 1947[204], historians seek to understand the past on its own terms. Bringing the 1931–40 drought closer to the center of the historical analysis of the underlying assumptions of the Upper Basin Compact and CRSP allows for a sharper appreciation of how Reclamation and the Upper Basin intended the Upper Basin to deliver the Lower Basin's 1922 Compact allocation during future dry periods without curtailing its own use, as well as the tensions between the Upper and Lower Basins over the waters of the Colorado River.

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197. KUHN & FLECK, *supra* note 5, at 154.

198. *Id.* at 154–55.

199. *See id.* at 155.

200. *See* H.R. Doc. No. 83-364, at 73 (1954). For information related to CRSP and to each of the authorized participating projects, see U.S. DEP'T OF THE INTERIOR, *supra* note 49; see also 2 TERRELL, *supra* note 133, for a detailed presentation of the hearings on various iterations of the CRSPA legislation (70 Stat. 105).

201. KUHN & FLECK, *supra* note 5, at 155.

202. U.S. DEP'T OF THE INTERIOR, *supra* note 49, at 361.

203. *Colorado River Storage Project*, BUREAU OF RECLAMATION, https://www.usbr.gov/uc/rm/crsp/index.html [https://perma.cc/HZ23-RM6G].

204. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 102.

Although the 1931–40 drought did not prompt the Upper Basin "to revamp" (to borrow Judge Clifford Stone's language)[205] "The Law of the River" or to join with Reclamation "to imbue the institutions for allocating and using the Colorado's waters" that were being created "with the flexibility to respond when there is less water than . . . planned" (in Kuhn and Fleck's words),[206] the Upper Basin states nevertheless derived lessons from the stream-flow conditions of this decade. Chief among these was that to enable their maximum development under the terms of the 1922 Compact more storage was necessary in the Upper Basin to satisfy the Lower Basin during a future comparable dry cycle.

The 10-year drought impressed upon the Upper Basin and Reclamation the need for additional reservoirs on the Colorado River. The Upper Basin states, heeding Reclamation warnings and recommendations, came to recognize that under streamflow conditions like those prevailing between 1931 and 1940 they would be unable to make full use of their 1922 Compact allocation and comply with the obligation (Article III[d]) to deliver 75 million acre-feet of water over 10 years downstream at Lee Ferry. The Upper Basin thus embraced a general plan of development whereby water would be stored in the Upper Basin to ensure the obligation could be met during a comparable drought while simultaneously making direct diversions, generally above regulatory storage. Upper Basin Compact negotiators sketched out the plan along with the apportionment of the 1922 Compact water allocated to the Upper Basin states; and with direct input from the Upper Basin, Reclamation designed CRSP to implement the plan. A system was fashioned in which 23 million acre-feet of holdover storage to the Lower Basin would conceivably be released during a 10-year period like 1931–40, without compromising the Upper Basin's use of its 1922 Compact allocation—otherwise curtailment by the Upper Basin states would be necessary.[207]

As Engle and Murdock's questions to Breitenstein and Tipton about the Upper Basin Compact and Ely's comments before Congress regarding the CRSP indicate, this solution for future droughts was not altogether satisfying and was even worrisome for the Lower Basin. Those concerns, moreover, were not limited to the potential impact of subsequent dry cycles in the Colorado River Basin.

The historical significance of the 1931–40 drought period is thus two-fold. First and foremost, the decadal dry cycle was a defining event that created the context and informed responses that led to the operational regime by

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205. UPPER COLO. RIVER BASIN COMPACT COMM'N, *supra* note 1, at 110.
206. KUHN & FLECK, *supra* note 5, at 225.
207. BUREAU OF RECLAMATION, *supra* note 11, at 13; H.R. Doc. No. 83-364, at 105 (1954).

which the Lower Basin receives its water under the 1922 Compact today. For that reason alone, for the role the drought played in structuring the "Law of the River," the climatic event is important and demanding of attention. The 1931–40 dry cycle directly contributed to how the Upper Basin conceived of its responsibility to the Lower Basin. The Upper Basin states focused on addressing that obligation first and conceded the possibility of curtailment should the contemplated main stem reservoirs "fail the test" (in Breitenstein's words).[208]

Second, while the Upper Basin's response to the 1931–40 drought period was intended in part to assure the Lower Basin of its 1922 Compact-allocated water in the face of Upper Basin development, it ironically set the stage for conflict with the Lower Basin. The Upper Basin states prior to the Upper Basin Compact and CRSP were not so concerned that they would fail to meet the Lee Ferry obligation during a future comparable drought, but rather that they could not meet the obligation *and* make use of their full 1922 Compact allocation during another such dry period. They developed a means by which they believed both aims could be achieved, in both policy and engineering terms, compliant with the 1922 Compact. That belief was nevertheless predicated upon views of the 1922 Compact and the administration of the Colorado River waters not shared by others in the Lower Basin, who questioned both how the Upper Basin proposed to account for its use and the overall plan for Upper Basin development.

208. UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 2, 1947, Afternoon Session, 101.

EXHIBIT 12

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

CAP ENVIRONMENTAL FLOW ASSESSMENT

Hydrobiological Impact Evaluation

BLACK & VEATCH PROJECT NO. 424374
BLACK & VEATCH FILE NO. 40.0000



PREPARED FOR

Central Arizona Project

19 FEBRUARY 2026

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Executive Summary

The Central Arizona Project (CAP) currently operates as a fast moving, low trophic system that supports stable biological communities and reliable water quality. The alternatives proposed in the DEIS reflect dramatic reductions to the CAP water supply with implication for this otherwise stable biological and water quality system. This study examines how flow reductions from one million (1000K) to 100K ac-ft/yr influence ecological conditions and public health concerns.

Moderate reductions between 1000K and 700K ac-ft/yr increase the likelihood of nutrient retention, warmer water temperatures, and the early formation of low velocity zones. These conditions raise the risk of eutrophication, cyanobacterial growth, aquatic vegetation establishment, and mosquito breeding. They also reduce thermal buffering, increasing the probability of temperature stress on fish.

More substantial risks emerge between 700K and 300K ac-ft/yr. Declining velocities make organic sediment accumulation more likely, which increases the risk of hydrogen sulfide odors and dissolved oxygen depletion. Fish kills become more probable as temperatures rise and oxygen levels fall. Cyanobacterial blooms are more likely to occur and persist, raising concerns about toxin exposure. Expanded slackwater areas increase the risk of mosquito breeding, while caddisflies and invasive mussels may experience greater population variability that complicates biological control. By 500K ac-ft/yr, these risks become more widespread and mutually reinforced.

At the Draft EIS allocation of 312K ac-ft/yr, which would be available to CAP under the Basic coordination (or “no deal”) alternative in the Post-2026 Colorado River Reservoir Operations DEIS, the risk of adverse biological conditions increases sharply. Fish kills become more likely, aquatic vegetation is more prone to establishment, and mosquito habitat expands significantly. Cyanobacterial, diatom, and filamentous algal blooms may intensify, increasing the risk of toxins, odors, and operational challenges. Lake Pleasant is expected to draw down, raising the likelihood of more frequent and severe algal blooms. Organic sediment accumulation becomes more widespread, increasing the risk of hydrogen sulfide odors and further oxygen depletion. Invasive mussels could become established, increasing the risk of reduced flow capacity.

Overall, flow reductions below 700K ac-ft/yr increase the risk of step changes in biological conditions that can lead to odors, insect breeding, harmful algal blooms, fish kills, and the expansion of nuisance or invasive species. The most significant risks, particularly those involving cyanotoxins and mosquito borne disease, become more pronounced between 500K and 300K ac-ft/yr. At 300K ac-ft/yr, the CAP faces a heightened risk of widespread, compounding impacts that are likely to affect water quality, public health, and system reliability.

1.0 Introduction

The Central Arizona Project (CAP) supplies municipalities, tribes, industry, and agriculture with Colorado River water from its pumping plant at Lake Havasu. Water from the Colorado River is conveyed along a 336-mile concrete lined canal with various distribution and storage points along the way. Flow is managed along the aqueduct (canal and its forebays) with pumping plants, gates, aquifer recharge basins and the Lake Pleasant reservoir (**Figure 1-1**).



Figure 1-1 Central Arizona Project Location

The CAP Biology Program was created in 2011 to address biological issues that can affect the CAP system operations, water quality, and the public health and welfare along the aqueduct. These issues include excessive growth of aquatic vegetation, phytoplankton, periphyton, quagga mussels and other invasive species, caddisflies, and organic sediment accumulations. Periodic weather patterns, increasing average temperatures, and longer-term water shortages can exacerbate these issues and create new ones. Of special concern are water supply reductions that would create a tipping point that shifts the historic hydrobiological processes in the aqueduct from those supporting a comparatively clean running-water biology (lotic system) to a more stagnant water system that may function more like a shallow, warm-water lake impacting and degrading water quality (lentic system). Recent climate related changes have caused relatively minor changes in the ecology of the canal, which provide insight into the larger scale shifts that may occur. This study explores more specific hydraulic changes and the potential impacts that may be experienced.

2.0 Evaluation Methods

2.1 Approach

The study approach is an incremental impact assessment that explores selected water quality and hydrobiological sensitivities to flow reduction in the aqueduct. The assessment focuses on biological issues that can increase public nuisance and human health risks. Issues affecting CAP physical operations of the various stakeholders which may result from incremental shortages were not included in

this study. The sensitivities to flow reduction included include those that can contribute to increased aerial insect swarms, more frequent and larger algal blooms and decay, sediment putridity, and fish kills. These outcomes are generally sensitive to decreased lotic functions as flow is reduced, and the system converts toward a stagnant water system.

The assessment involved four lines of evidence to investigate thresholds of impact with flow reduction, 1) flow relationships with hydraulic and water quality parameters of biological interest, 2) biological tolerances of potentially harmful and currently beneficial aquatic taxa in the aqueduct, 3) relationships among the affected taxa and water quality feedback loops likely to sustain or pulse harmful conditions, and 4) review of the existing water quality and biological monitoring program data for related sensitivities.

2.2 Existing Data Review

The team explored existing relationships in the aqueduct between flow and biological expression. This was based on 28 years of water quality data and five years of biological monitoring reports with concurrent data on inflow from Lake Havasu provided by CAP. The range of flows at the USGS gage 09426650 (Central Arizona Project Canal at Havasu) involved in the assessment were 0 to 4050 ft^3/s. Note that discharge from USGS gaging stations is calculated from stage and rating curves, so it may not reflect precise flow rates.

2.3 Simulated Hydraulic and Water Quality Parameters

The aqueduct's hydrology and water quality were represented in a CE-QUAL-W2 model originally developed for the CAP in 2023. The selected water quality model (CE-QUAL-W2) is a widely accepted water quality/hydrodynamics model which simulates current water quality conditions and potential future conditions. The team used model output data to calculate changes in hydraulics and water quality variables with various flow reductions. Five incremental flow scenarios were simulated, ranging from 100,000 to 1,000,000 ac-ft/yr of inflow pumped via the Mark Wilmer Pumping Plant from Lake Havasu. The existing flow conditions are similar to the 1,000,000 ac-ft/yr scenario. Key variables in the model assessment included water temperature, flow velocities, and dissolved oxygen concentrations.

The CE-QUAL-W2 model is a two-dimensional, laterally averaged hydrodynamic and water quality model designed for long, narrow waterbodies. It predicts hydrodynamic outputs like water surface elevation, longitudinal and vertical velocities, and temperature profiles, as well as water quality variables such as dissolved oxygen. These outputs are calculated by solving the governing equations for momentum, continuity, and energy, coupled with transport and reaction kinetics for water quality constituents. The model incorporates eutrophication dynamics by simulating nutrient enrichment effects on algal growth, oxygen depletion, and related biochemical processes, using coupled nutrient cycling and algal kinetics to represent the progression of trophic conditions.

The water quality model focused on estimating the water quality conditions during a typical year and was calibrated to past observed water quality conditions. The model simulated water movement, temperature, dissolved oxygen, and conservative constituents (e.g. trace metals). The model was set up to maintain a constant pool elevation behind each of the gates and pumps using pump flows and mass balance calculations between upstream flows and demands within each pool. This approach is consistent with the fact that the aqueduct is maintained at a consistent water level required for operational stability and reliability. Recent data (2023-2024) indicate that source water algal biomass averages 1.0 g/m^3. A model

sensitivity analysis was performed on source algae biomass, and the system remains oligotrophic between source biomass values of 0.0037 g/m3 and 1 g/m^3.

The calibration for the water quality model was built on the temperature calibration (which was generally within 0.8°C of observed values). The dissolved oxygen (DO) calibration was generally within 1.0 mg/L throughout the canal. The CE-QUAL-W2 model simulations can provide a wide range of information on the temperature, nutrients, dissolved oxygen and algal growth in the canal; however, the model did not simulate sediment transport. The CAWCD's current system-wide water quality model was not used in this study. The 2023 version was used because it is more fully developed, and it is calibrated for the variables of interest to this study, and the subject matter expert running these simulations developed the 2023 version and fully understands its applications and limitations.

For the analysis, the CE-QUAL-W2 model was split into "upstream" and "downstream" sections. The upstream section occurs upstream of Lake Pleasant and the Waddell Canal, and the downstream section occurs downstream of Lake Pleasant and the Waddell Canal (**Figure 2-1**, **Figure 2-2**, **Figure 2-3**). Each pool is a canal segment between pumping plants or gate structures. Shorter pools (10-15 miles) occur near major lifts, while longer pools (20-30 miles) occur in flatter terrain. Water levels are maintained by check gates in pools. Segments are defined as a discrete reach of the CAP canal between two operational control points, including, but not limited to, turnouts, pump stations, and flow-control gates, which are treated as single hydraulic reaches with consistent physical and operational characteristics. These segments are the basis for CAP's hydraulic models. Forebays are located immediately upstream of pumping plants, and they function as small reservoirs to provide sufficient depth for pump intakes. They are wider than the canal. The five flow scenarios represented incremental step-downs in flow, from 1,000k-, 700k-, 500k-, 300k-, and 100k- ac-ft/yr. Note that under the Basic Coordination (or "no deal") alternative in the Post-2026 Colorado River Reservoir Operations DEIS, the annual diversion volume available to CAP is assumed to be 312k- ac-ft/yr.

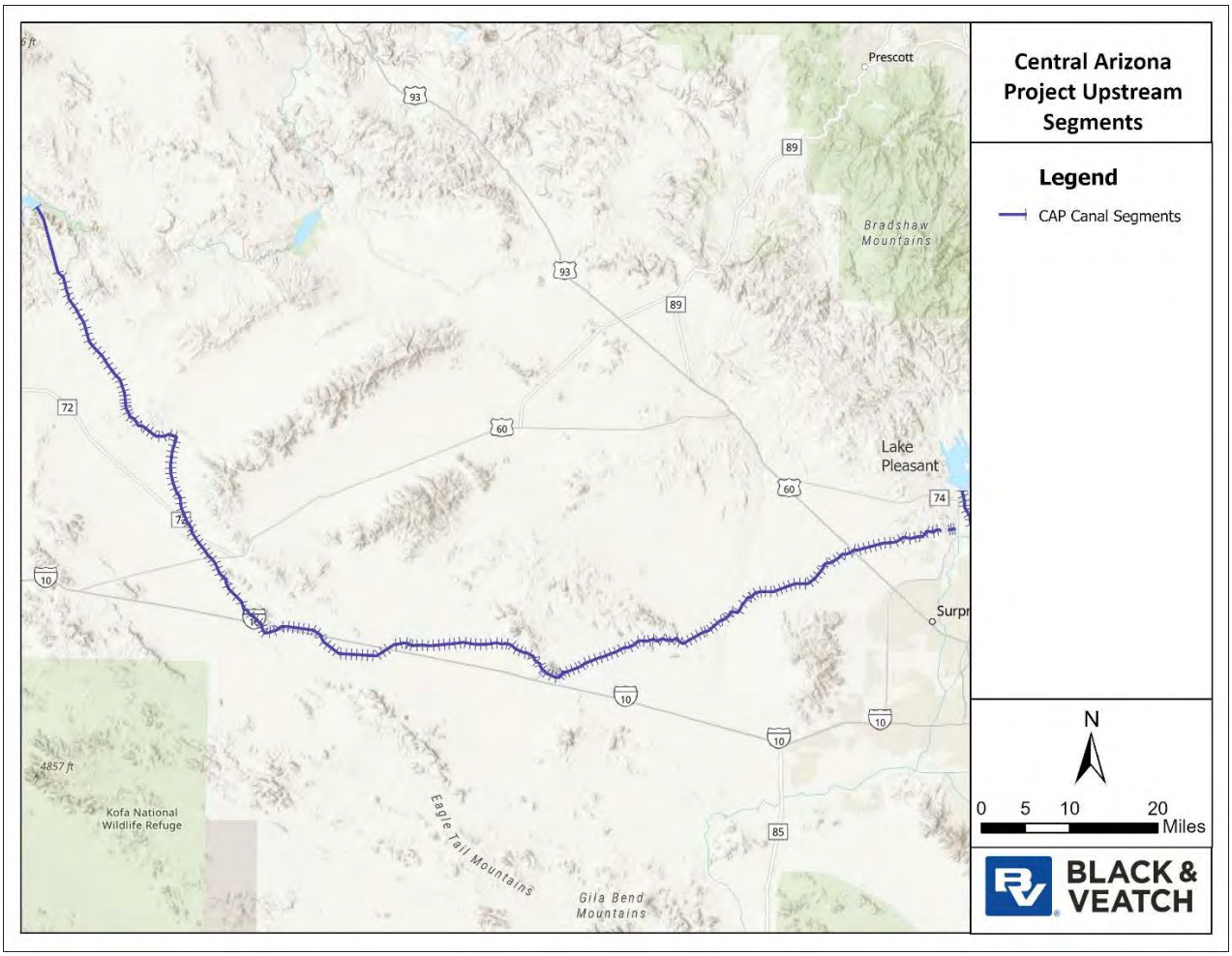


Figure 2-1 **Central Arizona Project Upstream Segments**

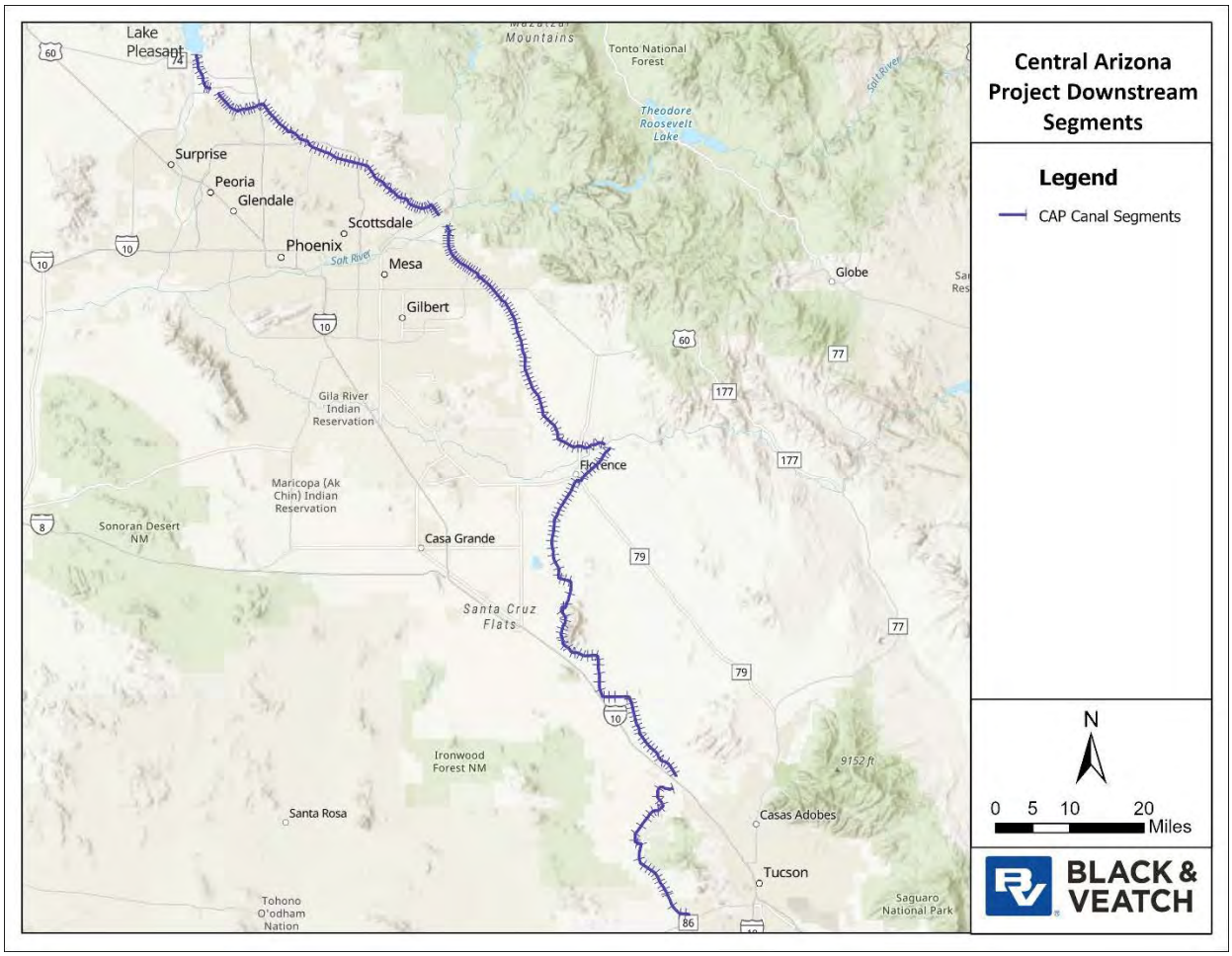


Figure 2-2 **Central Arizona Project Downstream Segments**



Figure 2-3 Central Arizona Project Lake Pleasant and Waddell Canal Segments

2.4 Biological Tolerances and Bottom-Up Effects

The water quality and hydraulic changes were compared against thresholds necessary to sustain lotic biological conditions in the canal versus those that promote adverse lacustrine/lentic conditions. Impact thresholds were defined based on scientific literature related to the physical and chemical requirements and tolerances of selected biological taxa. This is commonly referred to as a bottom-up approach regarding the biophysical controls in an ecosystem. It focuses on the external aspects of physics and water quality on biology. Several biological indicators were explored for bottom-up flow reduction impact thresholds including:

- Phytoplankton blooms, including green algae and cyanobacteria.
- Increased aquatic vegetation and filamentous algae growth.
- Increased *Cymbella* diatom growth (aka 'rock snot').
- Increased organic sediment yields in concert with reduced sediment transport capacity.
- Increased fish kills. Striped bass were included in the assessment due to their known sensitivity to temperature variability and their abundance in the system. Channel catfish were assessed because

they are comparatively tolerant to high temperature and help bracket the evaluation regarding the effects of thermal stress on sensitive versus tolerant species in the system. Channel catfish are periodically stocked in the canal to reduce nuisance caddisfly swarms. Triploid grass carp are also stocked for vegetative management in the canal and represent significant investment and an intermediate sensitivity to thermal stress. They grow to large sizes in the CAP and represent potential for large biomass fish kills.

- Increased opportunity for mosquito breeding.
- Increased quagga mussel populations (ammonia issue caused by decay of organisms during a die off, in addition to presence and decomposition of pseudofeces).
- Increased *Smicridea* caddisfly swarms.

2.5 Top-Down Effects and Feedback Loops

There are common biological influences on an aquatic ecosystem's biophysical integrity and species composition, often referred to as top-down controls. These involve feedback loops and competition within the system for limited resources such as nutrients, food, and DO and can involve boom and bust cycles in certain plant and animal populations. Some of these cycles create intense pulses of nutrients and periods of excessive oxygen sags with cascading effects on system functions and biological outcomes.

Top-down impacts were assessed within the context of common cultural (or anthropogenic) eutrophication effects on lakes and slow-flowing rivers, and at thresholds of lotic versus lacustrine biophysical processes and biological interactions. The conceptual model assumption is that some amounts of increased residence time and reduced flow velocity will raise temperatures and reduce flushing enough to cause greater nutrient loading and slackwater conditions suitable for nuisance algal blooms, which in turn will create dissolved oxygen crashes resulting in periodic fish kills (**Figure 2-4**).



Figure 2-4 Fish Kill at Lake Havasu

Crashes in insectivorous fish populations could allow for population spikes of aerial insects with aquatic larval stages, including caddisflies, blackflies and mosquitos. Mosquito larvae thrive in stagnant waters, intensifying the issue. Further, mosquitos oviposit on stillwater or on vegetation over water which flow reductions may increase. Increased aquatic vegetation growth (**Figure 2-5**) and floating mats of *Cymbella* create oviposition substrates and slackwater areas beneficial to mosquito production. Because they are a nuisance and can be disease vectors, mosquitos are of significant interest in this study. Blackflies and caddisflies generally indicate good water quality and thrive in lotic conditions. In contrast to mosquitoes, these taxa may decline with degraded water quality in association with reduced flow. The loss of caddisflies and blackflies in the system may create space for mosquitos to become more dominant and since caddisfly management occurs in the system to control nuisance swarms, caddisfly sensitivity was explored.



Figure 2-5 Aquatic Vegetation Mats in Pool SXV

Algal blooms and increased aquatic vegetation intensify organic sediment, and these sediments can increase the biological oxygen demand of the system, especially when they are re-entrained into the water column during higher flow conditions after accumulating in the channel and forebays during quiescent flow conditions (**Figure 2-6**). Increased biological oxygen demand will reduce DO in the water column. This can create a cycle of increased algal productivity related to pulses of nutrients into the water, formulating a continuous cycle of algal blooms and crashes, with cascading detrimental impacts, including fish kills and mosquito generation.



Figure 2-6 **Sediment Accumulation in Central Main Channel**

Quagga mussels (**Figure 2-7**) are filter feeders that can reduce phytoplankton and zooplankton blooms resulting in increased aquatic vegetation growth. They produce pseudofeces, which are pellets consisting of concentrated particles that the mussel did not digest, that can contribute to nutrient loading in the sediment, often resulting in dissolved oxygen crashes, amplified organic sediment yields, and concentration of organic pollutants such as PCB's promoting their bioaccumulation up the aquatic food chain. The quagga mussels in (**Figure 2-7**) were photographed in May 2024 inside the CAP turnout pipe to Phoenix-Anthem (PXATO) on the Waddell Canal.



Figure 2-7 **Quagga Mussels Accumulated in a Pipe**

2.6 Definitions of Significant Harm

Significant harm was explored in scientific literature and was based on common nuisance complaints in areas with shallow, warm water lakes in status of cultural eutrophication. Magnitude, frequency, and duration of harmful events were considered to the extent practical.

Significant harm for this study was defined based primarily on increased insect swarms, various odors, and introduction of potential disease vectors emerging from the aqueduct. For these reasons canal segments through developed areas were studied in the assessment. For example, common issues include algal blooms and fish kills that create odor problems along municipalities and attract vermin, adversely affecting quality of life in the residential and commercial areas close to the canal. Cyanobacterial blooms create odors and can produce aerial irritants near the canal. Mosquito populations could become an additional public nuisance as an outdoor activity annoyance and as disease vectors affecting public health

The scope of study did not include potential harm to water users from drinking water or for agricultural/livestock damage based on potential biologically-mediated residuals in the water supply.

3.0 Results

3.1 Trophic Status

3.1.1 Trophic Regime Shifts

Table 3-1 shows the trophic classification of lakes and streams based on literature values for total nitrogen and total phosphorus concentrations (Nürnberg, 1996). Trophic classifications represent the

biological productivity potential based on available nutrients for both lentic and lotic systems. Existing data collected by the CAP shows the system performing as oligotrophic for both flow scenarios, meaning low nutrient and high oxygen (Central Arizona Project, 2024). A decline in water quality is not expected under normal operating conditions. However, planned or unexpected operational changes could cause dramatic shifts in trophic status, leading to the eutrophication of portions of the system. The effects of eutrophication are generally harmful to freshwater systems, often negatively impacting water quality and aquatic life. This may include aesthetic impairments, interference with human usage, excessive plant and algal growth including potentially toxic cyanobacterial blooms, oxygen depletion, fish kills, and fluctuations in microbial biomass and productivity (Chislock, et al., 2013).

Table 3-1 Trophic Classification of Stream and Lakes based on Nutrients (Nürnberg, 1996)

Trophic Classification	Stream		Lake	
	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
Oligotrophic	<0.70	<0.025	<0.35	<0.01
Mesotrophic	0.70-1.50	0.025-0.075	0.35-0.65	0.01-0.03
Eutrophic	>1.50	>0.075	0.65-1.20	0.03-0.10
Hypereutrophic	NA	NA	>1.2	>0.075

3.1.2 Narrative Nutrient Criteria

The Arizona Administrative Code Title 18 Chapter 11 (18 A.A.C. 11, 2025) describes environmental water quality standards for the state of Arizona. The environmental water quality standards include Narrative Nutrient Criteria (NNC) for Lakes and Reservoirs and Narrative Biological Criteria (NBC) for Streams. While the CAP falls into the category of lotic systems and would be best represented as a stream, there is not currently bioassessment data available for this system. Thus, the NNC for Lakes and Reservoirs (**Table 3-2**) will be utilized as a proxy for water quality standards, even though the CAP is not required to meet the Lakes and Reservoirs NNC in practice. The Domestic Water Source (DWS) and Aquatic and Wildlife (warm water) (A&Ww) definitions will be the specific Lakes and Reservoirs NNC values used, since they are most applicable to the project.

Table 3-2 Narrative Nutrient Criteria Prescribed by Arizona Administrative Code Title 18 Chapter 11 (18 A.A.C 11,2025)

Designated Use	Narrative Nutrient Criteria for Total Phosphorous (mg/L)	Narrative Nutrient Criteria for pH	Narrative Nutrient Criteria for Chl-a (µg/L)	Narrative Nutrient Criteria for Blue Green Algae (Cyanobacteria) (per ml)	Narrative Nutrient Criteria for Total Nitrogen (mg/L)
DWS	0.070-0.100	5.0-9.0	10-20	20,000	1.2-1.5
A&Ww (Urban)	0.125-0.160	6.5-9.0	30-50	< 50 of % total count	1.3-1.6

Water quality data from the 2024 water quality report (Central Arizona Project, 2024) was compared to the Lakes and Reservoir NNC specified in **Table 3-2**. The average total phosphorous (TP) value for 2024 was non-detectable. While total nitrogen (TN) data was not available, the total inorganic nitrogen (TIN) can be approximated with ammonia nitrogen, nitrate, and nitrite, which serves as a rough estimate for TN. In 2024, ammonia nitrogen was an average of 0.4 mg/L, nitrate was 0.26 mg/L, and nitrite was non-detect. The average value for pH was 7.99.

3.1.3 Summary of Trophic Status Findings

- The CAP is currently meeting the NNC standards set by the state. Flow reduction has the potential to increase nutrient loading to the system, which in turn will increase harmful eutrophication effects such as increased algal blooms and sedimentation.

3.2 Algae

Algal classes represent groups of algal species that share specific traits and habitat conditions (such as light availability, salinity, temperature, or nutrient concentration). Assessment of the algal community can provide insight into various aspects of aquatic systems. Algal class composition data and chlorophyll-*a* values were provided for a short-term POR of July 17, 2023 through October 15, 2024 for six canal sites sampled by CAP staff (**Figure 3-1**). The data were provided in the form of percent of each sample composed of an individual algal class. The algal classes present in the sampled data included bacillariophyta (diatoms), Chlorophyta (green algae), Cryptophyta (mixotrophic flagellated unicellular algae), Crysophyta (golden algae), Cyanophyta (cyanobacteria or blue-green algae), Euglenophyta (Euglinoid algae), Pyrrhophyta (dinoflagellates), and Rhodophyta (red algae).



Figure 3-1 CAP Algal Data Sampling Sites

It should be noted that while there are narrative nutrient criteria for Blue-Green algae (Cyanophyta), assessing compliance with those criteria requires algal cell count data (cells/mL). Because the data were provided as percent composition, not algal cell count, these data were not able to be used to directly assess compliance with Blue-Green algal narrative nutrient criteria. However, chl-*a*, can be used as an indicator variable to represent algal blooms and should be reported against NNC values. The predominant type of chlorophyll used by algae and cyanobacteria, chl-*a*, is widely used as a surrogate for measuring algal biomass (Spaulding et al., 2024). Chl-*a* threshold concentrations vary by region and waterbody type and use but generally indicate an algal bloom and subsequent water quality impairment is present at measurements over a set standard. The average chl-*a* value for the existing POR is 2.82 µg/L, which is below the numeric nutrient target for both domestic water source (DWS) and aquatic and wildlife (warm water) (A&Ww) designated uses (**Table 3-2**).

Additional chl-*a* data were provided alongside dissolved oxygen and temperature data for the full depth profile of Lake Pleasant, allowing for an assessment of algal biomass across the 2025 season (**Figure 3-2** through **Figure 3-4**). Data were collected using a multiparameter sonde and therefore unable to be assessed for NNC compliance as chl-*a* was measured in relative fluorescence units (RFUs) rather than mg/L. Chl-*a* patterns in Lake Pleasant showed a strong seasonal cycle influenced by warming, stratification, and oxygen availability in the water column. During January through April, chl-*a* remained low and evenly distributed, consistent with cold temperatures and a well-mixed lake. As the lake began to

thermally stratify in May, surface, mid-depth, and near-bottom chl-*a* increased, peaking around late May to June, when warm surface temperatures and increased light availability can promote algal growth. July through October, chl-*a* declined across most depths as nutrient availability became limited by stratification and near-bottom dissolved oxygen concentrations began to decrease. September through October, as temperatures decreased and stratification weakened, chl-*a* appeared near the surface and near-bottom of the lake, indicating partial mixing and nutrient redistribution. Chl-*a* decreased as the water temperature lowered and dissolved oxygen increased with mixing. Lowering the water level of Lake Pleasant could increase the frequency, intensity, and duration of algal blooms based on the 2025 trend of chl-*a*, temperature, and dissolved oxygen. As water volume decreases, temperature is expected to increase more rapidly, causing earlier and more pronounced stratification and reduced oxygen levels, as well as increased internal nutrient loading (Zohary and Ostrovsky, 2011).

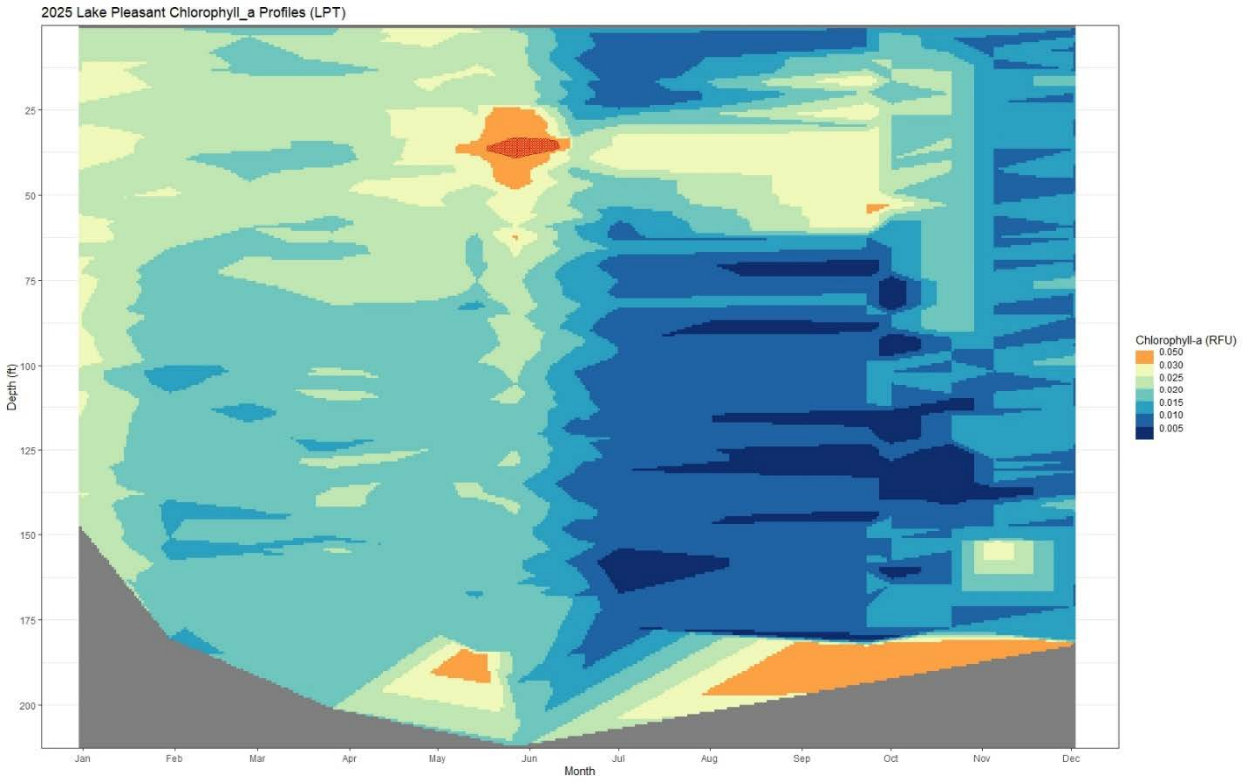


Figure 3-2 Chlorophyll *a* (NFU) Depth Profile

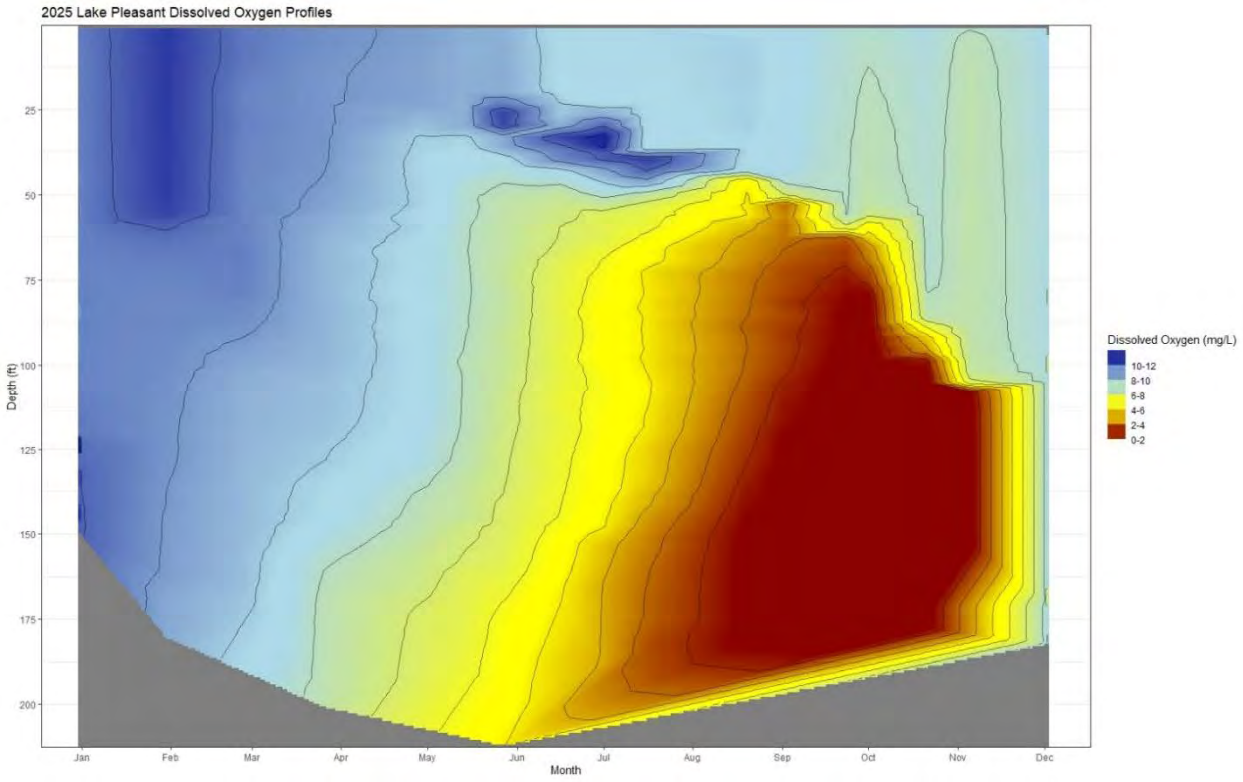


Figure 3-3 Dissolved Oxygen (mg/L) Depth Profile

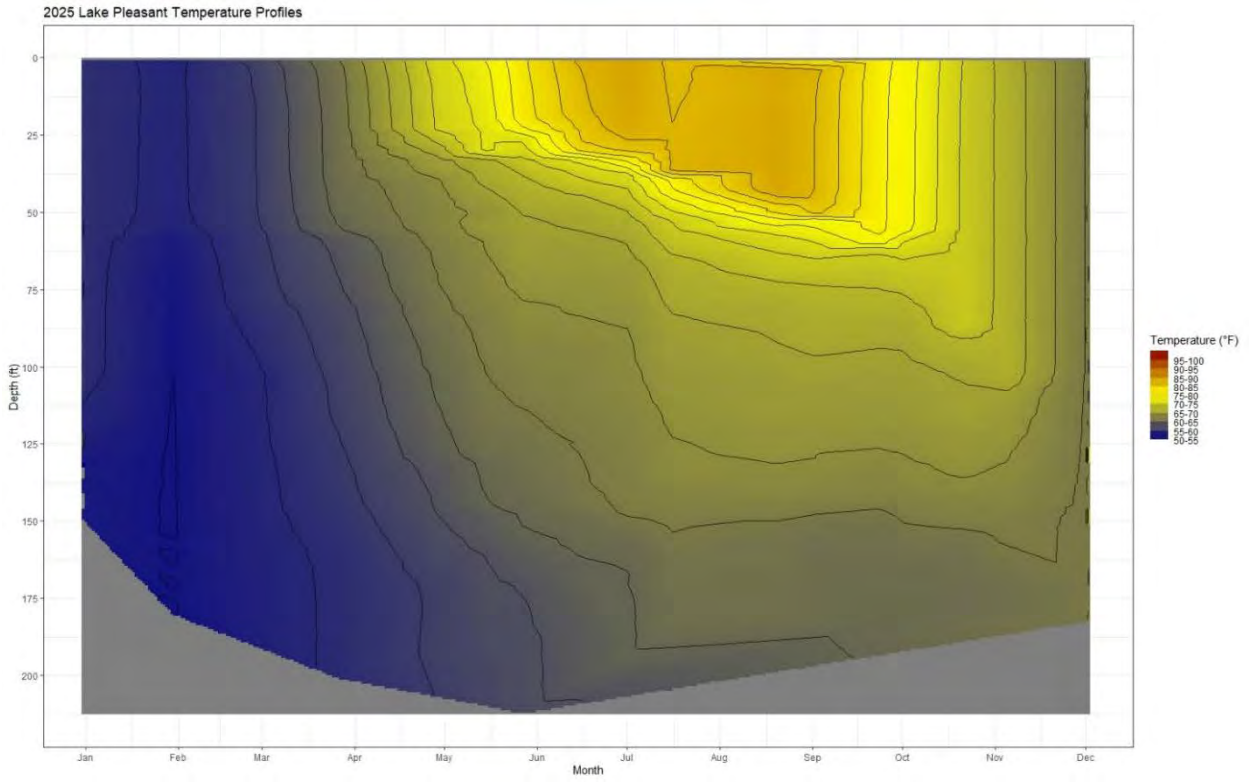


Figure 3-4 Temperature (°F) Depth Profile

The CAP system was dominated by Bacillariophyta (Diatoms), Chlorophyta (Green Algae), and Cyanophyta (Cyanobacteria) at the sampled stations during the POR (**Table 3-3** Percent Composition of Sampled Algal Data at Sampled Stations

This provides a glimpse of the algal community composition in a slice of time, and it shows the presence of a diverse community. Cyanobacterial algae associated with harmful algal blooms were present in the sample. Cyanobacteria thrive in warm, nutrient-rich waters with sufficient light availability, so increased eutrophication associated with possible flow declines could cause selective amplification of cyanobacteria and potential increases in the occurrence of harmful algal blooms.

Table 3-3 Percent Composition of Sampled Algal Data at Sampled Stations

CAP Station	Algal Class															
	Bacillariophyta		Chlorophyta		Cryptophyta		Crysophyta		Cyanophyta		Euglenophyta		Pyrrhophyta		Rhodophyta	
	Grab Sample	Sample Plate	Grab Sample	Sample Plate	Grab Sample	Sample Plate	Grab Sample	Sample Plate	Grab Sample	Sample Plate	Grab Sample	Sample Plate	Grab Sample	Sample Plate	Grab Sample	Sample Plate
BRD	23%	88%	37%	13%	18%	-	4%	-	59%	4%	-	-	3%	-	-	-
HSY	39%	86%	16%	12%	21%	-	-	-	55%	5%	-	-	2%	-	-	-
MWP	29%	83%	30%	7%	16%	-	-	-	45%	28%	2%	-	2%	-	1%	-
RWCD	47%	92%	26%	5%	21%	-	13%	-	48%	14%	-	-	13%	-	-	-
SXV	24%	81%	34%	15%	4%	-	2%	-	50%	12%	1%	-	1%	-	-	-
WAD	41%	89%	35%	12%	17%	-	-	-	42%	-	-	-	-	-	-	-

During the sampled period of record, phytoplanktonic algal classes obtained via grab sampling were more dominant in the CAP system than periphytonic classes, which were collected using plate sampling methods (**Table 3-3**). Typically, different habitats support different algal groups, such as lakes and large rivers supporting free-floating phytoplankton, and shallow clear-water streams and rivers supporting stalk-forming periphyton (Moulton et al., 2002). This suggests that different segments of the CAP are currently functioning as different habitats. Modified flow regimes could change existing habitats which in turn would alter algal class composition.

Water quality data reported by the CAP for the 2023 and 2024 POR shows oligotrophic system performance, which suggests that the composition of documented algae is reflective of the system at this trophic class (Central Arizona Project, 2023 & 2024). Without discrete species data, no thresholds were able to be produced for algae inhabiting the CAP system. However, algal groups are expected to be impacted by changes in trophic class, and increased nutrient loading associated with a shift to eutrophic waters is expected to have negative consequences stimulated by increased algal growth in the CAP system. Algal community shifts could lead to an increase in nuisance or harmful algae such as cyanobacteria. Cyanobacteria have been documented to displace and outcompete other planktonic taxa during periods of increasing eutrophication (Whitmore et al., 2018).

The diatom, *Cymbella* (Rock Snot), which thrives in low nutrient conditions could be replaced by cyanobacteria or Chlorophyta if this system undergoes eutrophication. A mass die off of *Cymbella* could lead to increased organic sedimentation, increased turbidity, unsightly water scum, and a decrease in water quality, in addition to the negative impacts associated with cyanobacterial blooms such as cyanotoxins and taste & odor compounds, which have both been reported within the CAP system (Amorim & Moura, 2021). Volatile compounds, commonly geosmin and 2-methylisoborneol (MIB), have been documented as contributing to taste and odor (T&O), while the cyanotoxin, cylindrospermopsin, has also been detected (CAP WQ report, 2023). While neither compound has discrete thresholds, T&O and cyanotoxin production can be produced by the same, similar, or different cyanobacterial species, as well as T&O from non-cyanobacterial species (Manganelli, et al., 2023). This suggests if the system progresses in eutrophication, that the increased algal presence can increase both T&O and harmful cyanotoxins within the CAP system. Changes in light availability, mineral and nutrient availability, and competitive exclusion can also contribute to algal species transitions, which could be expected during changes in flow regime.

3.2.1 Summary of Algae Findings

- The CAP system is currently dominated by diatoms, cyanobacteria, and green algae. An increase in nutrient loading could lead to an associated shift in trophic status resulting in greater occurrences of algal blooms at lower flow regimes. Examples of colonial algal blooms identified in the CAP are shown in **Figure 3-5** and **Figure 3-6**.
- Cyanobacteria thrive in warm, nutrient-rich waters with sufficient light availability, so increased eutrophication associated with possible flow declines could cause selective amplification of cyanobacteria and potential increases in the occurrence of harmful algal blooms.
- Under the 312k ac-ft/yr scenario, the water level in Lake Pleasant is expected to draw down, which could increase in the frequency, intensity, and duration of algal blooms based on the 2025 trend of chl-*a*, temperature, and dissolved oxygen.



Figure 3-5 **Cyanobacteria Bloom in the Colorado River near the CAP Intakes**



Figure 3-6 **Floating Mat of *Cymbella* at Waddell Canal**

3.3 Aquatic Vegetation

The Central Arizona Water Conservation District (CAWCD) uses down scan sonar to monitor the growth of aquatic vegetation throughout the intake channel in Lake Havasu. The mapping helps CAWCD to target specific areas for treatment, which prevents the eventual formation of vegetation mats, which can clog intake pumps and reduce the reliability of the aqueduct system (Central Arizona Project, 2024).

Mapping has shown that aquatic vegetation has significantly increased in Lake Havasu since quagga mussels were found in 2008, likely due to improved water clarity and an increase in nutrient loading. Aquatic vegetation grows most prominently during the summer months from June through August. Management methods currently employed by CAWCD for nuisance vegetation include herbicide application, mechanical removal, and biological control from sterile grass carp. Note that the grass carp

are only used for biological control within the canal, never within Lake Havasu. Common nuisance species identified in CAP (listed in order of prevalence) are horned pondweed (*Zannichellia palustris*), sago pondweed (*Stuckenia pectinata*), spiny naiad (*Najas marina*), southern naiad (*Najas guadalupensis*), and curlyleaf pondweed (*Potamogeton crispus*).

Horned pondweed, sago pondweed, spiny naiad, southern naiads, and curlyleaf pondweed are found in alkaline to brackish conditions, at depths of at least 1 meter (3 feet), and can tolerate a wide range of temperatures (Allan Casey, 2010; Halldorson, 2022; U.S. Fish & Wildlife Service, 2020; Bolduan et al., 1994). Sago pondweed prefers velocities below 1 m/s (3.28 ft/s) (Allan Casey, 2010). Spiny naiad, southern naiad, and horned pondweed prefer calm, still or slow-moving water (Missouri Department of Conservation, 2025; Lea 2015). Curlyleaf pondweed grows in a wide range of water depths but has been reported to grow excessively in waters between 1-3 meters (3-9 feet) deep. Curlyleaf pondweed prefers slower water velocities, between 0.12-0.5 m/s (0.4-1.6 ft/s). These slower velocities are anticipated under lower flow scenarios and along channel margins. Photosynthetic growth rate for curlyleaf pondweed is maximized at 30°Celsius (86 degrees Fahrenheit) but is supported as low as 1 degree Celsius (33.8 degrees Fahrenheit) (Bolduan et al., 1994).

Reducing the velocity of the aqueduct system may provide more favorable conditions for aquatic vegetation to grow throughout the system (Shivers et al., 2018). As a result, the increased presence of aquatic vegetation may reduce the expected velocities through the system more than expected from reducing discharge alone, causing habitat shifts that have the potential to increase the abundance of distribution of already existing nuisance species, as well as increase the opportunity for species that don't currently inhabit the CAP to become prevalent (e.g. mosquitoes, invasive non-native species) (Shivers et al., 2018). Increased aquatic vegetation presence will also increase the need for control mechanisms like herbicide application or mechanical removal to help ensure the reliability along the 336-mile length of the system. Reduced velocity is primarily expected along channel margins (**Figure 3-7**).

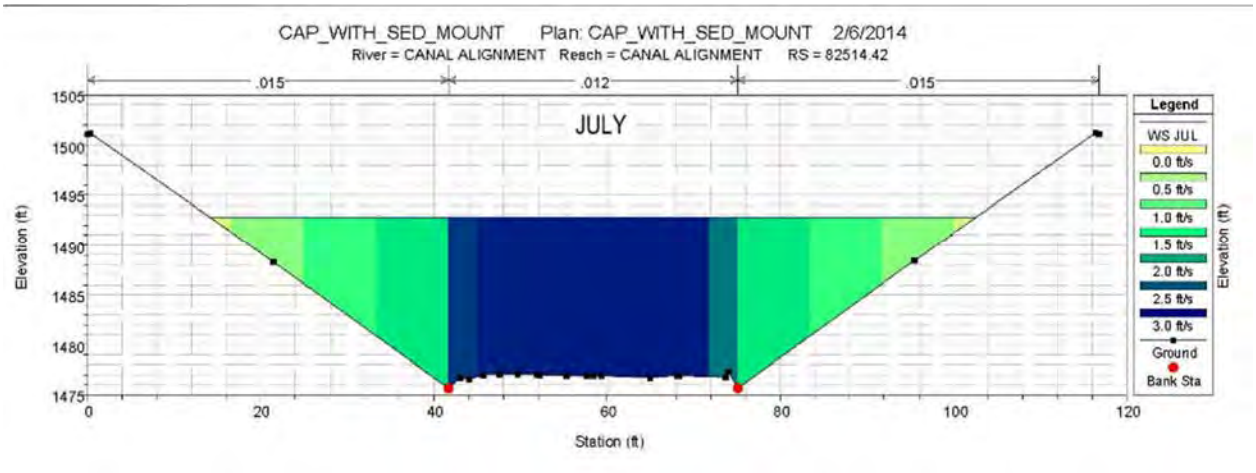


Figure 3-7 **Example Canal Alignment Velocity Graphic from Terracon Consultants (2014) under current flow conditions. Velocity is highest in the center of the forebay but decreases along the periphery.**

3.3.1 Summary of Aquatic Vegetation

- In some CAP pools flow reductions as little as down to 600k ac-ft/yr will favor optimum velocities for aquatic vegetation growth within practically the entire pool (**Figure 3-7**). Note that average velocities within each pool were calculated based on flow depth and flow rate outside of the CE-QUAL-W2 simulations, so average velocity is known for 600k ac-ft/yr even though that flow rate was not simulated in CE-QUAL-W2. At 600k ac-ft/yr some species that historically provide minor infestations in the CAP, such as curlyleaf pondweed will begin to express themselves more routinely because pool-wide velocities fall into their upper velocity range for establishment. With greater reductions including flows at 500k and 400k ac-ft/yr this becomes even more pronounced.
- Flow reductions are also likely to progressively establish lower velocities along channel margins under all flow reductions (**Figure 3-7**) progressively increasing these zones and allowing vegetation to make footholds in areas higher flows suppress. This kind of establishment favors mosquito oviposition and larvae development. An example of aquatic vegetation in the CAP is shown in **Figure 3-8**.



Figure 3-8 Aquatic Vegetation Mat in CAP Canal

3.4 Sediment Transport

Sediment accumulation within the CAP system is an existing phenomenon, increasing over time (**Figure 3-9**), and it is concentrated within the forebays where velocities are typically lower than in the pools (CAP, 2025). Sediment accumulations may reduce capacity in the system and can interfere with operations. CAP maintenance personnel indicate the deposition has an impact on their work, and projects routinely experience higher costs and delays because divers and vacuum trucks are needed to clear stop log guides. Additionally, suspended sediments often clog strainers and filtration systems, necessitating maintenance. However, the concern here is that sediment accumulation throughout the pools could drive organic matter low redox conditions, low DO, and increased risks of other deleterious biological feedback described in this report.

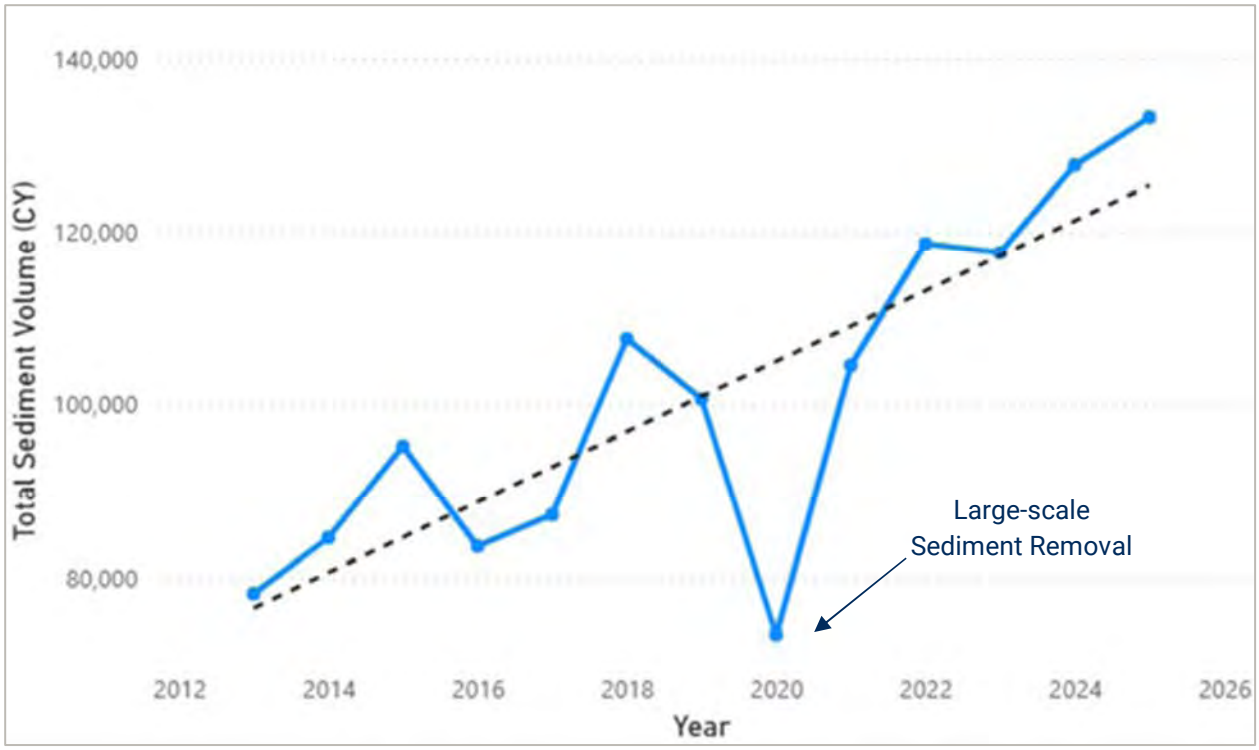


Figure 3-9 Total Sediment Volume Estimated in Forebays and Turnouts over Time (from CAP, 2025)

Based on lab testing of sediments in the Salt Gila Pumping Plant forebay, the existing sediments are highly erodible and are entrained at a rate of ~500 mm/hr at a velocity of 1.2 m/s (Terracon Consultants, 2014). No erosion took place at a velocity of 0.154 m/s. Reduction in flow will cause the highly erodible sediment to settle throughout the CAP, which could generate the need for sediment removal maintenance throughout the length of the CAP. Currently, CAP doesn't have a structured approach to sediment removal. Removal efforts are done opportunistically. The high cost of sediment removal and the logistics of dredge material disposal are among the likely reasons a sediment removal program has not been implemented. However, sediment monitoring is done annually at each pumping plant forebay and the three major turnouts in the southern portion of the DS canal.

Average velocity was calculated for each pool segment based on flow rate and depth, so the effect of canal flow rate is included in intervals of 100K ac-ft/yr (**Figure 3-10**). Under current flow conditions, the smaller flow velocities are expected only in the periphery of forebays and turnouts, where the sediment is more easily removed.

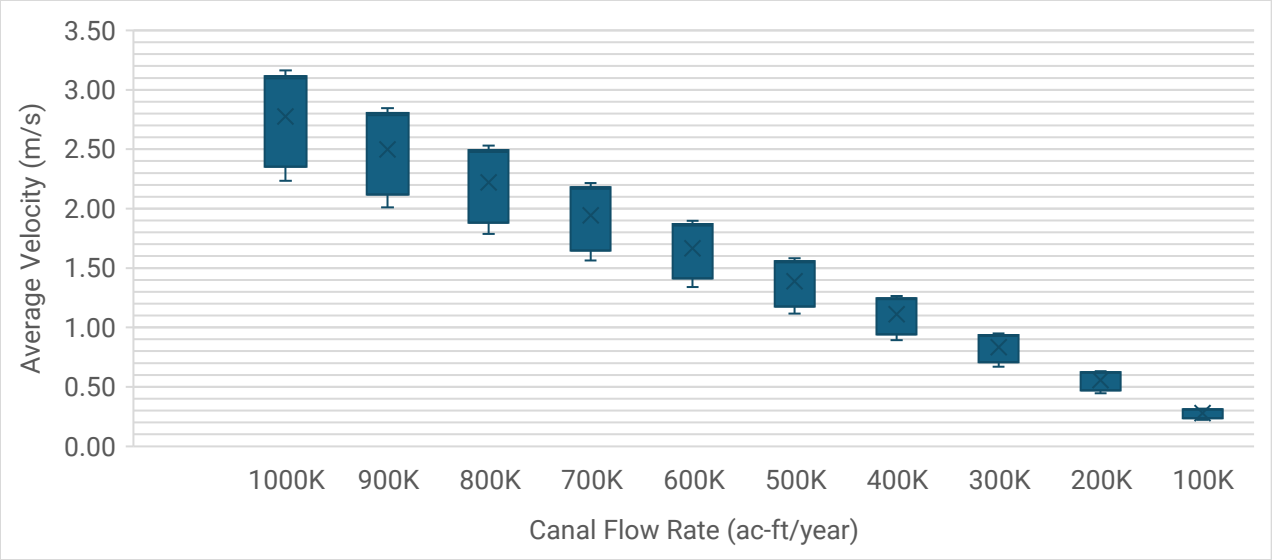


Figure 3-10 **Expected Average Velocities Across All Pool Segments Decrease with Decreased Annual Volume**

The measured erosion rate of sediments at the Salt Gila Pumping Plant Forebay follow a logarithmic relationship of approximately Erosion Rate (mm/hr) = $0.0619e^{\wedge 7.5837*(\text{Velocity in m/s})}$ (**Figure 3-9**). Based on this relationship, the estimated erosion rate under current conditions is more than sufficient to transport sediment through the pools. The erosion rates drop between 82 and 91%, reducing flow from 1,000,000 ac-ft/yr to 900,000 ac-ft/yr, though the estimated velocities at each flow scenario exceed those in the measured erosion rate curve (**Figure 3-11**). The estimated velocities will fall within this curve at a reduced flow rate of 500,000 ac-ft/yr, which roughly translates to an erosion rate of 1,000 mm/hr in the pools. Reducing flow from 500,000 ac-ft/yr to 400,000 ac-ft/yr would reduce the erosion rate by 82 to 91% (**Figure 3-12**). The erosion rate drops exponentially, so sediment accumulation with the pools is expected at reduced flow rate scenarios. This sediment, which would be located throughout the pools instead of only at forebays, so the resulting organic matter low redox conditions, low DO, and increased risks of other deleterious biological feedbacks could occur throughout the 300-mile CAP system instead of being localized within forebay peripheries.

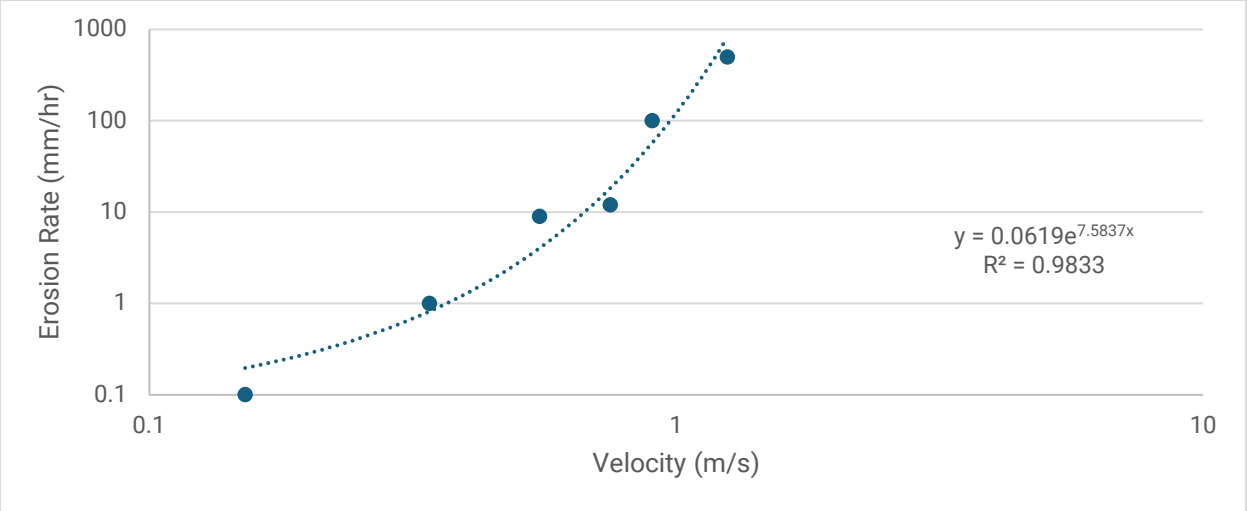


Figure 3-11 **Measured Erosion Rate of Salt Gila Pumping Plant Forebay Sediments Compared to Water Velocity**

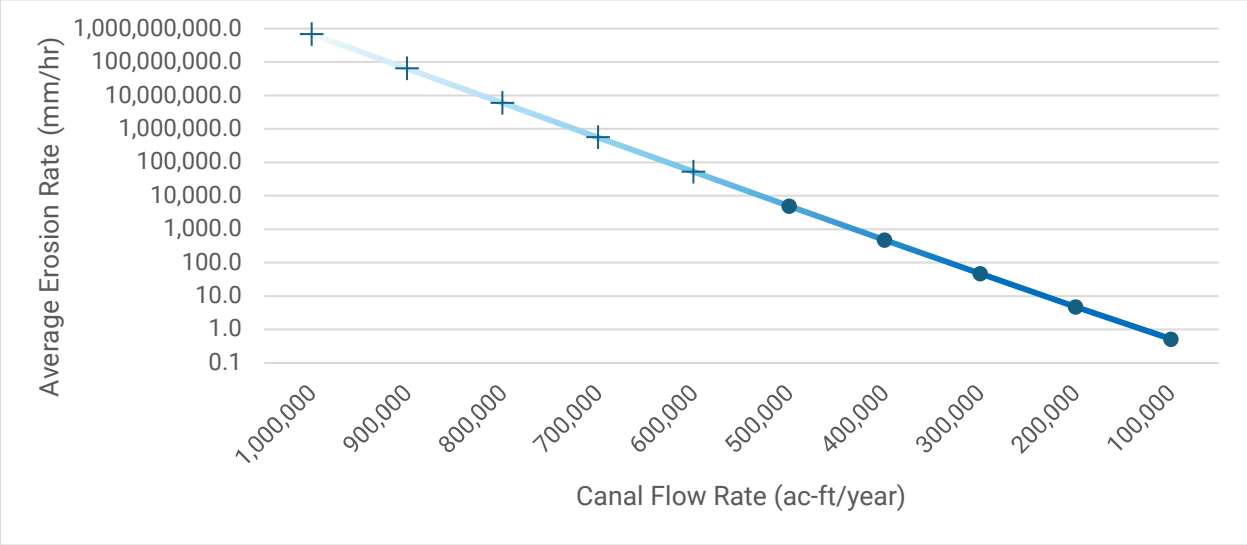


Figure 3-12 **Average erosion rate of sediment within the CAP is anticipated to fall exponentially with reduced canal flow rate. Note that estimated erosion rates >=600K ac-ft/yr annual volume is based on an extrapolated relation and are depicted with +s.**

Soils within the Salt Gila Pumping Plant forebay sediment mound within the CAP were characterized in a 2014 study (Terracon Consultants, 2014). The sediment composition includes fine sand, silt (53 to 62 %), clay (22 to 33 %), and organic material (0.9 to 7.0 %). One Shelby tube sample was described as black peat to sandy clay peat. The top of the sample also contained some shells.

In this report, the source of the sediment within the CAP and within this forebay was attributed to windblown particles from the surrounding desert. Whereas high clay content is expected from windblown sediments, the organic content of windblown sediments is typically very low (Li et al, 2009). Therefore, the relatively high concentration and accumulation of organic sediment in this forebay is likely from internal biological sources. The observation of shells supports the fact that organic material is contributing to the overall sediment load in the system.

Under anaerobic conditions, the organic content measured in the sediment mound study (Terracon Consultants, 2014) is sufficient for production of potentially harmful or odorous gases, methane and hydrogen sulfide, under anaerobic conditions. When organic content is above 3.5%, hydrogen sulfide production is known to be correlated with organic content: more organic content will generate more hydrogen sulfide (Sakai et al., 2013). Hydrogen sulfide gas is the primary culprit for “rotten egg” odor in sediments, wastewater, and sludge. Hydrogen sulfide emitted to the atmosphere from sewage or polluted rivers can cause acute symptoms such as inflammation of the eyes, skin burns, and respiratory diseases such as rhinitis, bronchitis, and pneumonia, headaches, and nausea (Wiener et al., 2006), and even death in confined spaces (OSHA, 2025). It is heavier than air, so it can travel along the ground and accumulate in low areas.

Sufficient discharge over these sediments can reduce the production of these gases through four mechanisms: 1) keeping small organic compounds in suspension, 2) increasing oxygen penetration into the sediments, thus suppressing anaerobic microbial activity (Mackenthun and Stefan, 1995), 3) potentially preventing the production of organic material (from aquatic plants, algae, and bacteria) that is expected to increase under lower discharge conditions, and 4) by decreasing temperature which can suppress microbial activity and gas production. Therefore, reduced flow velocity in the CAP is expected to increase hydrogen sulfide production through several mechanisms.

The optimal temperature for hydrogen sulfide production from aquatic sediments has been found to be 30 to 40°C (Zinder & Brock, 1978) or 35 to 42°C (Zeikus and Winfrey, 1976). Modeled results for the CAP show that these thresholds are currently met or exceeded at very few downstream segments for less than 1% portion of the year, but the number of segments greatly expands and the duration increases progressively under each lower flow scenario with large temporal and spatial expansions of the issue under scenarios from 1,000k, 700k, 500k and 300k ac-ft/yr (**Figure 3-13**). The change between 100k and 300k is more modest. Because there is sufficient organic matter in the CAP sediments, any reduction in flow will result in increased hydrogen sulfide production, with more than half the segments affected at flow levels somewhere between 700k and 500k ac-ft/yr.

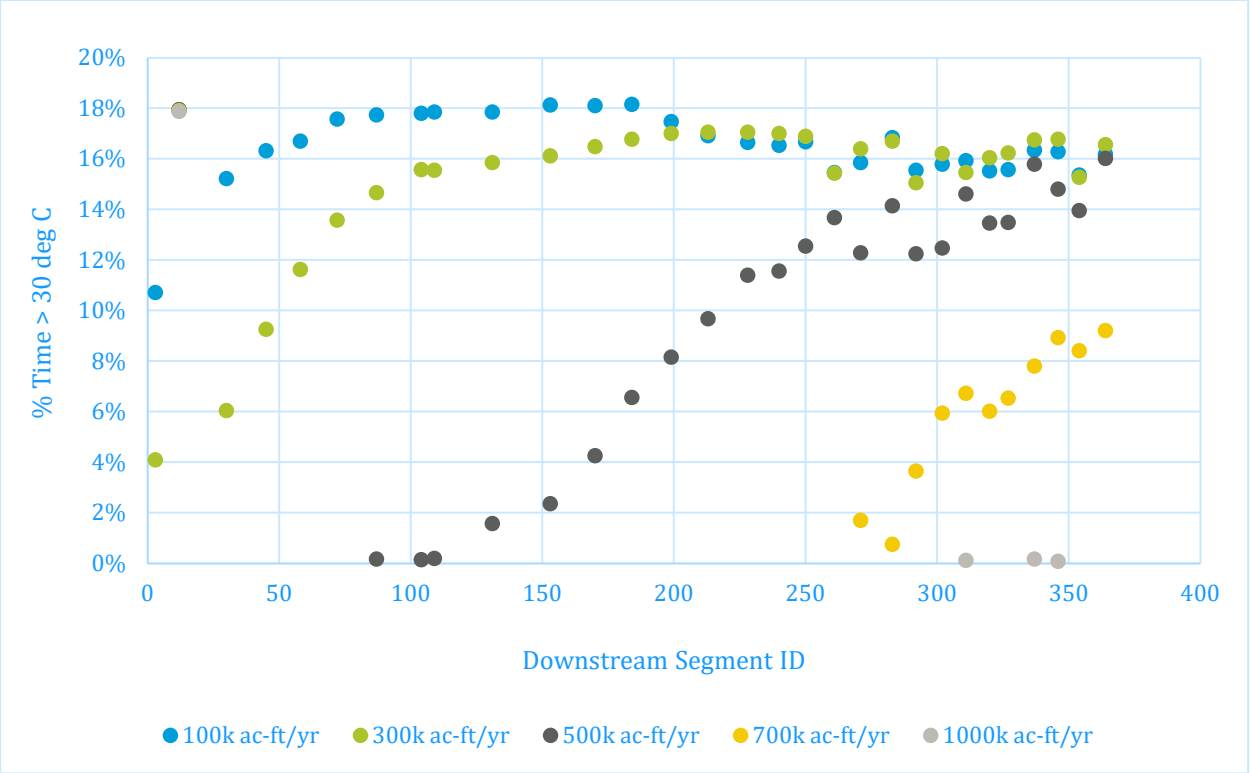


Figure 3-13 **The optimal temperature for hydrogen sulfide production in sediments is exceeded as annual flow volume drops below 1,000k ac-ft/yr, and the number of segments where this optimal temperature is reached also increases.**

The dissociation of hydrogen sulfide (breaking down into ionic forms which are not volatile and therefore do not cause odor) increases with the increased oxygen concentration associated with turbulence in the water column, and this dissociation is more rapid under low pH (Yongsiri et al., 2004). Under low flow scenarios in the CAP, pH is expected to increase slightly, but it may not be significant. Flow velocity (**Figure 3-10**) and DO concentration, however, are expected to decrease, so the production of hydrogen sulfide will increase.

Reducing the flow through the system may also increase concentrations of TN and TP in organic sediments by reducing the DO concentration (Leu et al., 1996). When DO concentrations are reduced, the processes in which TN and TP are released from sediments increase, as the processes shift towards anerobic processes in lower DO conditions (Leu et al., 1996). Changes in flow may also alter the distribution and concentration of organic sediments, so these effects may be more pronounced in slackwater areas such as the periphery of forebays.

3.4.1 Summary of Sediment Transport

- Incremental reductions in flow will likely result in an exponential drop in sediment transport, so sediment accumulation will increase throughout the pools. Based on available data, sediment transport may effectively cease at the lowest analyzed flow scenarios.
- Hydrogen sulfide gas will be increasingly generated by organic sediment development under reduced flow conditions. The number of canal segments affected and percent of time the gas is generated are both highly sensitive to flow reductions.

- Because there is sufficient organic matter in the CAP sediments, incremental reductions in flow will likely result in increased hydrogen sulfide production, with more than half the segments affected at flow levels somewhere between 700k and 500k ac-ft/yr.
- Severe spatial and frequency increases in this generation occur between flows of 1,000k and 700k, with the largest increase between 700k and 500k ac-ft/yr flows, and again with a large jump between 500k and 300k.
- This assessment indicates a key functional shift away from beneficial lotic conditions with even moderate flow reductions at somewhere between 1,000k and 700k ac-ft/yr delivery.
- Photo of organic sediment accumulation depicted in **Figure 3-14**.



Figure 3-14 Example of Accumulated Organic Sediment in CAP at Brady Pumping Plant

3.5 Fish

Fish kills make the news not only because they smell bad and the odors become a public nuisance but also because they signal something is wrong in the water. Thermally induced fish kills create organic matter that rapidly elevates biochemical oxygen demand (BOD) through microbial decomposition, accelerating dissolved oxygen (DO) consumption in the water column and the sediment-water interface. Decomposition rates increase with temperature, making warm water mortality events particularly effective at prolonging hypoxia beyond that caused by thermal stress alone. As oxygen declines, reduced mixing and limited reaeration can further suppress recovery, allowing post-mortality decomposition to function as a secondary driver of spatially and temporally expanded hypoxic conditions (Chidami & Amyot 2008; Boros et al., 2020). With exhaustion of DO, microbial metabolism shifts from aerobic respiration to anaerobic pathways, initiating “septic” conditions.

Channel catfish and grass carp represent high functional and economic value within the CAP system, owing to their roles in providing biological controls mitigating nuisance caddisfly swarms and vegetation in the canal, respectively. Mortality of these species has disproportionate implications for both system function and economic value because these species are cultivated and released into the system at

considerable cost to the CAWCD. Losses of channel catfish and grass carp can reduce biological control of nuisance species, potentially exacerbating secondary water quality impairments and increasing long-term management costs.

By contrast, striped bass are relatively abundant but more thermally sensitive than the grass carp or channel catfish, making them prone to episodic mortality during elevated temperature events. Striped bass exhibit well-defined thermal and DO constraints that vary by life stage. Extensive field and laboratory evidence indicates that adult striped bass experience significant physiological stress when summer water temperatures exceed 25-27°C (Cook et.al 2006). In large southern U.S. reservoirs, preferred adult habitat is typically restricted to cool, oxygenated depths (T<25°C; DO >2 mg/l), and prolonged loss of such habitat has repeatedly been associated with growth impairment and summer mortality.

Regulatory thermal threshold evaluations recommended chronic and acute criteria for striped bass. For example, The Nevada Department of Environmental Protection's (NDEP's) comprehensive thermal tolerance review recommends a chronic summer maximum weekly average temperature of 30°C for striped bass (NDEP 2016). Acute thresholds for short-duration exposure are recommended at 32°C, derived from upper incipient lethal temperatures for acclimated juveniles (approximately 31.8-33.9°C at 25-30°C acclimation). These criteria reflect the consistent finding that striped bass can survive brief excursions into the low 30s°C but cannot survive as temperature approaches this range on a chronic basis.

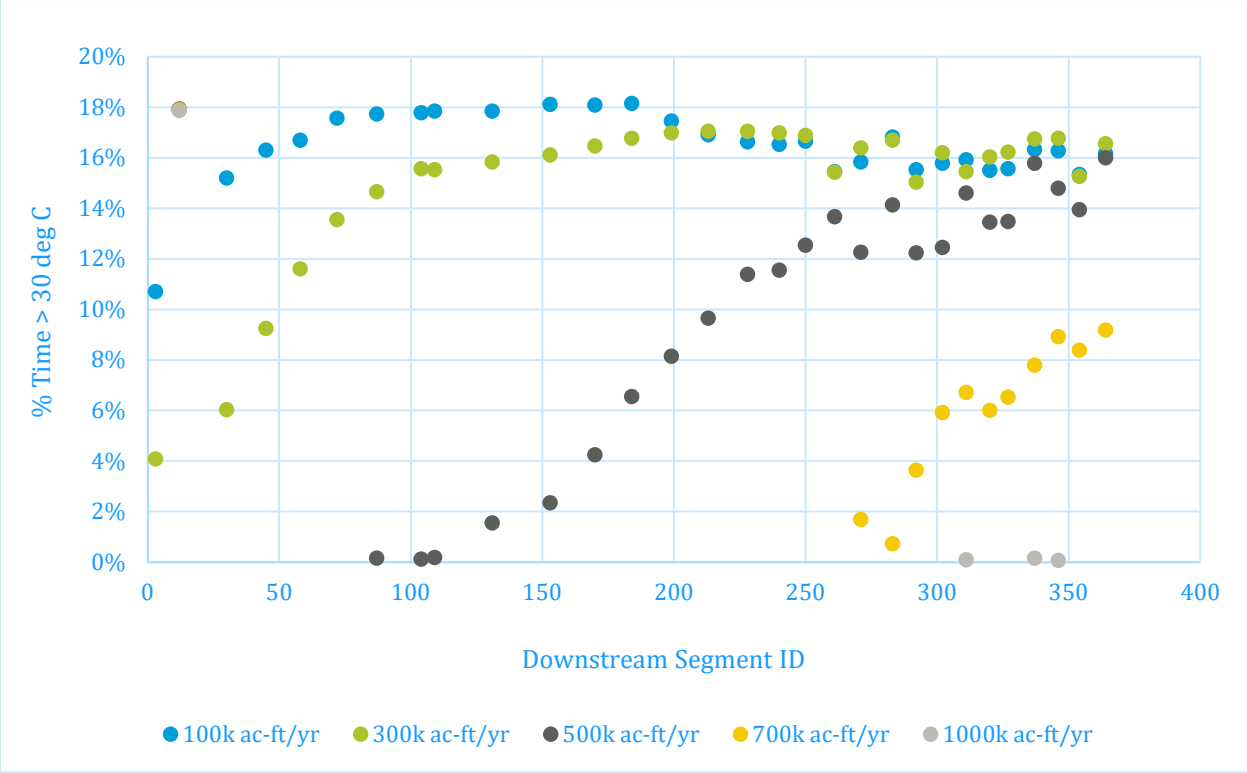


Figure 3-15 **Downstream canal segments and percent of time chronic mortality temperatures are equaled or exceeded for striped bass.**

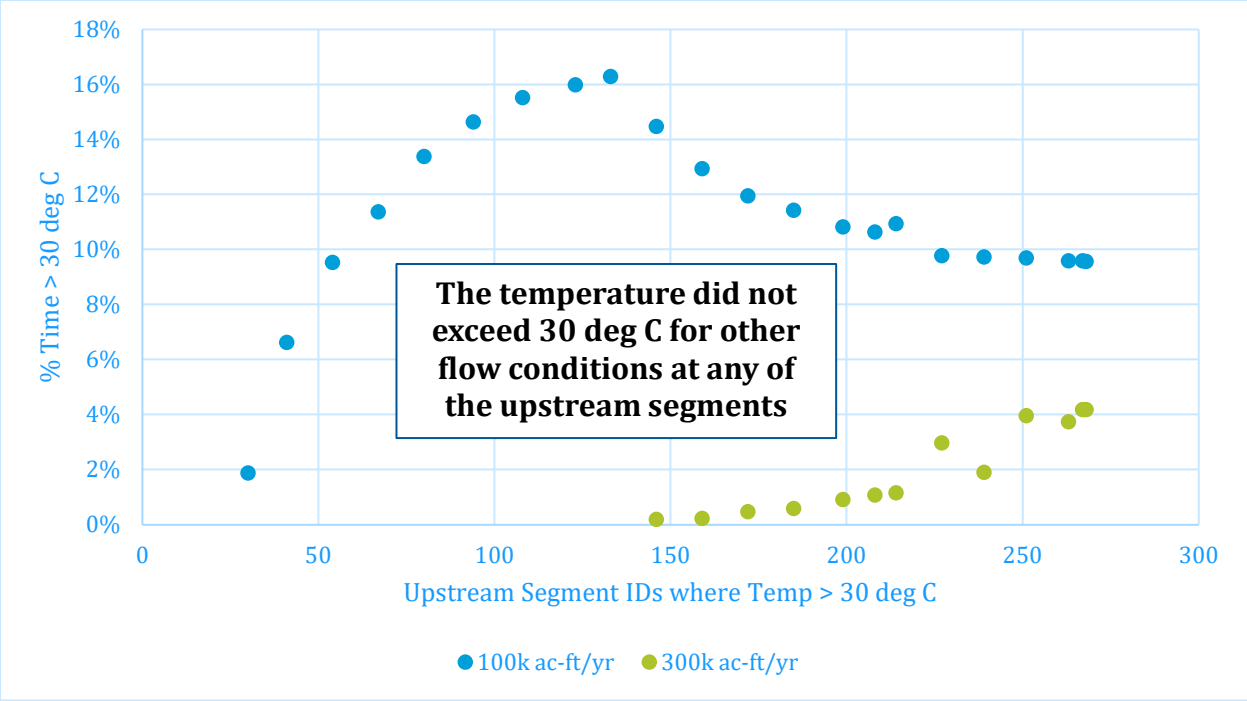


Figure 3-16 **Upstream canal segments and percent of time chronic mortality temperatures are equaled or exceeded for striped bass**

Channel catfish exhibit higher acute thermal tolerance than striped bass, reflecting their warmwater physiology. Laboratory studies reviewed in the Nevada Department of Environmental Protection's Channel Catfish Thermal Tolerance Analysis indicate that legal thresholds for juveniles and adults consistently fall within the upper 30s°C, with acute tolerance values ranging approximately 34.2 to 37.6°C. In accordance with the general EPA guidance and absent evidence suggesting a more restrictive criterion, NDEP selected the EPA acute threshold of 35°C as the recommended protective maximum for adult and juvenile channel catfish (NDEP 2016).

Sterile (triploid) grass carp are released into the CAP to control algae and vegetation growth. The carp are uniquely susceptible to the deadly koi herpesvirus, a disease that can produce severe fish kills with over 80% mortality. The virus is sensitive to temperature extremes and is largely inactivated at temperatures below 16°C and above 27°C. Flow reductions favoring temperatures between these values are suitable for herpesvirus outbreaks in the carp. However, as flows continue to decrease and temperature rise above the threshold for this virus, the impacts may be reduced. Grass carp are introduced annually into the canal in large numbers and reach large biomass often in excess of 20 pounds per fish. This large biomass at the individual and population levels means that fish kills affecting the carp may have severe functional and nuisance odor impacts.

3.5.1 Summary of Fish Mortality Findings

- Sensitivity of striped bass to fish kills associated with temperature increases associated with flow reduction is quite high, with substantial increases in the number of CAP segments affected and increased frequency of fatal conditions occurring in those segments across all the incremental flow reduction scenarios assessed.
- There is a large change in the number of canal segments and frequency of occurrence that are likely to kill striped bass in the downstream segments due to the species temperature tolerance even across

the most modest reduction examined, somewhere between deliveries from 1,000k down to 700k ac-ft/yr. The largest threshold change of combined spatial and temporal effect occurs between 700k and 500k ac-ft/yr and the problem becomes rather spatially ubiquitous at maximum frequency somewhere between 500k and 300k ac-ft/yr. Based on the findings, striped bass may be expected to suffer mortality in the lower reaches (rural portion) of the canal first, but at higher flow reductions, downstream segments near the populated urban areas of Phoenix are likely to experience fish kills.

- Along the upstream portion of the system, a similar pattern was observed. There were no CAP upstream segments with exceedances for values until 300k ac-ft/yr. The temperature exceedances become temporally and spatially ubiquitous for 300k and 100k ac-ft/yr.
- The utility of channel catfish to suppress caddisfly swarms may be adversely affected by boom-and-bust cycles in fly populations (see caddisfly section for details).
- The results indicate that higher flows provide increased thermal buffering and reduced persistent thermal risk, so fish mortality is greatly decreased with higher flows.

3.6 Caddisflies

Caddisflies (order Trichoptera) represent a broad range of insects with aquatic larvae that are known for creating tubular protective cases. Adult caddisflies are mothlike and terrestrial, and they inhabit areas close to water bodies. In 2004, their presence was recorded as a nuisance by nearby residents of the CAP. Further investigation found that these insects belonged to the *Smicridea* genus, which is native to the Colorado River. Their presence has been recorded in the CAP as early as 1993 and were likely introduced to the area with the first delivery of Colorado River water. These insects do not pose a serious health threat to humans but can cause skin irritation, allergic reactions, and mild respiratory problems from repeated contact (McNulty and Divekar, 2017). They are also considered a nuisance due to their swarming tendencies. Since 2011, the CAP has stocked channel catfish in the canal to reduce the caddisfly population (Central Arizona Project, 2024).

While current literature on *Smicridea* is limited, research on different Trichoptera species indicates that caddisflies are sensitive to low levels of dissolved oxygen, with egg hatch, larval development, molting success, time of molting, pupation, and adult emergence being delayed at and below a dissolved oxygen level of 4.6 mg/L (Nebeker et al., 1996). Additionally, Trichoptera are typically found in clean, clear streams and their presence can be used as an indicator of water quality in some cases. While some types of caddisflies are not significantly responsive to increased turbidity on its own, increased turbidity combined with temperatures above 25°C can cause a stress response (Cogo et al., 2019).

Additionally, while no specific literature exists for *Smicridea* and its preferred flow ranges and tolerances, research for related Trichoptera has been documented, specifically how flow affects their ability to settle from drift, catch refugia, or return to stream bottom. This research suggests that very few species of Trichoptera can survive flow velocity in excess of 0.6 m/s (de Brouwer et al., 2016). Larvae are most successful in flowing water between 0.1 and 0.2 m/s where their silk structures can anchor them and feeding is most efficient (Gall et al., 2009).

Currently, caddisfly larvae are present throughout the CAP canal system. Caddisfly larvae are able to thrive in the CAP through attaching their casings to the concrete liner where water velocities are lower than the center of the canal. As an illustration of the lower velocity periphery areas of the canal forebays, an example from the CAP Salt-Gila Pump Station Forebay Sediment Mound Study is presented in **Figure 3-7** (Terracon Consultants, 2014).

The Bullhead City Pest Abatement District currently deploys and researches multiple methods of caddisfly control including artificial fish habitat and trout stocking, RIP (Reduce Insect Pests) low flows, pesticide paints, and light trapping (Bullhead City Pest Abatement District, n.d.). The optimal temperature range for caddisflies was chosen as 10-25°C to account for survival and reproduction. When this temperature range was tested with the 100k, 500k, and 1,000k ac-ft/yr models, it was found that the 1,000k ac-ft/yr model had the highest number of qualifying days (**Figure 3-18**). Similarly, the 1,000k ac-ft/yr scenario has the most days with a DO range greater than 4.6 mg/L (ideal range to avoid stress) also with small inter-scenario differences until the decrease to 300k ac-ft/yr and 100k ac-ft/yr scenarios (**Figure 3-19**).

The moderate to slight effects of temperature, pH, and DO under different flow scenarios suggest that caddisfly populations will remain under a wide variety of flow conditions in the CAP. It is anticipated that favorable low-velocity areas in the periphery of pools and forebays will increase under any reduced flow scenario. However, the average velocity of entire pool segments under the lowest simulated flows of 100k ac-ft/yr and 200k ac-ft/yr will be favorable, so increased populations are expected with lower flows. Note that increased organic sediment deposition associated with reduced flows also will create anaerobic (low DO) conditions which are less favorable to caddisfly larvae, so the species may end up undergoing somewhat unpredictable boom and bust cycles making the current catfish stocking control less effective.

3.6.1 Summary of Caddisfly Findings

- Days within optimal temperature range and DO are higher in higher flow conditions, but the reductions among flow scenarios are rather modest and unlikely to affect the ability of caddisflies to generate nuisance swarms
- Reduced flow conditions will increase extent of favorable water velocity conditions in pool and forebay locations, potentially amplifying swarms.
- Reduced flow conditions will increase organic sediment deposition and increase anerobic conditions which are not ideal for caddisfly larvae and may suppress swarms or lead to less predictable inter-annual variation in swarm development making the current use of released channel catfish control difficult to utilize. So, there may be fewer occurrences but more severe swarms when they express under reduced flow.

Photo of caddisflies included in **Figure 3-17**.



Figure 3-17 **Adult Caddisflies Flying Over CAP Canal**

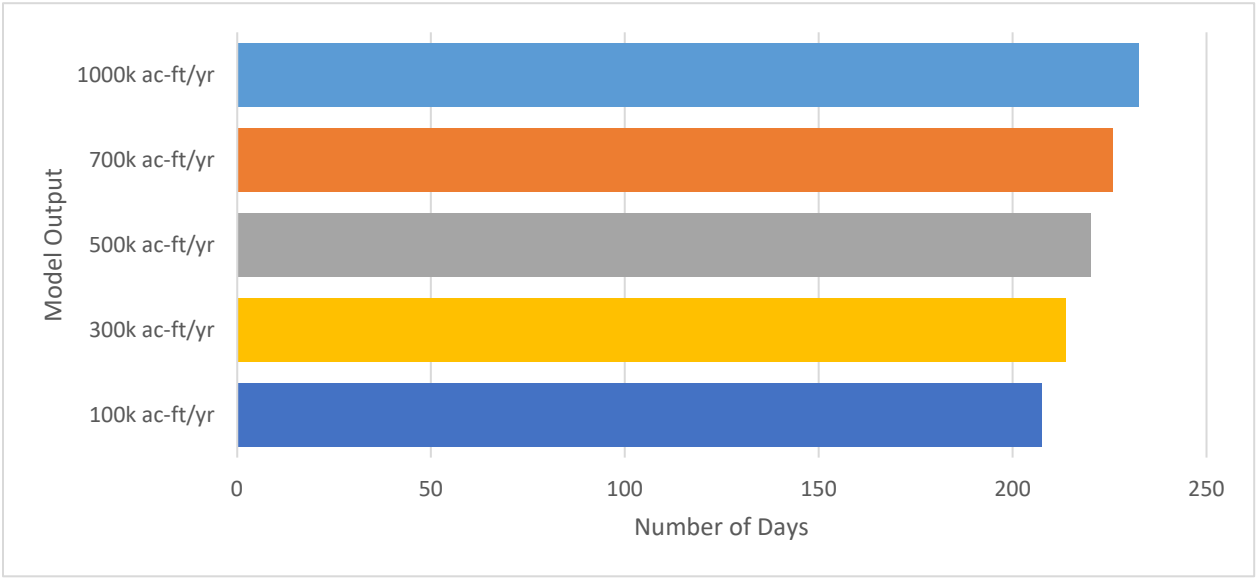


Figure 3-18 **Average Number of Days Modeled within Optimal Temperature for Caddisfly Larvae**

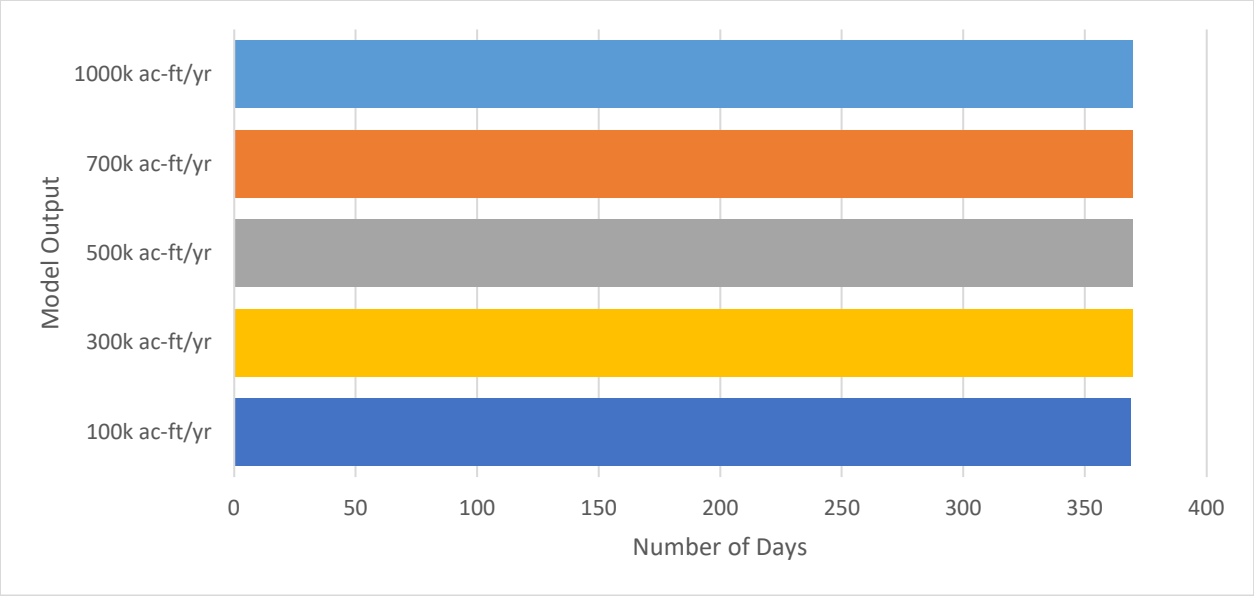


Figure 3-19 Average Number of Days Modeled within Optimal DO for Caddisfly Larvae (>4.6 mg/L)

3.7 Mosquitos

Mosquitoes, particularly *Aedes aegypti,* a known vector for dengue, chikungunya, and Zika viruses, and *Culex quinquefasciatus,* a vector for West Nile, St. Louis encephalitis, and eastern equine encephalitis viruses, have been well documented within the study area encompassing Maricopa, Pinal, and Pima counties through which the CAP canal system operates (Jobe et al 2024). Routine fogging occurs within these counties and is provided by the respective County Environmental Services Vector Control Division. Mosquito-eating fish (*Gambusia*) are also available free of charge to residents of these counties as additional mosquito control.

Mosquitoes are poikilothermic (cold-blooded) organisms, meaning their physiological processes, including development rates, are highly dependent on ambient temperature. As temperatures rise, mosquito larvae develop more rapidly, shortening the time to adulthood. In hotter temperatures, the metabolism of adult mosquitos increases resulting in an increased drive for "blood meals." Higher temperatures also create a longer breeding season. Female mosquitoes, driven to consume more due to their increased metabolisms, can lay eggs more frequently due to the availability of proteins in blood meals essential for egg development. Therefore, warmer temperatures accelerate the egg laying process. The longer breeding season, coupled with accelerated larval life cycle in warmer water temperatures, can rapidly increase mosquito populations.

Water temperature tolerances of larvae vary by species. Research indicates that the optimal temperature range for larval development is approximately 28–30°C for *Aedes aegypti* and 27–30°C for *Culex quinquefasciatus*. *Culex quinquefasciatus* larvae exhibit a narrower temperature tolerance, with lower development times but resulting in smaller larvae occurring at 32°C (Ciota et. Al 2014). *Aedes aegypti* and *Culex quinquefasciatus* larvae survival rates both notably decline above 34°C, where larvae experience significant physiological stress and increased mortality. However, *Aedes* species appear to have adapted the ability to survive higher temperatures (Brown et al., 2017). Adult mortality occurs, and egg and larval development fail when water temperatures surpass 40°C.

Research suggests that the optimal pH for mosquito larval development is 6.5-8.5. Outside of this range, larval survival and longevity in adulthood decreases (Ukubuiwe et al., 2020). For the purposes of this study, a conservative optimal temperature range for larval development of 27–30°C and a pH range of 6.5-8.5 was chosen based on available literature for both *Aedes aegypti* and *Culex quinquefasciatus*. Additionally, an upper lethal limit of 40°C was chosen for *Aedes aegypti* given this species' documented adaptability to higher temperatures in order to examine how the species survivability may be affected by higher average temperatures.

Mosquito larvae require stagnant or slow-moving water for development. Similar to the caddisfly larvae discussed above, it is likely that the current mosquito larvae populations within the CAP canal currently survive within the slack water periphery areas of the pools and canal forebays where the water velocities are lower than the rest of the system as documented in Terracon Consultants (2014). Additional aquatic vegetation and floating diatom mat growth may further reduce velocities and create improved egg laying substrates favorable to mosquito breeding.

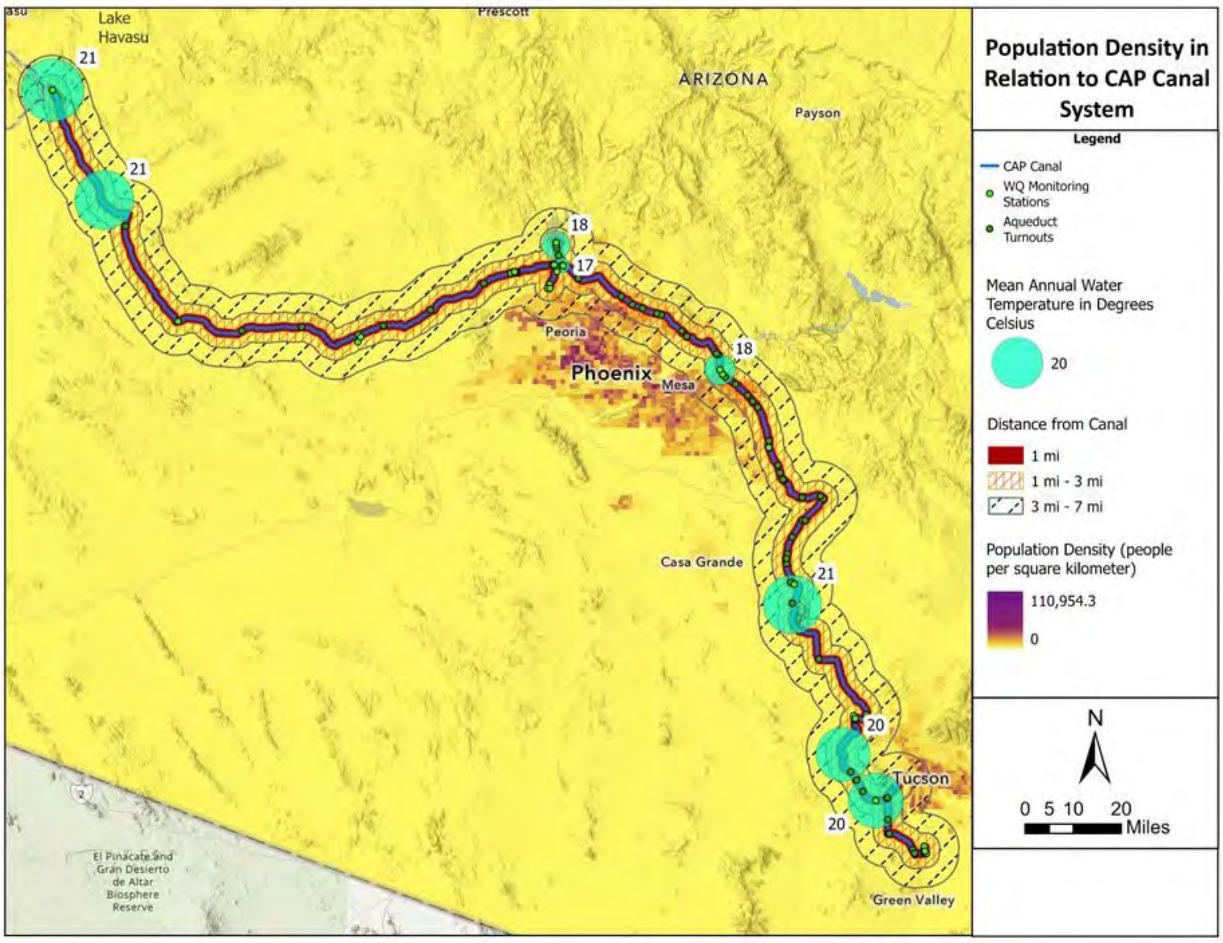


Figure 3-20 **Population Density in Relation to the CAP Canal System and Measured Mean Annual Water Temperature**

Measured water quality data shows that the mean average water temperature is slightly higher at the canal upstream near Lake Havasu and the downstream segment near Tucson (**Figure 3-20**). These temperature variations are likely attributed to regionally specific temperature and weather patterns, elevation, and duration of time water has spent in the canal. Temperature dependent mosquito life cycle events, such as mosquito breeding season and larval incubation period, are likely already somewhat extended in these reaches of the system and duration of favorable conditions could further increase by reduced flow conditions.

Most mosquito species travel one to three miles from their breeding grounds in search for food, though larger species may travel up to seven miles. **Figure 3-20** also illustrates how population dense areas such as Mesa, Phoenix, Scottsdale and Tucson are within the flight distances of a mosquito's search for food from the canal and could be affected by potential swarms and the associated threat of mosquito borne disease.

Based on the model, the average number of days predicted for the system to be within the optimal temperature range for larval mosquito development is expected to decrease 14.5% from approximately 62 days in the 1,000k ac-ft/yr scenario to approximately 53 days in the 100k ac-ft/yr scenario (**Figure 3-21**). These moderate reductions are unlikely to adversely affect populations.

The average number of days predicted for the system to be within the optimal pH range for larval mosquito development is expected to decrease 24.4% from approximately 287 days in the 1,000k ac-ft/yr scenario to approximately 217 days in the 300k ac-ft/yr scenario, which is a substantial reduction but with the intermediate reductions showing intermediate outcomes on larval development potential. The 100k ac-ft/yr scenario shows an increase of 34 days on average of favorable pH conditions over the 1000k ac-ft/yr (**Figure 3-22**).

The average number of days predicted for the system to be within the upper temperature threshold of *Aedes aegypti* (30-40 ºC) is expected to increase from approximately 46 days in the 1,000k ac-ft/yr scenario to approximately 79 days in the 100k ac-ft/yr scenario, again with intermediate changes at intermediate flow reduction. In each case more than 78% of the year remains favorable for larval development (**Figure 3-23**).

Additionally, the reduced flow conditions will increase the extent of favorable water velocity conditions in all pools and canal forebays, so the populations of mosquitoes will increase under these conditions. Almost any amount of flow reduction is therefore likely to increase the volume of potential breeding waters, but periods of suboptimal pH may reduce the time of year that maximum swarm densities can occur under the lowest flow scenarios.

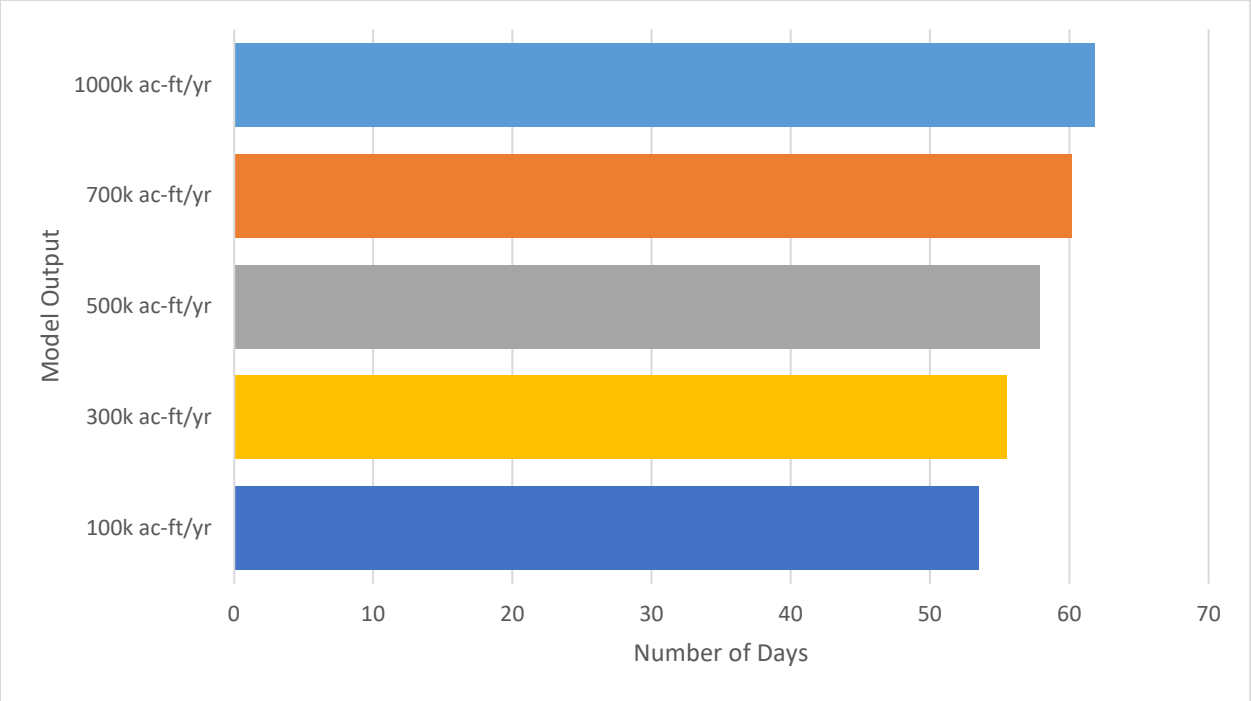


Figure 3-21 **Average Number of Days Modeled within Optimal Temperature Range for Mosquito Larval Development (27-30 °C)**

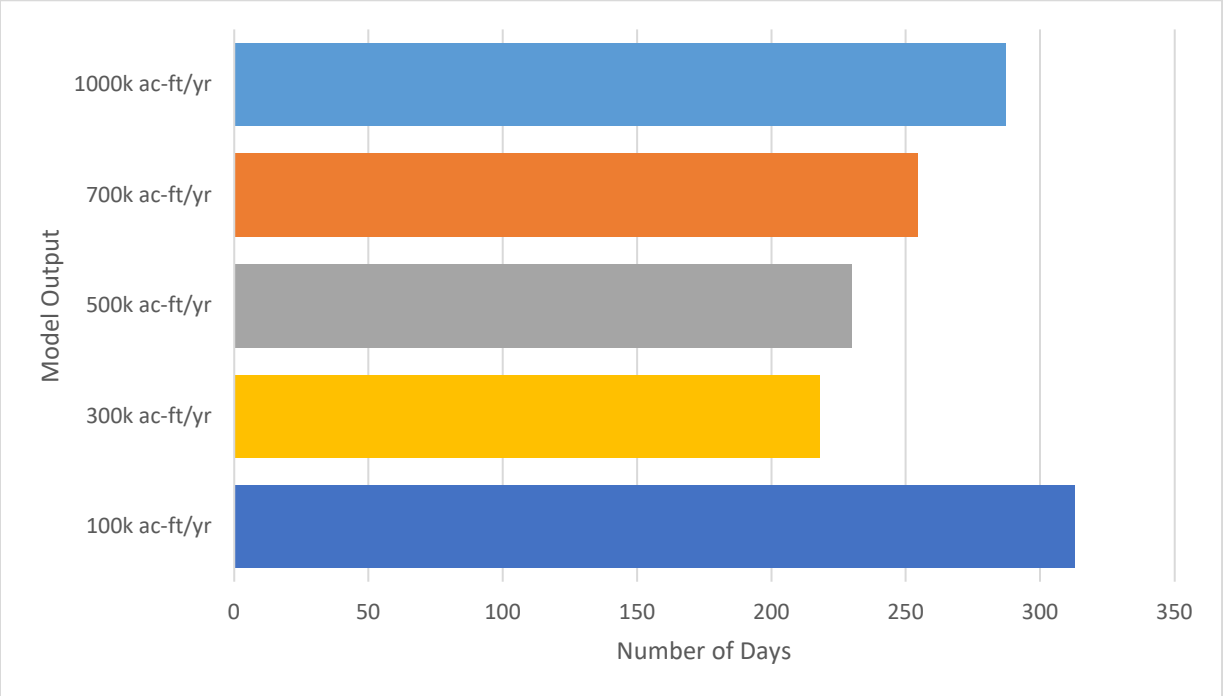


Figure 3-22 **Average Number of Days Modeled for each Model Output within Optimal pH Range (6.5-8.5 pH) for Larval Development by Model Output**

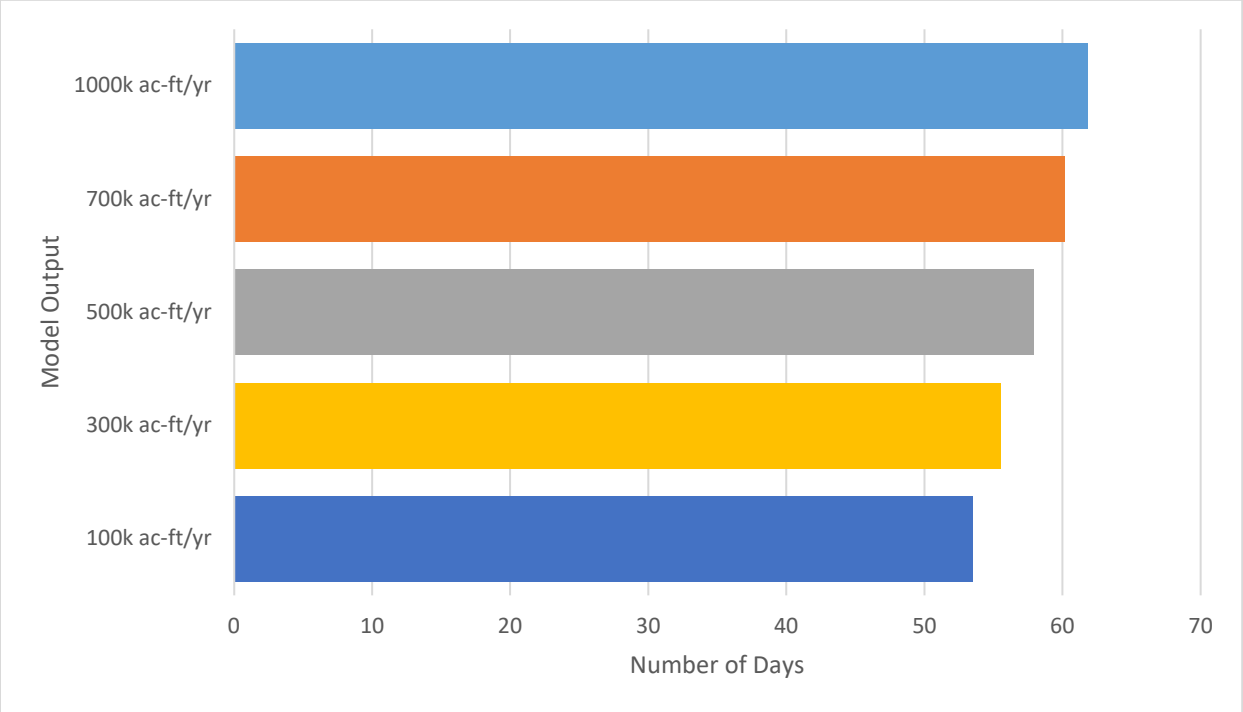


Figure 3-23 Average Number of Days Modeled within Temperature Range of 30-40 °C by Model Output

Reduced flow conditions are associated with fewer days meeting optimal temperature and pH for mosquito larval development, suggesting potential declines in larval and adult populations. However, these scenarios also show more days within the upper temperature threshold for *Aedes aegypti*. Combined with projected increases in nutrient loads (TP and TN) and enhanced photosynthetic growth of aquatic vegetation and algae at temperatures at and exceeding 30°C, these conditions may create favorable habitats for oviposition and larval development within the CAP Canal system.

Although optimal temperature days decrease under reduced flow, these reductions are moderate, and higher water temperatures accelerate larval development, reducing the time required for maturation. This inverse relationship indicates that the number of optimal temperature days may be less influential than the overall increase in warm days. Additionally, rising water temperatures—driven by reduced flow, higher average daily temperatures, and low rainfall—could extend the breeding season, promote stagnant water, increase mosquito populations, and intensify mosquito metabolic activity, ultimately elevating disease transmission risk.

3.7.1 Summary of Mosquito Findings

- Reduced flow conditions are associated with fewer days meeting optimal temperature and pH for mosquito reproduction, but the reductions are moderate, and the system retains at least some areas favorable for breeding under all flow scenarios.
- The reduced flow conditions will increase the extent of favorable water velocity conditions in all pools and canal forebays which can increase mosquito populations.

- Aquatic vegetation increases along channel margins are likely to favor mosquitos by creating slackwaters useful to larvae and by creating oviposition sites for females to use. This occurs at even at the most modest flow reductions.
- Some CAP pools will experience large scale conversion to low velocities favoring mosquito breeding and development with the smallest evaluated flow reductions. The potential progressively increases as flow reductions increase in severity.

3.8 Invasive Mussels

3.8.1 Quagga Mussel

Quagga mussels (*Dreissena bugensis)* were first introduced to the United States through the Great Lakes in the late 1980s. Their presence in the Colorado River was first detected in 2007, while their presence in the CAP was first detected in 2008. Currently, the abundance and distribution of quagga mussels are monitored by the CAWCD to inform system maintenance. While the CAP quagga mussels have established a stable population, they are largely considered to not affect system reliability. The exception is at the Mark Wilmer Pumping Plant (WMP), where the cooling water system is treated with copper to limit quagga mussels within the cooling system and ensure that the motors do not shut down from overheating.

Quagga mussels are bivalve mollusks that can settle on both hard and soft substrates. They rely on slow-moving freshwater and show a notably low tolerance to salinity, reaching 100% mortality from as little as 12 hours of exposure to brackish water with a salinity of 4 ppt (Seitz et al., 2023). While they rely on water flow for food transport, water velocity above 2 m/s can affect the attaching byssal threads to the point of preventing attachment (USFWS, 2007).

The mussels prefer a water pH within a range of 7.4-9.5 and show signs of stress and/or mortality beyond a pH of 10 (Seitz et al., 2023). Quagga mussels also prefer relatively saturated levels of dissolved oxygen (DO) to maintain their metabolism (Chen et al., 2011). The depth of quagga mussel settlement is largely influenced by water temperature. They can tolerate temperatures ranging from 1-30°C and require temperatures above 9°C for reproduction, while their ideal temperature for spawning is closer to 16°C (USGS, n.d.).

A temperature range of 9-30°C was identified as optimal for quagga mussels to account for both survival and reproduction. When these conditions were modeled at 100k, 300k, 500k, 700k, and 1,000k ac-ft/yr flow scenarios, it was found that the 1,000k ac-ft/yr flow scenario would have the highest number of days within the optimal temperature range, with moderate incremental reductions at each subsequent flow level (**Figure 3-25**). Additionally, a pH range of 7.4-9.5 was evaluated along the same flow scenarios and it was found that the 500k through 1,000k ac-ft/yr scenarios had the highest number of days in the optimal pH range and the 100k ac-ft/yr scenario had the lowest (**Figure 3-24**).

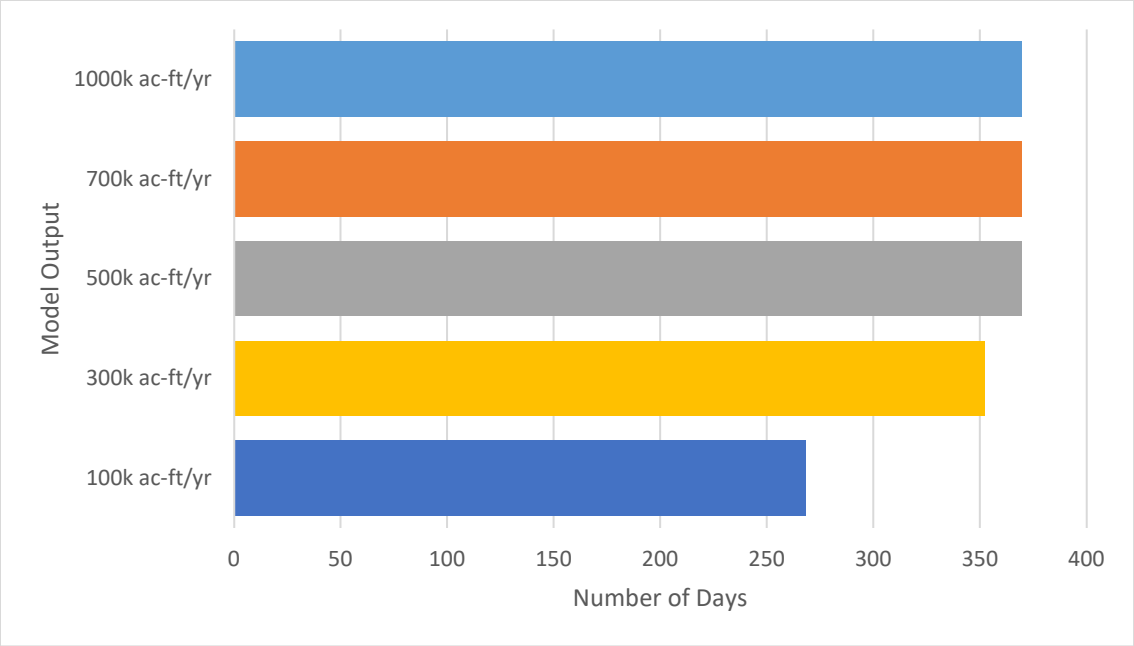


Figure 3-24 Average Number of Modeled Days within Optimal pH (7.4-9.5) by Model Output

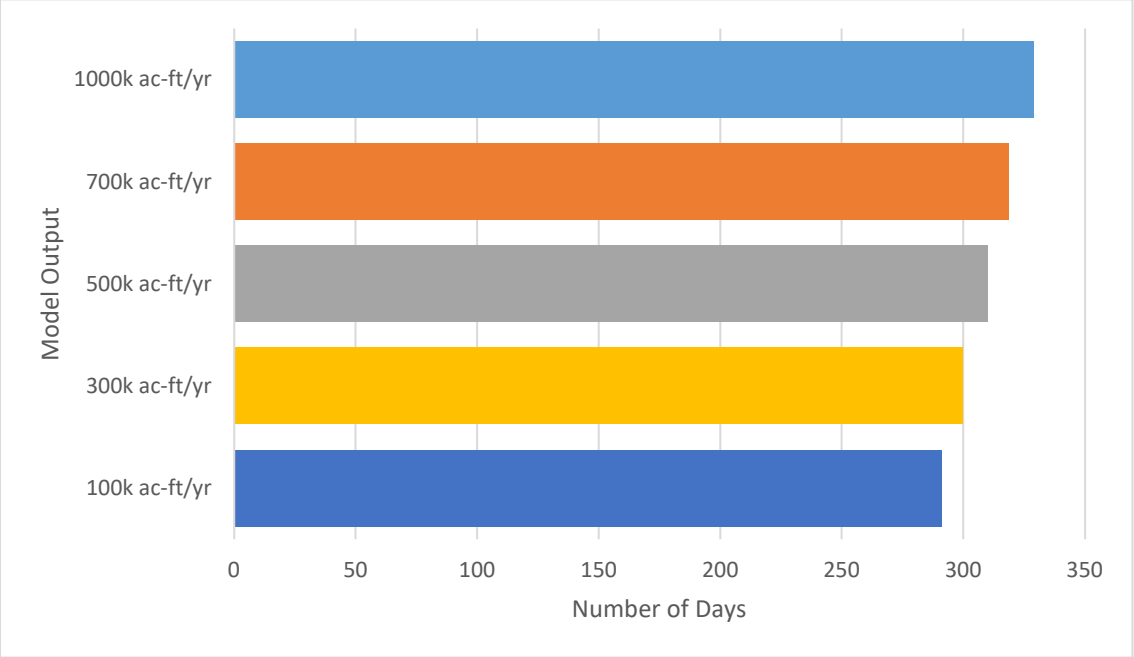


Figure 3-25 Number of Modeled Days within Temperature Range 9-30°C by Model Output

These differences among the various flow scenarios showed moderate to slight temperature and pH benefits at the highest flow over the lowest, suggesting that quagga mussel populations will remain under a wide variety of flow conditions in the CAP (**Figure 3-25**). Notably, under reduced flow conditions, (all flow conditions below 600k ac/ft as water velocity decreases below 2 m/s), the extent of favorable water velocity conditions will increase in all pools and forebay locations (**Figure 3-14**), however, the increased organic sediment deposition associated with reduced flows will create anaerobic (low DO) conditions which are less favorable to quagga mussels.

3.8.2 Golden Mussel

Golden mussels (*Limnoperna fortune*) were first detected in the United States in San Joaquin County, California in October 2024. Their presence has since spread across California. While golden mussels have not been detected in the CAP at the time of this report, the broader Arizona region could be vulnerable to golden mussel infestation in coming years.

Golden mussels have shown different temperature tolerances in different regions. For example, mussels are found in temperatures between 8-32°C in Asia and in temperatures between 17-28°C in temperate regions of South America (USFWS, 2020). A temperature of 16-28°C is necessary to support larval development. These mussels can also establish on both hard and soft substrates and have been found to settle as far as 40 m below water surface. They can inhabit both freshwater and brackish environments, tolerating a constant salinity below 3 ppt as well as fluctuations to higher salinities. They can tolerate contaminated waters with low calcium and pH but have shown themselves to be negatively affected by low levels of dissolved oxygen (NOAA, n.d.). Hypoxic events lasting 5 days or more have been shown to cause golden mussel death and extirpate established populations (Oliveira et al., 2010).

When the 16-28°C water temperature window was modeled for the 100k, 300K, 500k, 700K, and 1,000k ac-ft/yr flow scenarios, it was found that the highest number of days with optimal temperature for quagga mussels was during the 100k ac-ft/yr flow scenario.

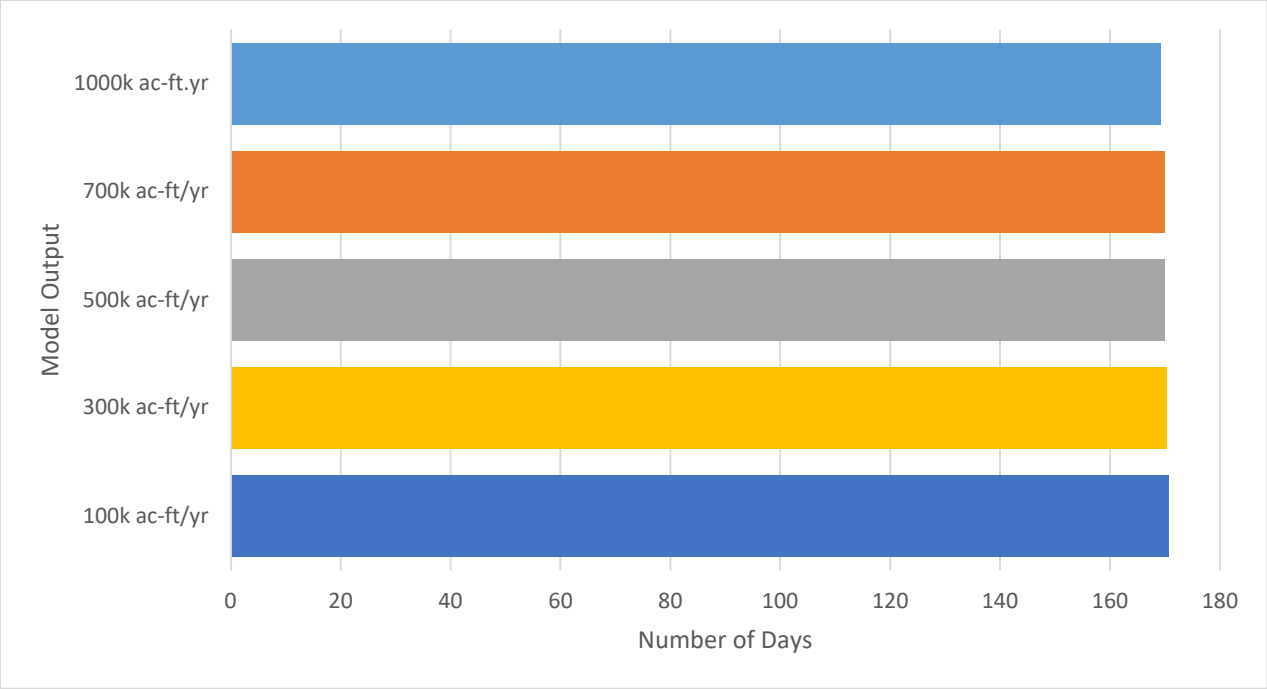


Figure 3-26 Average Number of Days Modeled within Optimal Temperature

There was little to no difference among all 5 flow scenarios, suggesting that golden mussel populations may establish under a wide variety of flow conditions in the CAP (**Figure 3-26**). Notably, under reduced flow conditions the increased organic sediment deposition associated with reduced flows will create anaerobic (low DO) conditions which are less favorable to golden mussels.

3.8.3 Summary of Invasive Mussel Results

Under all flow conditions below 600k ac-ft/yr the extent of favorable water velocity conditions will increase in all pools and forebay locations, however, the increased organic sediment deposition associated with reduced flows may increase anaerobic (low DO) conditions which are less favorable to both quagga and golden mussels. This means flow reduction to levels at or below 600k may lead to boom-and-bust cycles in non-native mussel populations.

Photo of invasive mussels is included in **Figure 3-27**.



Figure 3-27 Quagga Mussels on Mark Wilmer Pumping Plant Trash Racks

3.9 Drinking Water Treatment and Potable Water Quality

Microbial pathogen control in drinking water is achieved through a combination of physical removal by pre-treatment and filtration followed by disinfection. Disinfection of drinking water is the final treatment barrier to waterborne disease. To maintain the human-health benefits provided by disinfection, a chemical disinfectant residual must be maintained throughout drinking water distribution. However, reactions between chemical disinfectants and constituents naturally present in drinking water supplies, including total organic carbon (TOC), result in the unintended formation of a wide variety of both organic and inorganic disinfection byproducts (DBPs). Common DBPs include trihalomethanes (TTHMs) and haloacetic acids (HAA5), which are regulated under the EPA's Disinfection Byproducts Rule.

Extensive laboratory and epidemiological research indicate that a number of these DBPs pose health concerns if present at elevated concentrations in drinking water. Heath risks include:

- **Cancer**: Long-term exposure to DBPs, particularly TTHMs and HAAs, is associated with an increased risk of bladder cancer and possibly colorectal cancer.
- **Reproductive and Developmental Effects**: Epidemiological studies link DBPs to miscarriage, low birth weight, and neural tube defects in infants.
- **Mutagenicity and Cytotoxicity**: Laboratory studies show DBPs exhibit mutagenic and cytotoxic properties, contributing to DNA damage and potential carcinogenicity.

The amount and type of DBPs produced by reaction between water constituents and disinfectants depends on many factors, including alkalinity, water temperature, type of disinfectant, TOC chemical composition, and duration in distribution system.

Arizona treatment plant and potable water providers have a maximum treatment plant effluent TOC goal to limit the DBP formation in their distribution systems to below regulated levels. As TOC increases in the CAP canal, treatment plants will need to remove more TOC in their treatment processes, via enhanced chemical coagulation, use of ozone and /or with powdered or granular activated carbon to achieve these goals.

Historically, (~+90% of the time) the total organic carbon (TOC) in the CAP canal has ranged between 2 and 4 mg/L. In cases where TOC levels have increased, these elevations have usually lasted no more than two weeks and have generally remained below 8 mg/L. CAP water is also typically higher in alkalinity (normally ranging between 120- 160 mg/L as CaCO3) which impacts how efficiently TOC can be removed through typical potable water treatment processes.

As the canal operates under lower flow rates and CAP canal pools shift to more lake-like conditions, biological activity in the canal, including increased aquatic vegetation and algae growth will increase. This increased bioaccumulation and related aquatic organism impacts, such as increased larvae, fish die-offs, etc. will increase the TOC in the CAP water delivered to the potable water treatment plants treating their Colorado River water supply. Also, reduced flow velocities allow for more organic sediment accumulation in the pools.

As summarized in **Table 3-4**, the amount of TOC that needs to be removed through the treatment process is based on the type of treatment process, the influent, a.k.a. CAP water TOC, and alkalinity. If alkalinity is above 120 mg/L as CaCO3, the amount of TOC removal required is lower than that required at lower alkalinity 0-60 mg/L as CaCO3.

Table 3-4 TOC Removal Requirements

	Required TOC Removal (%)*		
Alkalinity (mg/L as $CaCO_3$)>>	≤ 60	> 60 – ≤ 120	> 120
Source Water TOC			
2.0 – 4.0 (mg/L)	35%	25%	15%
4.0 – 8.0 (mg/L)	45%	35%	25%
> 8.0 (mg/L)	50%	40%	30%
* Removal requirement for conventional potable water treatment plants w/ filtration from EPA Disinfectants and Disinfection Byproducts Rule (DDBP Rule)[2].			

Existing potable water treatment plants treating CAP water are currently designed and regularly operated to treat and remove TOC at typical CAP water TOC levels (2-4 mg/L) to meet regulatory requirements for both percent removal and to limit disinfection byproducts. These treatment plants can remove at higher levels of influent TOC and meet higher removal requirements, but currently most are limited to the amount of time they can treat at those higher removal levels due to their facility treatment equipment capacity limitations, such as chemical systems capacity, granular activated carbon filter capacity, and sludge handling for the increase coagulant chemicals and organic matter removed.

3.10.2 Summary of Disinfection Byproducts Findings

With decreasing flow volumes in the CAP canal, higher excursions of TOC are expected to occur more frequently and persist for longer durations. Although potable water treatment plant operators will continue to meet all regulatory requirements for TOC removal and DBPs these conditions are anticipated to increase potable water plants operational challenges. There is also a greater likelihood of elevated baseline DBP levels—remaining within regulatory limits—which may pose increased potential long-term human health risks.

4.0 Conclusions

The biological environment of the CAP is highly sensitive to flow reductions. Even moderate decreases—deliveries between 1,000k and 700k ac-ft/yr—produce adverse conditions. The most severe, spatially widespread, and increasingly generalized impacts occur when deliveries fall between 700k and 300k ac-ft/yr. At these levels, trophic conditions and water temperatures shift, and flow stagnation increases. These changes favor undesirable species while elevating mortality among desirable species. All deleterious effects described in this report intensify sharply when flows decline to 312k ac-ft/yr.

Under current and historic flow regimes, the CAP functions as a lotic system with low trophic status. This condition supports biological communities that rarely disrupt system integrity or generate public nuisances such as odors, insect swarms, disease vectors, fish kills, or organic sediment accumulation.

As flows decrease, the risk of organic sediment buildup accompanied by hydrogen sulfide odors (rotten-egg smells) rises. These conditions expand in both the number of affected canal segments and the frequency of occurrence across all modeled flow-reduction scenarios. The system becomes broadly impacted somewhere between 500k and 300k ac-ft/yr. Fish kills exhibit similar spatial and temporal sensitivities, further contributing to offensive odor episodes

Mosquito breeding is likely to be favored by increased aquatic vegetation establishment along canal margins as flow is reduced across each category examined, with temperature regimes often acceptable but not universally ideal for *Aedes* species larvae that can carry disease. This is a step change in a system that currently operates under flow conditions not allowing this to occur with much frequency or across large amounts of the canal segments. Mosquitoes also will interact with top-down predation by insectivorous fishes, which will experience their own increased die-offs with increasing levels of flow reduction. This suggests mosquitos may be presented with increased opportunities for egg laying such that larval populations will have routine opportunities to initiate during most years, but that the larvae will experience large boom-bust cycles in response to the dynamics of other species and air temperatures interacting with more stagnant waters. In other words, the likely scenario is that breeding will increase with increased flow reduction but not always result in adult swarms. However, when such swarms develop, they may be quite severe, especially given the proximity of the canal system to population dense residential areas.

Caddisflies may exhibit similar population dynamics, and the use of channel catfish as a biological control method may become less predictable and less practical under reduced-flow conditions.

Nuisance invasive mussel species are also sensitive to tradeoffs between flow velocity and temperature. Under some reduced-flow scenarios, they may reach higher peak establishment in certain pools and in certain years than under current conditions.

Under the current and historic flow regime the system's velocities, temperatures, and nutrient concentrations tend to favor growth of attached diatoms (*Cymbella*) , cyanobacteria, and green algae. The risk of cyanobacterial blooms throughout the CAP, both spatially and temporally, can increase under increasing nutrient concentrations. These step changes are significant because while attached diatoms can cause some operations challenges, they generally do not create severe nuisance odors or aquatic and aerial toxins, all of which some species of phytoplankton, particularly cyanobacteria do cause. These blooms also generally cause dissolved oxygen crashes that often cause fish kills, acerbating the die offs attributable to increased bottom-up factors like temperature increases associated with flow reduction. These potential conditions are not limited to the canal. Under the 312k ac-ft/yr scenario, the water level in

Lake Pleasant is expected to draw down, which could increase in the frequency, intensity, and duration of algal blooms based on the 2025 trend of chl-*a*, temperature, and dissolved oxygen.

In summary, moderate flow reductions are likely to create step-changes in the biological community in ways that increase public nuisances related to odors and insect swarms. **Table 4-1** and **Figure 4-1** and **Figure 4-2** below summarizes the effects, the interactions among the affected parameters, and the various flow reduction sensitivities of the biological components. **Figure 4-2** illustrates that categorical jumps in adverse impacts occurred for all the biological components examined at the 700k ac-ft/yr model scenario versus 1,000k ac-ft/yr, except caddisflies. Even more severe jumps in significant harm occurred at 500k ac-ft/yr for the effects of nuisance mussels and organic sediment accumulation. Among all risks, cyanotoxins produced during cyanobacterial HABs pose the greatest public health concern, both in water and aerially. It is difficult to tie this to a specific flow reduction, but the risk increases with decreased flow. The significant harm for mosquito breeding occurs at somewhere between the 300k and 500k ac-ft/yr model scenarios. That outcome poses disease vector issues for the people of the Tucson and Phoenix metro areas, among other areas adjacent to the CAP. All these adverse effects are suppressed at flows modeled above 700k ac-ft/yr, except caddisfly breeding which is rather insensitive to the range of flows assessed.

Moderate to severe flow reductions in the CAP trigger major shifts in biological conditions, leading to increased odors, insect breeding, fish kills, harmful algal blooms, and the expansion of nuisance or invasive species. These impacts intensify rapidly below 700k ac-ft/yr and become widespread and potentially hazardous to public health—especially regarding cyanotoxins and mosquito-borne disease—between 500k and 300k ac-ft/yr.

Outcomes Associated with a 312k ac-ft/yr Flow Scenario

An assumed annual diversion volume of 312 ac-ft/yr would be available to CAP under the Basic coordination (or “no deal”) alternative in the Post-2026 Colorado River Reservoir Operations DEIS. At this reduced flow rate, the risk increases for each of the deleterious biological effects described in this report. Many of the potential outcomes occur because of feedback loops, and one outcome may trigger environmental conditions favorable for another outcome to occur. The increased risk includes the following.

- Fish kills are likely because temperatures will increase beyond acute tolerances and dissolved oxygen will fall. This can lead to nuisance odors and attract vermin.
- Aquatic vegetation is likely to become established because of reduced velocity. The vegetation creates slackwater which can promote mosquito breeding.
- Mosquito populations will increase because of the reduced flow velocity, favorable pH, and an increase in slackwater areas for breeding. This can spread disease or create nuisance swarms.
- Cyanobacterial blooms may increase in severity and duration which can lead to aquatic and aerial toxins, nuisance odors, and additional drops in dissolved oxygen.
- Diatom blooms and filamentous algal blooms may also increase as algal communities shift, which can impede flow, cause nuisance odors, and create favorable conditions for mosquito breeding.
- The water level in Lake Pleasant is expected to draw down, which could increase in the frequency, intensity, and duration of algal blooms in the lake.
- Currently sediment is deposited in forebays and turnouts. The reduced velocity from the lower flow rate will result in sediment depositing throughout the canal. Much of this sediment is organic, and some algal blooms can lead to a dramatic increase in organic matter accumulation.

The risk of nuisance odors from the decay of organic material increases throughout the canal. The organic sediments will also lead to reduced dissolved oxygen in the water column.

- Nuisance invasive mussel species also are sensitive to competing tradeoffs in flow velocity and temperature and may exhibit greater peak establishment in some pools and in some years than current conditions. The mussels can reduce flow capacity, bioaccumulate toxins, and result in additional dissolved oxygen sags.

Table 4-1 Risk of Harm of Impact Category Risk of Hawm to Flow Reduction

Item	Impact Category	Flow Reduction Sensitivity	Flow-Affected Parameters	Effects & Public Nuisance	Top-down Impact Categories Item #s
1	Fish Kills	Moderate	DO, T	Nuisance odors, attract vermin	3, 4, 5, 6
2	Aquatic Vegetation Establishment	Moderate	V	Creates slackwater for mosquito breeding	1, 9
3	Cyanobacterial Blooms	High	V, TN, TP, T, DO	DO sags, nuisance odors, aquatic & aerial toxins	1, 5, 6
4	Diatom Blooms	High	V, TN, TP, T, DO	Flow impedance, Nuisance odors, Creates slackwater for mosquito breeding	1, 6, 9
5	Filamentous Algal Blooms	Moderate	V, TN, TP, T, DO	DO sags, nuisance odors, Creates slackwater for mosquito breeding	1, 3, 6, 9
6	Organic Sediment Accumulation	High	V, DO, TN, TP	DO sags, nuisance odors	2, 3, 4, 5, 7
7	Exotic Mussel Establishment	Moderate	V, T	Reduced flow capacity, bioaccumulation of toxins, DO sags	
8	Caddisfly Breeding	None	V, T, DO	Nuisance swarms	1
9	Mosquito Breeding	Moderate to High	V, T, pH	Disease, nuisance swarms	1, 2, 4, 5

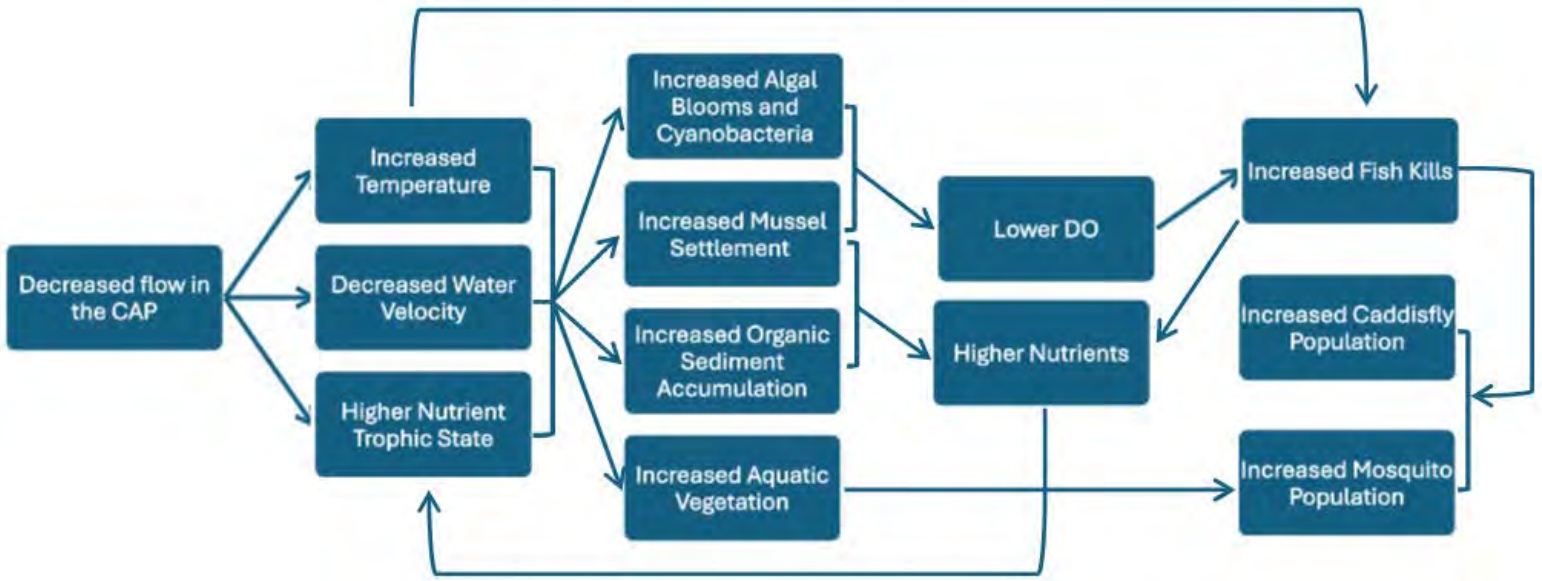


Figure 4-1 **Interconnected Effects of Reducing Flow in the CAP Canal**

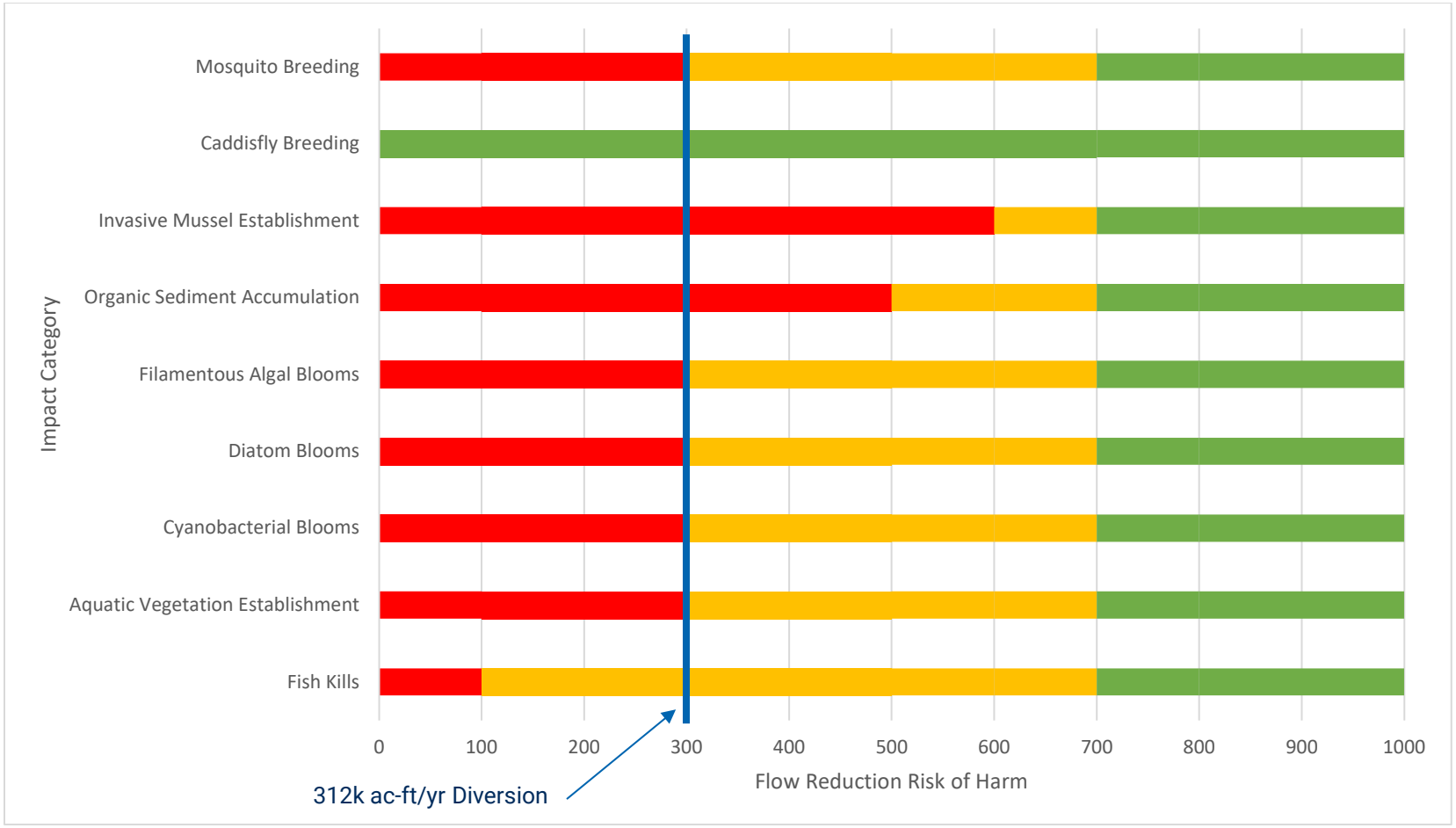


Figure 4-2 **Risk of Harm at Each Flow Scenario for Each Impact Category. Yellow classes are considered a nuisance, and red classes are considered significant harm. Nuisance and harm are not strictly defined for some categories.**

Flow Sensitivity Categories

High - likely to occur between 900k and 700k ac-ft/yr

Moderate - likely to occur between 700k and 300k ac-ft/yr

Low - likely to occur between 300k and 100k ac-ft/yr

None - no detectible increase in risk or harm

Bottom-Up Parameter Abbreviations

DO - dissolved oxygen

T - water temperature

V - flow velocity

TN - total nitrogen

TP - total phosphorus

Impact Category Descriptions

Fish kills - periodic and sudden die-offs of large groups of fish

Aquatic vegetation - plants that partially fill the water with dense growth

Cyanobacteria - floating and suspended blue green and golden algae that fix nitrogen and generate harmful algal blooms

Diatoms - colonies of organisms commonly referred to as 'rock snot' that form dense submerged and floating mats

Filamentous algae - growths of long stringy mats of algae commonly referred to as 'pond scum'

Organic sediment - muck or decaying vegetation accumulated with sands on the channel bottom

Exotic mussels - quagga and other non-native species that form dense reefs on solid surfaces and excrete pseudofeces

Mosquitos - species that can serve as disease vectors to humans and livestock

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EXHIBIT 13

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

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 employes 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

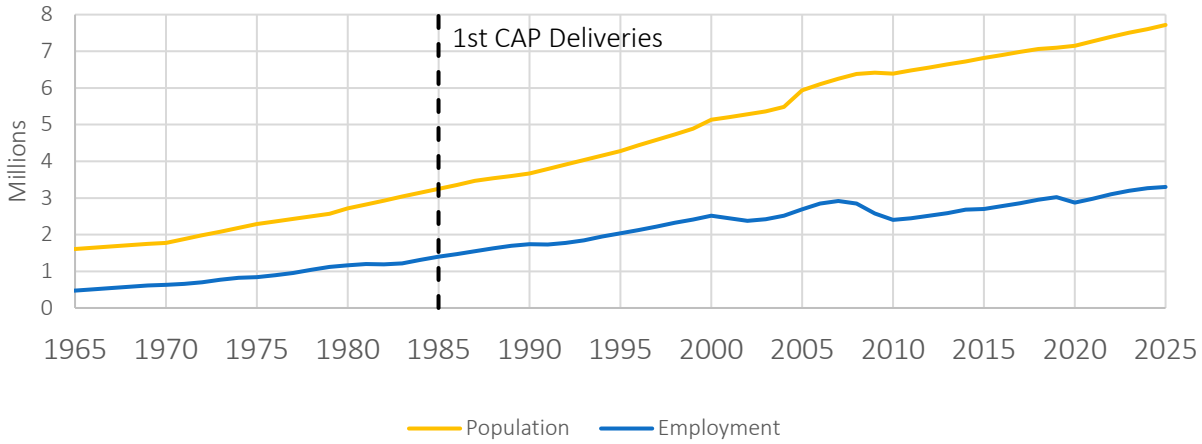
Central Arizona's economic expansion over the past four decades was built on reliable water supply, particularly Colorado River water delivered through the CAP. This infrastructure enabled the region to transition from depleting groundwater reserves to a more sustainable mix of surface water sources. 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.

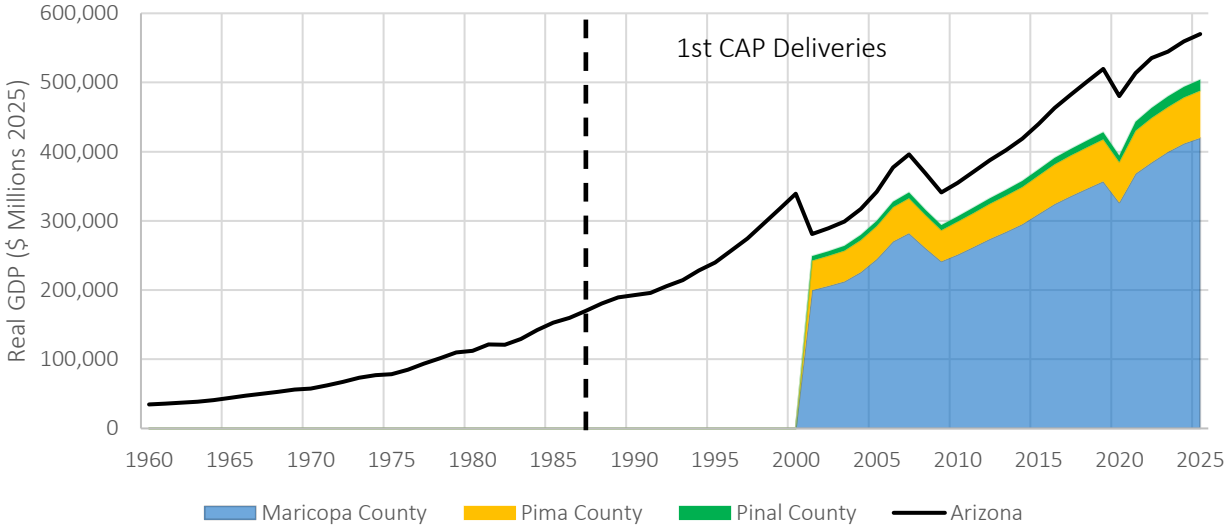
[6] FRED/U.S. Census Bureau

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.

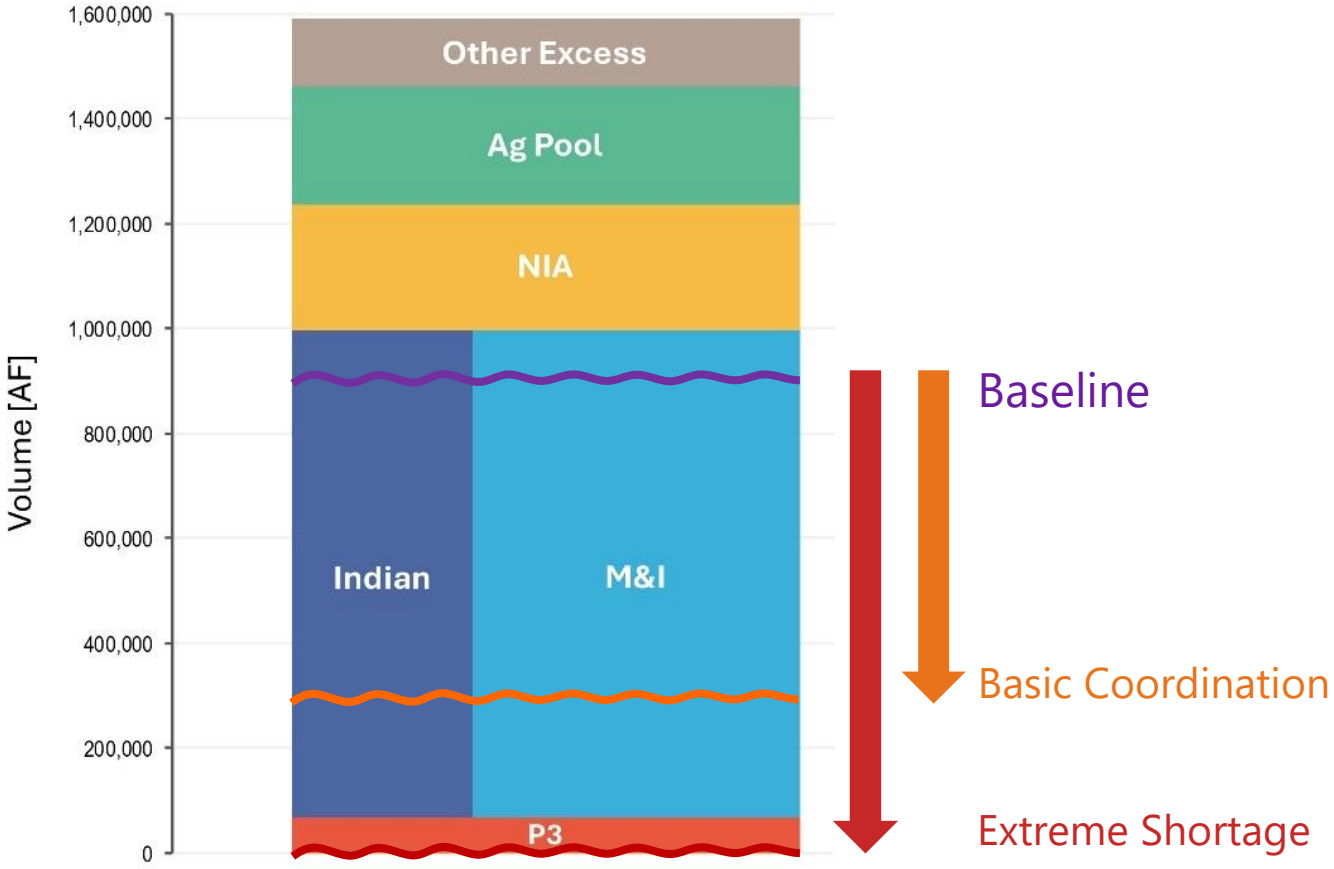
2.1.2. Basic Coordination Scenario (236,900 acre-feet)

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

[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.

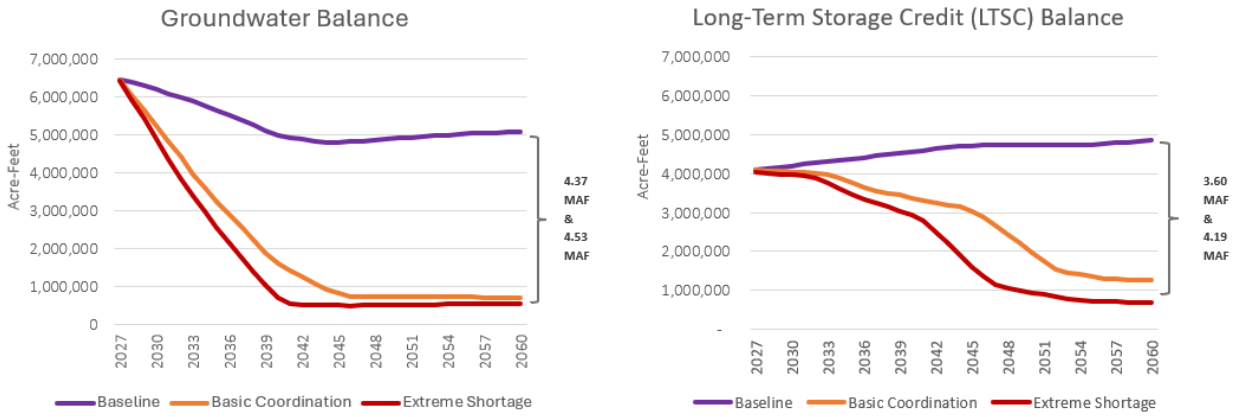
[13] Arizona Water Demand Analysis by Land Use Category. WestWater Research. October 9, 2024.

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



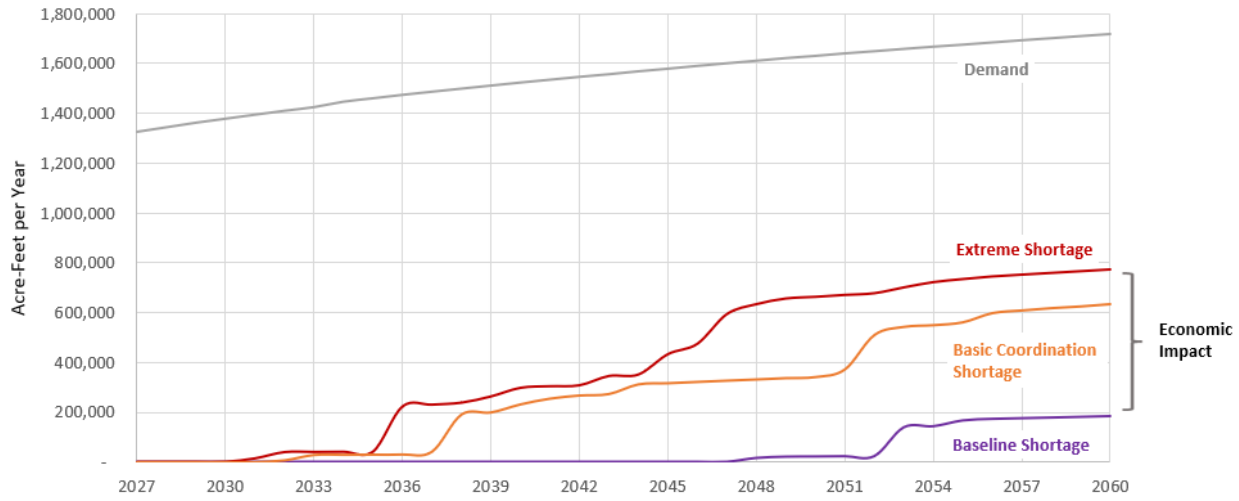
1. Projected Shortages

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)

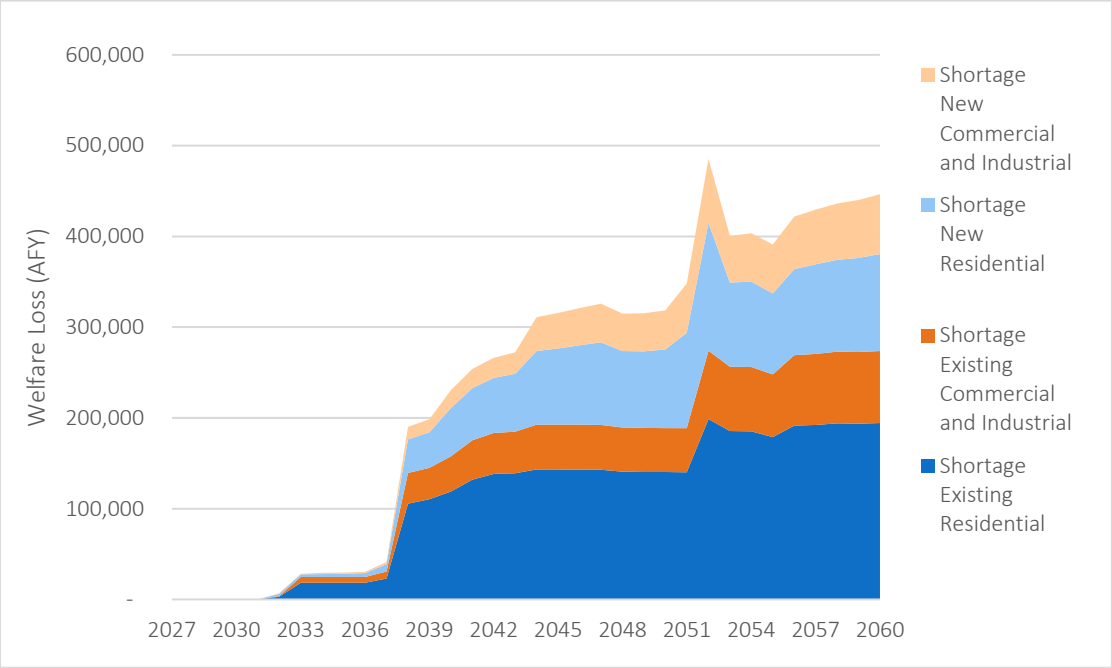


Figure 7: Allocation of Additional Water Shortages across Sectors (Extreme Shortage)

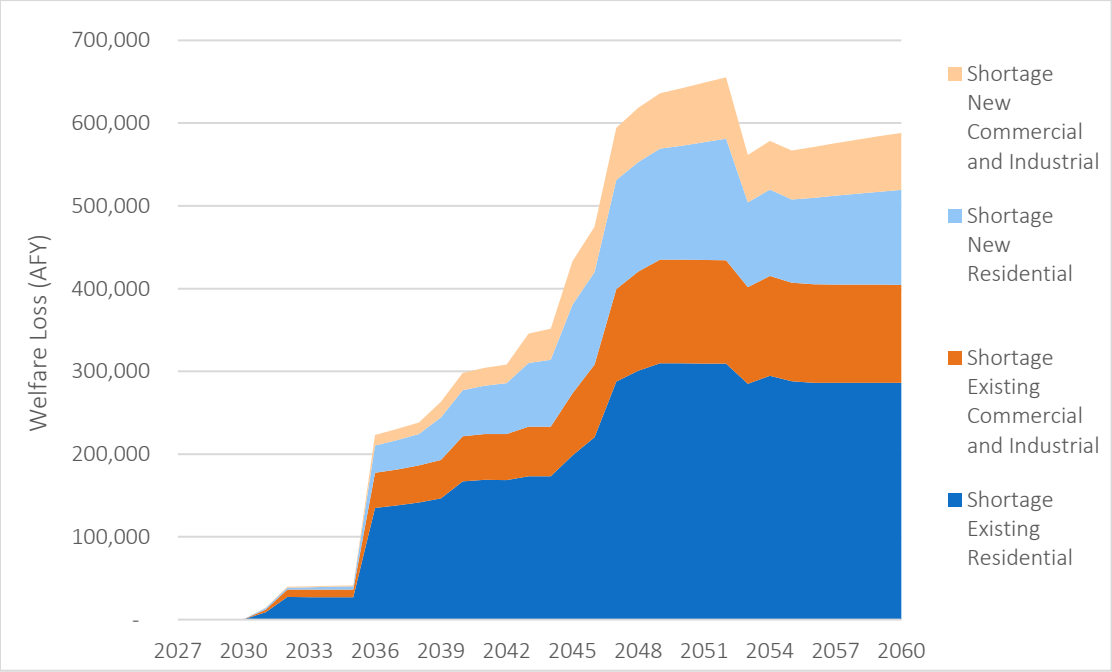
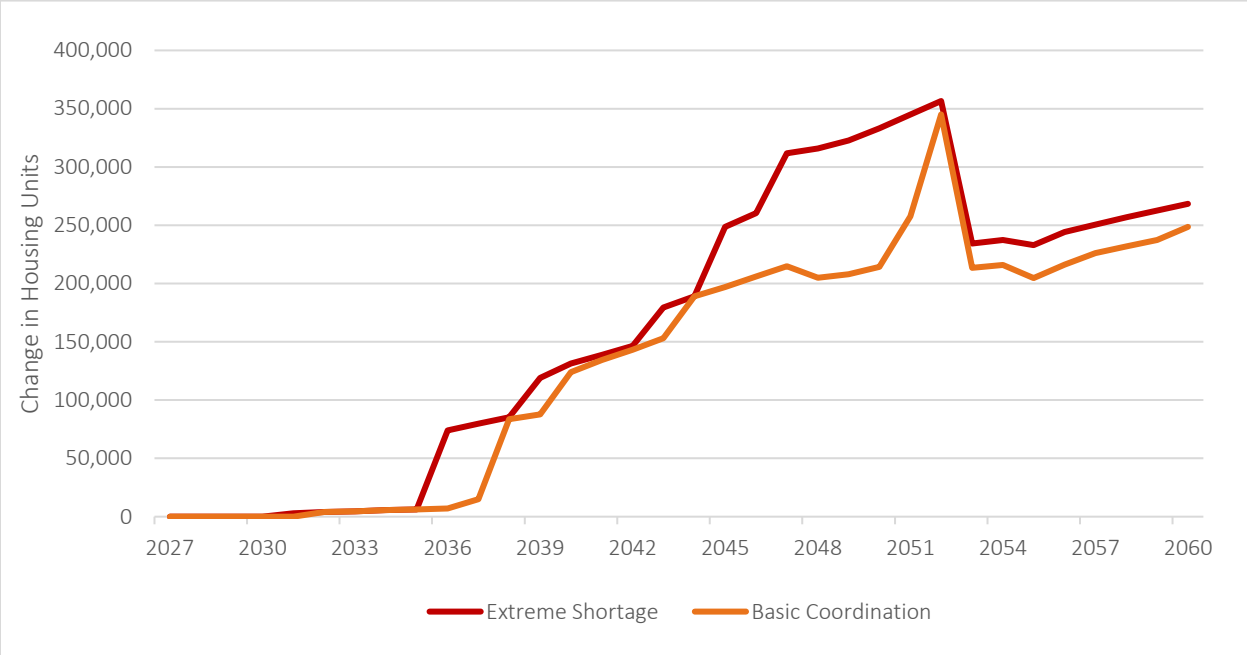


Figure 8 shows the annual number of housing units foregone due to insufficient water supply for new development. For each provider, the number of foregone units is calculated by taking the shortage volume allocated to new development, multiplying by the residential share of demand in each service area, 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.

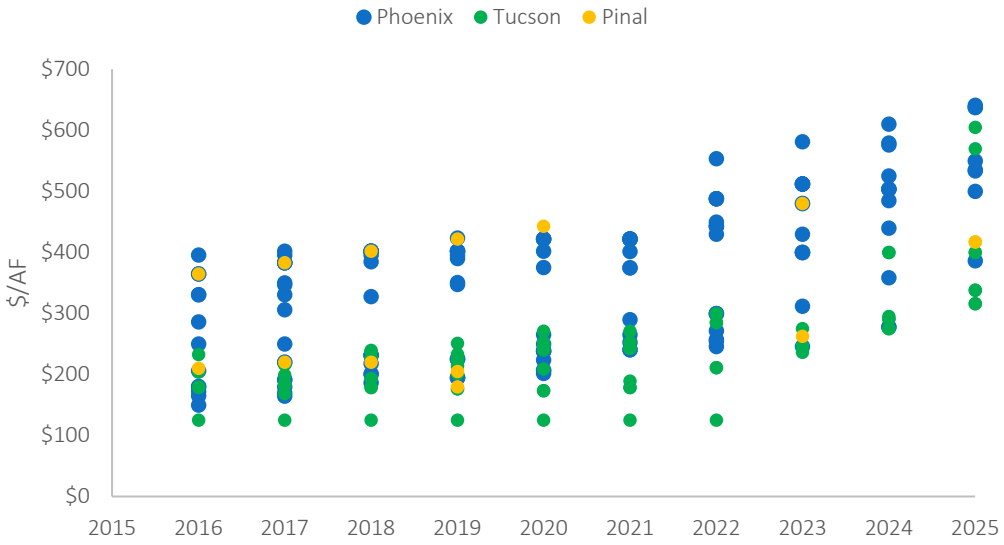
4.1. Overview of Arizona Water Market

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),

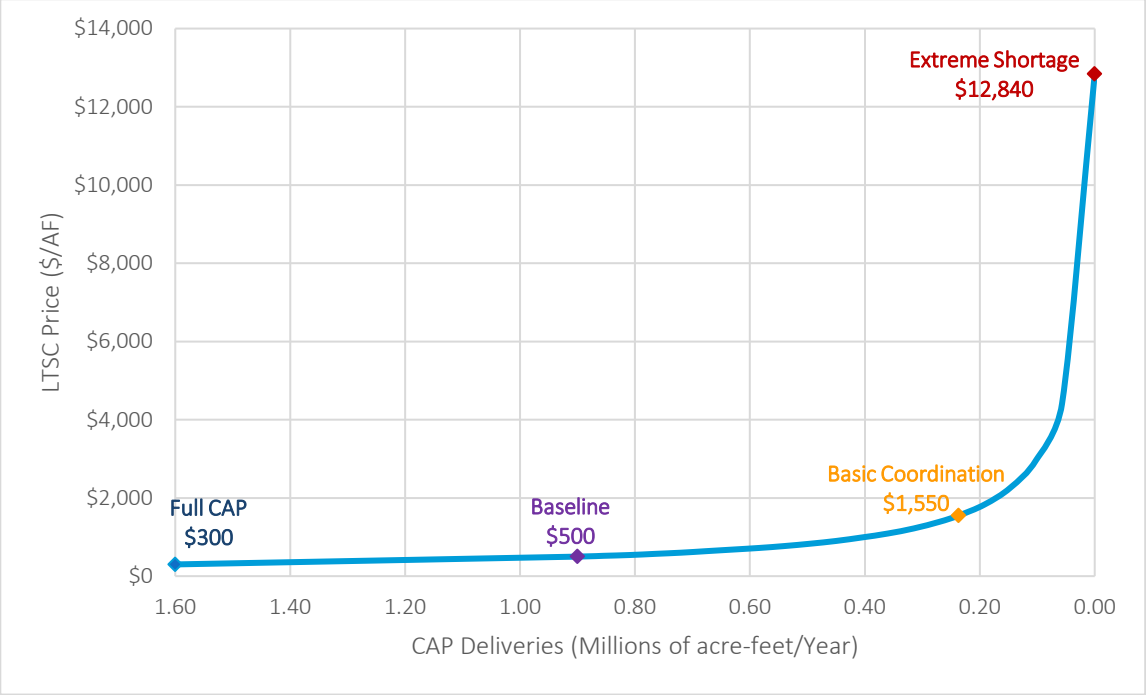
1. [14] CAP System Loss: Seepage & Evaporation = ~1.5% (or ~25,000 acre-feet) system loss from CAP canal. CAP website: **3 facts of CAP efficiency: seepage and evaporation.**

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.

[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)

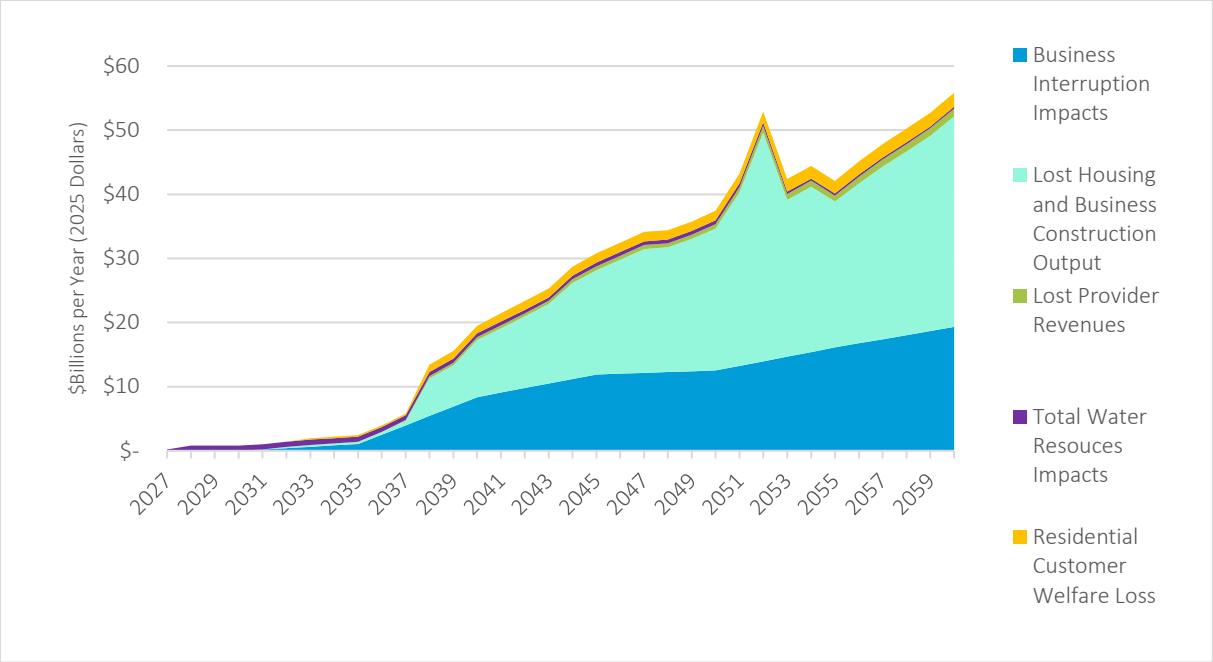


Figure 12: Annual Direct Economic Impacts (Extreme Shortage)

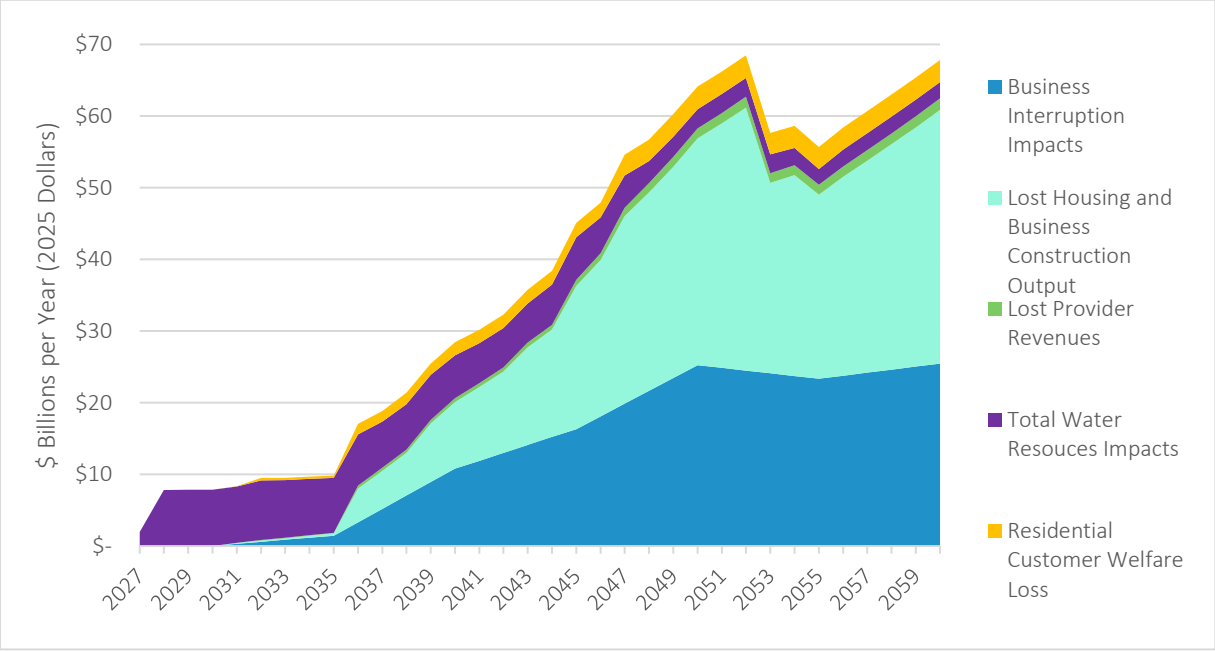


Table 4: Direct Economic Impacts

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

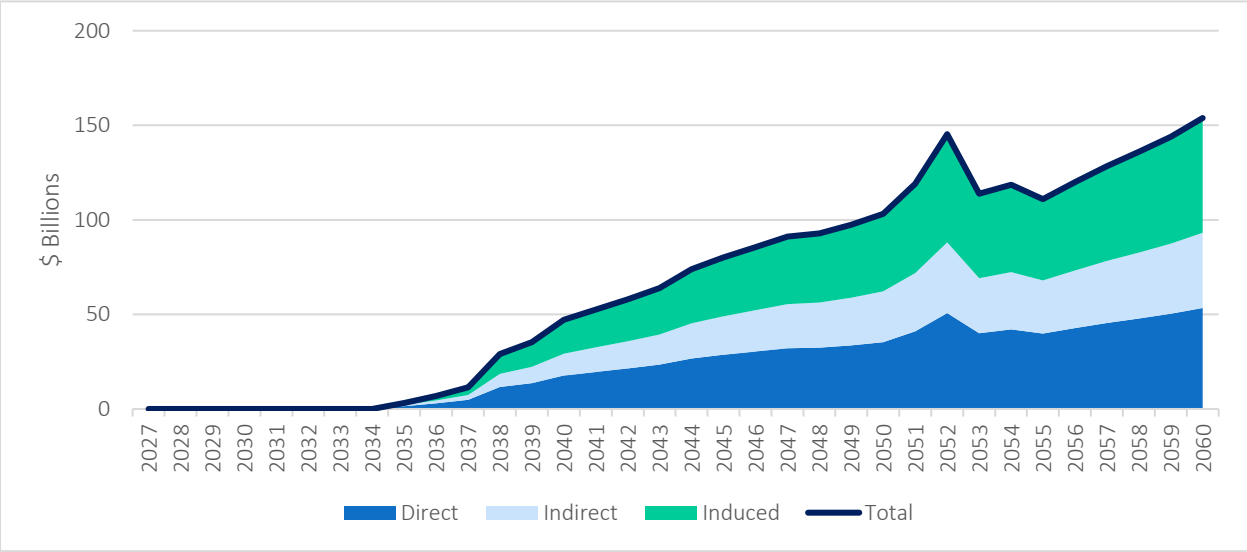
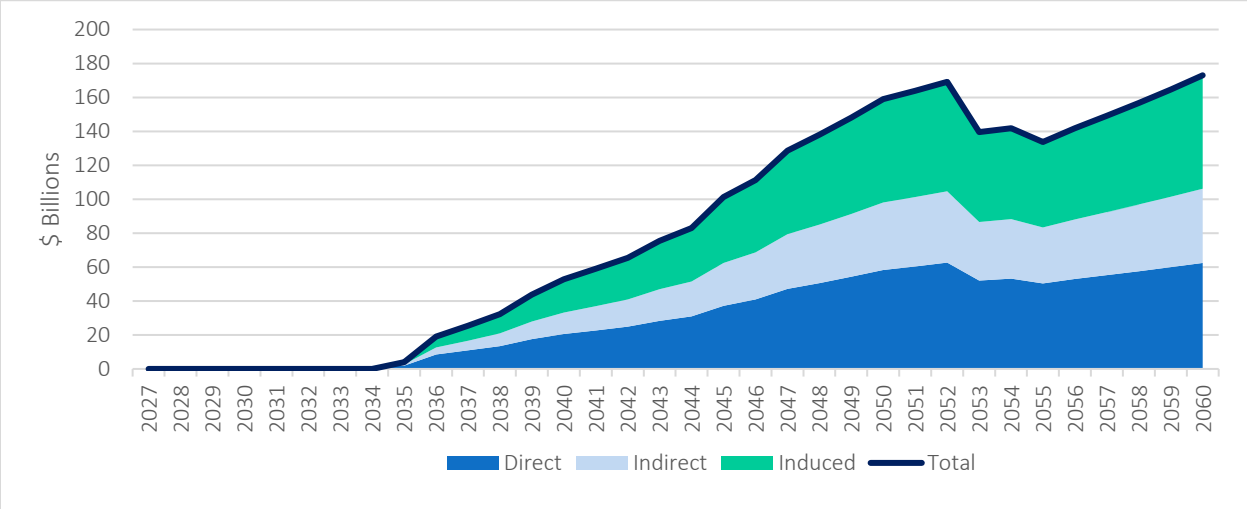


Figure 14: Direct, Indirect and Induced Economic Impacts of a reduction in CAP Deliveries Under Extreme Shortage Scenario



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.

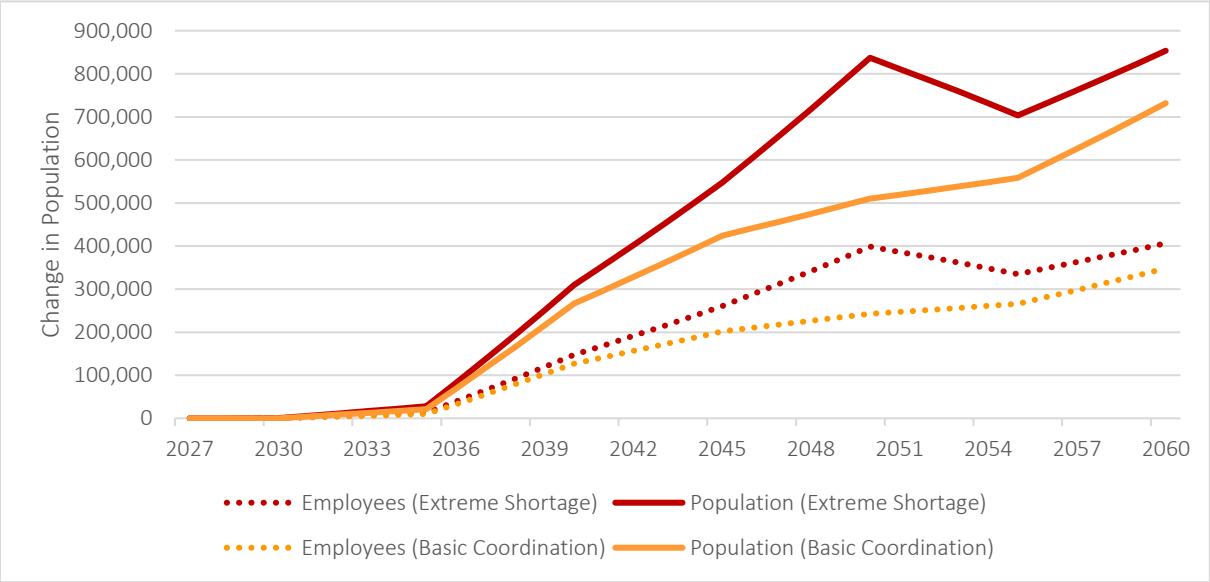
Foregone housing is estimated separately from the IMPLAN model based on the volume of water shortage allocated to new residential demand in the water supply model, rather than derived from IMPLAN. By 2060, under Basic Coordination, foregone housing totals 248,558 units annually, with 4.60 million units 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

[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.

EXHIBIT 14

to

Central Arizona Project Comments on Draft EIS for Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead

JRP Historical Consulting LLC

February 25, 2026

TO: Jay M. Johnson, General Counsel | Central Arizona Water Conservation District

FROM: Scott A. Miltenberger, Ph.D., Principal Historian
Heather K. Norby, M.A., Senior Historian

RE: Upper Basin Compact and CRSP Historical Questions

At your request and direction, JRP Historical Consulting, LLC ("JRP") prepared this memorandum report in response to three historical questions concerning the 1948 Upper Colorado River Basin Compact ("Upper Basin Compact") and the Colorado River Storage Project ("CRSP"):

1. In negotiating the Upper Basin Compact, how did Colorado, New Mexico, Utah, and Wyoming conceive of their responsibility for flows at Lee Ferry under the terms of the 1922 Colorado River Compact ("1922 Compact")?

2. What was the intent of CRSP (authorized in the 1956 Colorado River Storage Project Act, "CRSPA," Public Law 485, chapter 203, 70 Stat. 105) and how was it related to the Upper Basin Compact?

3. What is the origin and intent of Section 14 of CRSPA?

JRP examined both secondary and primary sources, consistent with historical methodology, to address these questions. Scholarship on the Upper Basin Compact and CRSP was reviewed,[1] as

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[1] These works included: John Upton Terrell, *War for the Colorado River, Volume One: The California-Arizona Controversy* (Glendale, CA: The Arthur H. Clark Company, 1965), and *Volume Two: Above Lee's Ferry – the Upper Basin* (The Arthur H. Clark Company, 1966); Norris Hundley, Jr., *Water and the West: The Colorado River Compact and the Politics of Water in the American West*, 2nd ed. (Berkeley and Los Angeles: University of California Press, 2009 [1975]); Marc Reisner, *Cadillac Desert: The American West and Its Disappearing Water* (New York: Penguin, 1993 [1986]); Eric Kuhn and John Fleck, *Science Be Dammed: How Ignoring Inconvenient Science Drained the Colorado River* (Tucson: University of Arizona Press, 2019); and Eric Kuhn, Katherine H. Tara, and John Fleck, "A Horse Named 'Stream Depletion Theory': The History of the Negotiation of the Upper Colorado River Basin Compact," *Natural Resources Journal* 65:1 (Winter 2025): 69-121, available at: https://digitalrepository.unm.edu/nrj/vol65/iss1/5.

Publications on related aspects of the history of Colorado River Basin development were consulted as well. These included: Russell Martin, *A Story That Stands Like a Dam: Glen Canyon & the Struggle for the Soul of the West* (Salt Lake City: The University of Utah Press, 1989; reprint, 1999); Daniel Tyler, *The Last Water Hole in the West: The Colorado-Big Thompson Project and the Northern Colorado Water Conservancy District* (Niwot: University Press of Colorado, 1992); Mark W. T. Harvey, *A Symbol of Wilderness: Echo Park and the American Conservation Movement* (University of Washington Press, 2000); Daniel Tyler, *Silver Fox of the Rockies: Delphus E. Carpenter and Western Water Compacts* (Norman: University of Oklahoma Press, 2003); and

were documents from the National Archives Building in Washington, DC; the National Archives at College Park, Maryland; the National Archives at Denver, Colorado; the American Heritage Center at the University of Wyoming; the Wyoming State Archives; the University of Denver Special Collections; and the Colorado State Archives. The United States Serial Set and congressional hearing records, the "Colorado River Compact Collection" (online) of the Utah State Archives, and the papers of Royce J. Tipton, technical advisor to Colorado Upper Basin Compact Commission Judge Clifford J. Stone (1946-49); of Ival V. Goslin, UCRC Engineer-Secretary / Executive Director (1953-79); and of Clair Engle, US Representative (1943-1959, later Senator, 1959-1964) from California were also considered.

Analysis of this historical information revealed:

1. In negotiating a compact between 1946 and 1948 to apportion the 7.5 million acre-feet ("MAF") allocated by 1922 Compact Article III(a), the Upper Basin states[2] recognized a shared "obligation" (also referenced as a "duty") to ensure delivery of 75 MAF at Lee Ferry over a 10-year period pursuant to 1922 Compact Article III(d) – prior to expansion of their states' water development to full utilization of their 1922 Compact Article III(a) allocation. The obligation was to be fulfilled through the use of "main stem reservoirs" in the Upper Basin that would capture sufficient water for release to the Lower Basin to address a decadal drought comparable to 1931-1940 – otherwise, curtailment of Upper Basin use would be required to meet the Lee Ferry obligation.

2. Both the Upper Basin states and Reclamation intended CRSP to enable development of the Upper Basin's 1922 Compact Article III(a) allocation (through irrigation projects, identified as "Participating Projects") without compromising the Upper Basin's ability to meet the Lee Ferry 10-year obligation. To ensure the latter, CRSP contemplated regulating the river with "main stem reservoirs" (identified as "Units") and storing sufficient water below major Upper Basin points of use to satisfy the obligation. As authorized by CRSPA, Glen Canyon Dam was furthest downstream and planned to impound the greatest volume of water.

3. Section 14 of CRSPA originated with California attorney Northcutt Ely as "Amendment No. 5" to the first CRSP bill, and US Representative Clair Engle (D., CA) introduced an initial amendment based on Ely's proposal. The intent was to check the possibility of the Secretary

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Steven C. Schulte, *As Precious as Blood: The Western Slope in Colorado's Water Wars, 1900-1970* (University Press of Colorado, 2016).

Additionally, several of the themes, ideas, and facts presented in this memorandum report are discussed in Scott A. Miltenberger, Ph.D., "'We Have to Judge the Future by the Past': The 1931-40 Drought, the Upper Basin Compact, and the Colorado River Storage Project," *Arizona State Law Journal* 57:4 (Winter 2025): 1441-1480, available at https://arizonastatelawjournal.org/2026/02/18/we-have-to-judge-the-future-by-the-pastthe-1931-40-drought-the-upper-basincompact-and-the-colorado-river-storageproject/.

[2] Notwithstanding that a portion of Arizona lies within the Upper Basin (above Lee Ferry) and a portion of Utah lies within the Lower Basin (below Lee Ferry), throughout this memorandum report (and consistent with general usage), "Upper Basin" is used to denote "the States of the Upper Division" as identified in the 1922 Compact (Article II[c]): Colorado, New Mexico, Utah, and Wyoming.

of the Interior operating CRSP in a manner that would harm any Colorado River Basin state in contravention of the 1922 Compact – but particularly a Lower Basin state. Congress ultimately adopted a provision that directed the Secretary of the Interior to comply with "applicable provisions" of documents comprising the "Law of the River," permitted any basin state to "maintain an action in the Supreme Court" for the secretary's non-compliance in the "storage and release of water," and made possible the joining of the United States as a party to any such action. Lower Basin interests envisioned the 1922 Compact, the 1928 Boulder Canyon Project Act, the 1940 Boulder Canyon Project Adjustment Act, and the 1944 Mexican Treaty as providing the operational framework for the secretary to follow. In the wake of a revised CRSP bill introduced by US Representative Byron Rogers (D., CO), however, the Senate Interior and Insular Affairs Committee included the Upper Basin Compact among the compliance documents.

These points are discussed in greater detail in dedicated sections below, with citations to both primary and secondary sources (as appropriate).[3]

The Upper Basin's Lee Ferry Obligation

In negotiating the Upper Basin Compact between 1946 and 1948, Colorado, New Mexico, Utah, and Wyoming conceived of their responsibility for flows at Lee Ferry under the terms of the 1922 Compact as a shared "obligation" or "duty." The Upper Basin Compact commissioners recognized that the 1922 Compact "placed an obligation on the Upper Division States…to deliver specified quantities of water at Lee Ferry for the use of the Lower Basin."[4] Negotiations leading to the Upper Basin Compact indicate that this "joint obligation"[5] was to ensure delivery of 75 million acre-feet ("MAF") at Lee Ferry over a 10-year period (pursuant to 1922 Compact Article III[d]) – prior to the Upper Basin's full development of its 1922 Compact Article III(a) allocation. "Main stem reservoirs" in the Upper Basin, as conceived by Upper Basin Compact Commission, were intended to capture, store, and release sufficient water for the Lower Basin in service of the Lee Ferry obligation during a period of low basin inflow, such as between 1931 and 1940.[6]

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[3] Primary sources cited in the footnotes below are provided as exhibits along with this memorandum report. The exhibits, collated into 32 bookmarked PDF volumes, are identified in the footnotes by letters in brackets (e.g., "[EX. A]"). A tabular index cross-referencing the exhibits to volumes appears at the end of this memorandum. This index also appears at start of each volume, with the exhibits contained therein highlighted. Some exhibits are excerpted from longer documents, such as congressional hearing records, and some exhibits are split across volumes to accommodate file size limitations.

[4] Upper Colorado River Basin Compact Commission [hereafter UCRBCC], *Official Record*, volume I, *Record of Preliminary Governors' Meeting, and for Commission Meetings No. 1-5, inclusive*, "Foreword," ii [EX. A].

By the time of the Upper Basin Compact negotiations, those waters were to include a quantity guaranteed to Mexico under the 1944 treaty. Hundley, *Water and the West*, 296-297; and Kuhn and Fleck, *Science Be Dammed*, 116-125.

[5] UCRBCC, *Official Record*, vol. I, "Foreword," ii [EX. A].

[6] Kuhn, Tara, and Fleck likewise have pointed out the influence of this drought period on the Upper Basin Compact negotiations. See "A Horse Named 'Stream Depletion,'" 87, 89-90, 100, and 103-104. Their article addresses the Upper Basin Compact negotiations in detail.

Work toward an Upper Basin compact dated to the late 1920s, following congressional approval of the 1922 Compact in the Boulder Canyon Project Act.[7] It was not until June 1934, however, that the Upper Basin states took their first major step towards an Upper Basin compact and additional Colorado River development since ratification of the 1922 Compact. Representatives from the states, meeting with United States Bureau of Reclamation ("Reclamation") officials, agreed to each state pursuing their own projects for the waters of the Colorado River system, subject to an eventual compact amongst themselves. This agreement helped pave the way for congressional authorization of the trans-basin diversion Colorado-Big Thompson Project ("C-BT") for Colorado in 1937.[8] Throughout the 1930s, Colorado also pursued smaller federal and "'nonfederal' projects" on its Taylor, Los Pinos, and Arkansas rivers.[9]

What ultimately spurred the Upper Basin states to consummate a compact, as Breitenstein later recalled,[10] was the March 1946 report prepared jointly by Reclamation's Region III (now Lower Colorado River Region) and Region IV (now Upper Colorado River Region). The Boulder Canyon Project Act of 1928 ("BCPA"), which provided congressional ratification of the 1922 Compact and approved construction of Hoover Dam, as well as the Boulder Canyon Project Adjustment Act of

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[7] Hundley, *Water and the West*, 275-276.

In November 1929, Colorado's 1922 Compact commissioner Delph Carpenter prepared a "Preliminary Suggestion for an Upper Colorado River Compact" that became the basis of initial negotiations before the Upper Basin states reached an impasse. See [Delph Carpenter] "Preliminary Suggestion For An Upper Colorado River Compact, November, 1929 [EX. B]; "Preliminary Suggestion For An Upper Colorado River Compact," September 15, 1930 (C-4th) [EX. C]; and "Remarks in Re Preliminary Draft of Upper Colorado River Compact" (C-4th) (9-15-30) [EX. D]; ff. Upper Colorado River Commission, Upper Colorado River Compact, 1930, 1944-49, 1956, RG 0037, Box 11, Wyoming State Archives, Cheyenne [hereafter WYSA]; and Tyler, *Silver Fox of the Rockies*, 261-263. See also Kuhn and Fleck, *Science Be Dammed*, 141.

[8] This resolution was made along with others recommending terms for a future treaty with Mexico regarding the waters of the Colorado River, urging federal funding for additional studies of Colorado River development, and calling for Arizona to ratify the 1922 Compact before contracting for water from Boulder Dam (later known as Hoover Dam).

See Resolutions Adopted at a Conference of Representatives of the States of Colorado, New Mexico, Utah and Wyoming, and the Bureau of Reclamation, called by the Secretary of the Interior, at Denver, Colorado, on June 29 and 30, 1934 [hereafter Resolution Adopted at a Conference of Representatives, June 29 and 30, 1934] File code 711.1216M/834, Box 3970, Central Decimal Files, 1910-1963, Entry 1930-1939 [hereafter File code 711.1216M/834, Box 3970, CDF 1910-63, E1930-39] Records of the Department of State, RG 59, National Archives at College Park, Maryland [EX. E]; "Meeting 4 Upper Basin States Is Harmonious One," *Daily Press* (Montrose, Colorado), July 2, 1934 [EX. F]; "States of Upper Basin Offer Plan," *Daily Press*, July 3, 1934. ff. 032. - Colorado River. Settlement of Water Rights. Colorado River Compact. Upper Basin Allocation. 1930 Thru November 1938 [3 of 3], Entry 7 [hereafter ff. 032.- Colorado River…Upper Basin Allocation. 1930 Thru November 1938 [3 of 3], E7], Box 210, RG 115, National Archives at Denver, Colorado [hereafter NARA D] [EX. G].

[9] Hundley, *Water and the West*, 300; Tyler, *The Last Water Hole in the West*, 66-96; Schulte, *As Precious As Blood*, 53-65; and Kuhn and Fleck, *Science Be Dammed*, 109-112 and 141.

[10] Jean S. Breitenstein, Attorney for Colorado Water Conservation Board, "The Upper Colorado River Basin Compact," undated [ca. April 1949] [hereafter Breitenstein, "The Upper Colorado River Basin Compact" [ca. April 1949]], 3. ff. Upper Colorado River Commission - 47877, Box 47877. Natural Resources. Water Conservation Board - Administrative Files of Jean Breitenstein [hereafter ff. Upper Colorado River Commission - 47877, Box 47877, Breitenstein Admin Files], Colorado State Archives, Denver [hereafter COSA] [EX. H].

1940 ("BCPAA") had authorized investigations for the development of the Colorado River.[11] The resulting report, its substantiating materials, and a June 1946 transmittal letter from Acting Reclamation Commissioner William Warne to Secretary of the Interior Julius A. "Cap" Krug were bound as a single volume titled, *The Colorado River: "A Natural Menace Becomes a Natural Resource"* (colloquially known as "The Blue Book").[12] Congress subsequently released *The Colorado River* as House Document 419 in July 1947.[13]

The Regional Directors' report made several findings and recommendations key to the subsequent development of the Colorado River Basin. The report identified 100 potential projects in the Upper Basin and 34 potential projects in the Lower Basin but recognized "[t]he need for a determination of the rights of the respective States to deplete the flow of the Colorado River consistent with the Colorado River Compact and its associated documents…."[14] This determination was required before Reclamation could pursue authorization of any new projects in the Colorado River Basin, as the agency's studies indicated "there is not enough water available in the Colorado River system for full expansion of existing and authorized projects and for all potential projects outlined [therein]." Notably the report observed that there would be sufficient water for "within-basin projects or units of projects if no further exportation of water is made [i.e., from the Colorado River Basin]." It also raised the prospect "that the States may elect to forgo construction of some irrigation projects within the natural drainage basin in order to make water available for exportation," and pointed out that "some States may be unable to use their full amount [of apportioned water] unless part is exported."[15]

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[11] 42 Stat. 1065 (1928); and 643 Stat. 774 (1940).

[12] The bound volume has a different cover title and title page. The cover title is *The Colorado River: "A Natural Menace Becomes a Natural Resource" – A Comprehensive Department Report on the Development of Water Resources of the Colorado River Basin for Review Prior to Submission to the Congress* and the title page is *The Colorado River: "A Natural Menace Becomes a Natural Resource" – A Comprehensive Report on the Development of the Water Resources of the Colorado River Basin for Irrigation, Power Production, and Other Beneficial Uses in Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming* (March 1946). Congress carried only the title page forward when publishing the report as House Document 419, 80th Cong., 1st sess. July 1947. For a digitized version of the bound volume showing the original cover, see ff. 4 The Colorado River - A Natural Menace Becomes A National Resource - A Comprehensive Department Report on the Development of Water Resources of the Colorado River Basin for Review Prior to Submission to the Congress, Box 3, Series 13912 Office of the State Engineer Colorado River project records, Utah State Archives and Records Service, available at: https://images.archives.utah.gov/digital/collection/p17010coll70/id/8793/rec/1. Hereafter citations to this report refer to the congressionally published document, given as H. Doc. 419, *The Colorado River* (March 1946) [EX. I].

[13] Martin, *A Story That Stands Like a Dam*, 48-50; and Kuhn and Fleck, *Science Be Dammed*, 130-131; H. Doc. 419, *The Colorado River* (March 1946), 7 and 13 [EX. I].

[14] H. Doc. 419, *The Colorado River* (March 1946), 21 [EX. I].

[15] H. Doc. 419, *The Colorado River* (March 1946), 13–14 [EX. I].

Trans-basins diversions were discussed during Upper Basin Compact negotiations. Wyoming was especially concerned for the impact of such diversions in formulating a compact. In December 1946, in the midst of Upper Basin Compact negotiations, Wyoming State Engineer and Upper Basin Compact commissioner L. C. Bishop share with Bashore that the Wyoming delegate saw "that the practical solution of meeting the obligation at Lee Ferry [i.e., Article III(d) of the 1922 Compact] was to close all transmountain

Given this situation in the Colorado River Basin, the report made two principal recommendations. First, "[t]hat the States of the Colorado River Basin acting separately or jointly, recommend for construction . . . a group of projects, the stream-flow depletions of which will assuredly fall within the ultimate allocation of Colorado River water," and second, "[t]hat the States of the Colorado River Basin determine their respective rights to deplete the flow of the Colorado River consistent with the Colorado River Compact."[16] These recommendations galvanized the Upper Basin states to formulate a compact that would define each state's respective rights to utilize Colorado River water and establish the scope of the Upper Basin's obligation to the Lower Basin for its rights to that same water supply.[17]

The recent 1931-1940 drought in the Colorado River Basin informed the findings and recommendations of the March 1946 Regional Directors' Report. This drought was the most severe in the basin to date, and in fact 1934 would prove to be "the second driest year in the twentieth century."[18] Historical news coverage indicates that Southern California's Imperial Valley suffered especially from diminished Colorado River flows in 1934. In the early 1930s, Imperial Valley was almost wholly reliant on the river; Boulder (Hoover) Dam was under construction, and thus there was no stored water available upstream[19] and groundwater was little developed in the area at the time.[20] According to a report from the *Los Angeles Times* on July 15, 1934, officials with the Imperial Irrigation District were worried that the "Colorado River will be completely dry within ten days if it

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diversions until the obligation is meet." Bishop and his advisors believed that Reclamation should, in turn, "plan our reservoir system so it will never be necessary to close any diversions." See L. C. Bishop, State Engineer and Interstate Streams Commissioner for Wyoming, to Mr. Harry W. Bashore, Chairman, Upper Colo. R. Compact, December 27, 1946. ff. Upper Colorado River Commission, Correspondence, 1946, RG 0037, Box 1, State Engineer, Upper Colorado River Commission, General Correspondence, 1945-1954, WYSA [EX. J].

Before his fellow commissioners at the fifth meeting, Bishop identified "transmountain diversion[s]" as "the most troublesome item that confronts this Commission." He believed that Upper Basin advocacy for transmountain diversions during the 1922 Compact negotiations led to the Article III(d) requirement "a mistake that can well wreck the entire plan of the development of the Upper Basin unless we face the facts and keep the amount of water to be transported from the Basin within reasonable limits." He expressed Wyoming's willing to take "about 200,000 acre feet of water for transmountain diversion [*sic*] and we will sign on the dotted line to scale ours down to take care of the obligation at Lee Ferry…it is our position that it is morally wrong to take water from a basin which is needed within that basin…." UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, 26-27 [EX. K]. No such provision or any provision relating to transmountain or trans-basin diversions, however, was adopted in the Upper Basin Compact.

[16] H. Doc. 419, *The Colorado River* (March 1946), 21 [EX. I].

[17] By contrast, in the late 1940s, Lower Basin states of Arizona and California were moving toward an interstate adjudication that would culminate in the landmark decision in *Arizona v. California*, 373 US 546 (1963) that shaped Lower Basin water administration. See Hundley, *Water and the West*, 299-306; and Kuhn and Fleck, *Science Be Dammed*, 157-168.

[18] Kuhn and Fleck, *Science Be Dammed*, 108-109.

[19] Boulder Dam would begin filling in 1935 but would not be completed until 1936.

[20] "Colorado River Flow for 1934 Sets All-Time Low," *Los Angeles Times*, January 12, 1935 [EX. L]. According to the *Nevada State Journal*, the 1934 Colorado River flow was "4,372,200 acre feet compared to a normal of approximately 16,000,000" – "a 75 per cent drop." See "Colorado's Flow Is 75% Below Normal," *Nevada State Journal*, January 11, 1935 [EX. M].

continued to drop at its present alarming rate."[21] Domestic water was being trucked in that same month because of the lack of supply.[22]

Water supply conditions began improving in 1935. River flows rebounded that year, and Hoover Dam began filling (prior to its full completion), promising more regularity in deliveries to Imperial Valley lands in the near future.[23] Parker Dam, a diversion for the Metropolitan Water District of Southern California to bring domestic water to growing communities, was also under construction by Reclamation and would be completed in three years.[24]

In his 1936 analysis of the "Drought of 1934," United States Geological Survey hydrologist John Hoyt attributed the "extremely low run-off of the Colorado River" that impacted the Imperial Valley "to drought conditions in the upper basin States."[25] The Upper Basin states nevertheless had yet to develop the Colorado River as the Imperial Valley had. Both Reclamation and Upper Basin engineers later assessed Upper Basin use of the waters of the Colorado River system as approximately 2 MAF between 1914 and 1945.[26] As noted above (and addressed further below), the authorization of C-BT notwithstanding, Upper Basin development of the Colorado River waters was modest.

Any potential long-term impacts to lands and communities in Southern California as a result of the drought of the 1930s were thus blunted by the fact that the average flows passing Lee Ferry (the 1922 Compact point of measurement between the Upper and Lower basins) exceeded the Lower Basin's 7.5 MAF 1922 Compact allocation (Article III[a]) during most years between 1931 and 1940. As depicted in **Figure 1**, a 1949 Reclamation analysis of the period determined that an average of

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[21] "Dry Colorado River Looming," *Los Angeles Times*, July 15, 1934 [EX. N].
[22] "Water Shipped Into Imperial," *Los Angeles Times*, July 11, 1934 [EX. O].
[23] "Boulder Lake Now Reality; Water Stored," *Nevada State Journal*, February 5, 1935 [EX. P].

Later Reclamation assessment found that approximately 9.5 MAF reached Lee Ferry in 1935. See "Colorado River Storage Project, River Flow at Lee Ferry," in United States Department of the Interior, Bureau of Reclamation, Region 4, Salt Lake City, Utah, "Interim Report: Colorado River Storage Project and Participating Projects, States of the Upper Division, Upper Colorado River Basin," March 1949 [hereafter Region 4, "Interim Report," March 1949], Substantiating Report, facing 31. ff. 21, Box 21, Papers of Mark W.T. Harvey [hereafter Harvey Papers], Colorado State University, Fort Collins, Libraries, Archives, and Special Collections [hereafter CSUFC] [EX. Q].

[24] Terrell, *War for the Colorado River*, *Volume One*, 26; US Department of the Interior, Water and Power Resources Service [US Bureau of Reclamation], *Project Data*, *1981* (GPO, 1981) [hereafter *Project Data*, *1981*], 770, [EX. R]; and Hundley, *Water and the West*, 294 and 300.

[25] Hoyt, *Droughts of 1930-34*, USGS WSP 680 (GPO, 1936), 46 [EX. S].

See also Region 4, "Interim Report," March 1949, Substantiating Report, 14 ff. 21, Box 21, Harvey Papers, CSUFC [EX. Q].

[26] H. Doc. 419, *The Colorado River* (March 1946), 151 [EX. I]; and Memorandum, Engineering Advisory Committee, To Upper Colorado River Basin Compact Commission, July 7, 1948, Vernal, Utah, 6-7 [hereafter Engineering Advisory Committee Memorandum, July 7, 1948]. ff. Upper Colorado River Commission, Upper Colorado River Compact, 1930, 1944-49, 1956, RG 0037, Box 11, State Engineer, Upper Colorado River Commission, Hearings, Compacts, Litigation, Green River, Adjudication, Media Presentations, Hoover Dam Flood Control [hereafter ff. Upper Colorado River Commission, Upper Colorado River Compact, 1930, 1944-49, 1956, RG 0037, Box 11], WYSA [EX. T].

10,151,00 AF ("Historical Flow") reached Lee Ferry during this decade – exceeding the 75 MAF over 10 years identified in the 1922 Compact (Article III[d]).[27]

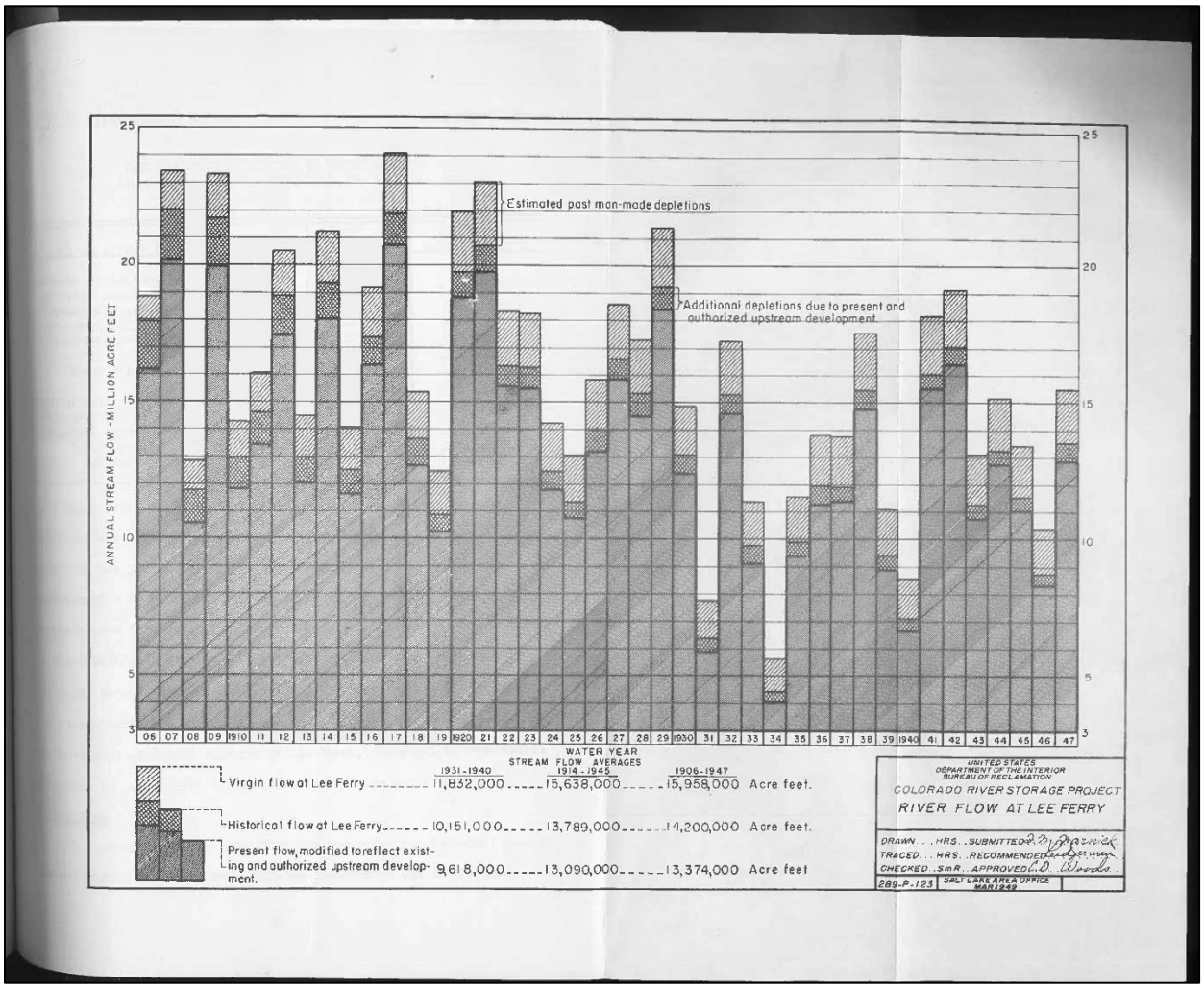


Figure 1. Reclamation Graph of "River Flow at Lee Ferry," prepared March 1949.

While the Lower Basin received more water than required by the 1922 Compact during the 1930s, the drought revealed that the Upper Basin would not have sufficient water for its own future full development under the 1922 Compact. As Reclamation engineer and the chair of the Upper Basin Compact's Engineering Advisory Committee J. R. "Randy" Riter later pointed to the Upper Basin Compact commissioners that "during a low ten-year period" like 1931-1940, to meet the Lower Basin's "bottom right…to 7,500,000 acre feet" and release sufficient water "for the benefit of the Mexican Treaty," the Upper Basin would have "something less than 5,000,000 acre feet for

[27] Region 4, "Interim Report," March 1949, Substantiating Report, facing 31. ff. 21, Box 21, Harvey Papers, CSUFC [EX. Q].

use…probably 4,000,000 acre feet."[28] This figure was a little more than half the 7.5 MAF 1922 Compact Article III(a) allocation.

Riter's own knowledge of the ramifications of this decadal dry cycle appears to date back to the fall of 1940. In an October 1940 internal Reclamation memorandum assessing Colorado River power possibilities and operations of Lake Mead, the engineer noted that "generally low run-off…has prevailed since 1934."[29] More importantly, as he later acknowledged to Ival Goslin, the Engineer-Secretary for the Upper Colorado River Commission in 1959, Riter's analysis of this data indicated that by 1988 "the minimum 10-year inflow" at Lee Ferry would be less than the 75 MAF obligated to the Lower Basin by the 1922 Compact (Article III[d]). "It was the awareness of that situation," Riter wrote Goslin, "that prompted me to realize the necessity for holdover storage capacity in the Upper Basin to permit the Upper Basin to meet its Compact obligation at Lee Ferry and to concurrently utilize water allocated to it under the terms of the Compact."[30]

In his role as the Acting Director of Project Planning for Reclamation, Riter communicated his "awareness of the situation" posed by the 1931-1940 period of record to Reclamation Commissioner Harry Bashore (later the federal chair to the Upper Basin Compact Commission) in an April 1944 memorandum. Noting the potential impact to developments downstream of Lee Ferry as a consequence of 1931-1940 stream flows the engineer "assumed that holdover storage would be provided above Lees Ferry to permit an ultimate average annual depletion of 7,500,000 acre-feet in the upper basin and also insure an average annual flow of 7,500,000 acre-feet at Lees Ferry in the 10-year critical period 1931 to 1940, inclusive."[31]

By 1944, Reclamation was using the 1931-1940 period as a "yardstick in measuring the water supply available for individual projects" – in both the Upper and Lower basins. "In other words," Riter informed Upper and Lower basin representatives during a presentation on Reclamation's progress in investigating further developments in July 1944, "new projects that must be developed would have to live through this drought period in order to be sound."[32] "[I]f the Upper Basin is going to realize the use of 7,500,000 acre feet of water," the engineer told the Upper Basin Compact commissioners when they met three years later, "some schemes have got to be devised so that

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[28] UCRBCC *Official Record*, vol. II, *Record of Commission Meetings No. 6-11, inclusive*, "Meeting No. 6," Denver, Colorado, February 17, 1948, 48 [EX. U].

[29] Memorandum to Hydraulic Engineer (J. R. Riter), Subject: Power possibilities at Boulder Dam – Boulder Canyon Project, October 25, 1940, 8, in J.R. Riter's Memorandum Power Possibilities at Boulder Dam, Boulder Canyon Project, October 25, 1940. ff. 4, Box 51, Goslin Collection, CSUFC [EX. V].

[30] Riter to Goslin, November 10, 1959, in J.R. Riter's Memorandum Power Possibilities at Boulder Dam, Boulder Canyon Project, October 25, 1940. ff. 4, Box 51, Goslin Collection, CSUFC [EX. V].

[31] John R. Riter, Air Mail, From: Acting Director, To: Commissioner, Subject: Total depletions above Lees Ferry under 1988 conditions – Upper Colorado River Basin, April 12, 1944, 2. ff. 69263, Entry 97-565, Box 17, PRPC 1943-49, RG 115, NARA D [EX. W].

"Lees Ferry" and "Lee Ferry" denote the same division point identified in the 1922 Compact. The terms were often used interchangeably in the early 20th century, particularly during the negotiations of the 1922 Compact as Hundley has noted. See Hundley, *Water and the West*, 192, fn 52.

[32] *Proceedings of the Committees of Fourteen and Sixteen…Meeting Held November 10 and 11, 1944, Denver*, 13. ff. CRB 3/3, Box 3, RG 115, NARA D [EX. X].

water will be available to us [i.e., the Upper Basin states] and still meet the obligation at Lee Ferry."[33] In approaching a compact, the Upper Basin states would come to understand that in order to fully develop and utilize their 1922 Compact allocation they needed physical storage solutions to ensure they could make future deliveries to Lee Ferry (pursuant to the Article III[d] of the 1922 Compact) under drought conditions at least comparable to 1931-1940.

Upper Basin Compact talks were initiated at a July 1946 meeting of the Upper Basin state governors in Cheyenne, Wyoming. The Upper Colorado River Basin Compact Commission itself would assemble eight times between July 1946 and October 1948 before agreeing to a final Upper Basin Compact in Santa Fe, New Mexico. The compact was signed into law in April 1949,[34] but the commission held "Post-Compact Meetings" in December 1948, February 1949, and August 1949 before formally adjourning with the organization of the Upper Colorado River Commission (UCRC) that oversees Upper Basin Compact administration today.[35] At the final meeting, the commission adopted its "Inflow-Outflow Manual," the method of calculating its use as prescribed by Article VI of the Upper Basin Compact.[36]

"[T]wo "primary problems" confronted the Upper Basin Compact commissioners, as articulated by Utah State Engineer and Upper Basin Compact commissioner Edward Watson in December 1947: "(1) to divide the water equitably [among the Upper Basin States], and (2) allocate the obligation at Lee Ferry."[37] The recent 1931-1940 dry cycle in the Colorado River Basin, which demonstrated that the available water supply from the Colorado River could be lower than previously thought, complicated resolution of these "primary problems." Yet the experience of that period also provided a context for the solutions articulated and embraced by the Upper Basin Compact.

Among those solutions was the necessity for holdover storage as recognized by Riter and communicated to the Upper Basin Compact commission. Such physical works were critical because in the view of Judge Clifford Stone, State jurist, first president of the Colorado Water Conservation Board ("CWCB") and Colorado's Upper Basin Compact commissioner, future drought conditions could not absolve the Upper Basin of its obligation to the Lower Basin. Stone doubted that an "unprecedented drought" would be a sufficient excuse for the Upper Basin states individually to fail to deliver water at Lee Ferry. He opined to his fellow commissioners at the fifth meeting: "I would assume that the defense of drought would not be a complete defense….We can't control Mother

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[33] UCRBCC *Official Record*, vol. I, "Meeting No. 3," Rock Springs, Wyoming, October 28, 1946, 32 [EX. Y].
[34] 63 Stat. 31 (1949) [EX. Z].
[35] UCRBCC *Official Record*, vol. I, Foreword, i-ii and "Explanatory Note" [EX. A].
[36] John R. Riter, Chairman, Engineering Advisory Committee, Upper Colorado River Basin Compact Commission to H.W. Bashore, Chairman, Upper Colorado River Basin Compact Commission, August 19, 1949, transmitting the first copy of the "Inflow-Outflow Manual." ff. Upper Colorado River Compact Commission Inflow-Outflow Manual 1949 August, Box 48, Harry W. Bashore Papers 2783, American Heritage Center [hereafter AHC] [EX. AA]. See also Kuhn, Tara, and Fleck "A Horse Named 'Stream Depletion,'" 83-101, 103-113, and 118-120.
[37] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 4, 1947, 129 [EX. K].

Nature. Neither can we go back and revamp the Colorado River Compact. The Colorado River Compact does make it a joint and several obligation...."[38]

Meeting that "joint and several obligation," determining how to ensure reliable deliveries to the Lower Basin under the 1922 Compact, was essential prior to making any apportioning of the remaining water. As Breitenstein later observed about the Upper Basin Compact negotiations:

> while the 1922 Compact by its paragraph III (a) apportions to the Upper Basin the beneficial consumptive use of 7,500,000 acre-feet annually, such use is subject to the availability of water. The States of the Upper Division [i.e., the Upper Basin] are required by the 1922 Compact to maintain certain flows at Lee Ferry. The water available for use [i.e., by the Upper Basin] is that remaining after the Lee Ferry delivery requirements are satisfied.[39]

Acknowledgment that the Upper Basin Compact commissioners were not going "to revamp the [1922] Compact" (in Stone's words) applied both to their recognition of the Lee Ferry obligation and to their understanding of their rights to develop fully waters allocated to them by the 1922 Compact.[40]

Stone was the first to call attention to "the obligation" imposed on the Upper Basin "to make deliveries to Lee Ferry" at the preliminary meeting of the Upper Basin state governors in July 1946.[41] When the commissioners themselves convened to initiate compact negotiations that same month, in the midst of discussion of how they might apportion the 7.5 MAF allocated to the Upper Basin by the 1922 Compact's Article III(a), he reminded them, "We are not concerned here solely with the question of dividing the water." "These states [i.e., Colorado, New Mexico, Utah, and Wyoming]," Stone maintained, "have assumed an obligation in the Colorado River Compact to deliver a specified amount at Lee Ferry, and that is going to be a very important phase of these negotiations.[42]

Noting the importance of the Lee Ferry delivery obligation in the face of drought periods, the Upper Basin commissioners and their advisors further conceded over the course of their meetings that Upper Basin use could be curtailed to ensure compliance with the 1922 Compact as well as the 1944 Mexican Treaty. Charles L. Patterson, the CWCB engineer and one of Colorado's engineering advisors, for instance, observed that the states could very well apportion their 1922 Compact Article III(a) waters but "when you consider the delivery obligation along with it you may finally conclude that it won't be possible for you collectively to reach that amount...."[43]

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[38] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, 110 [EX. K].
[39] Breitenstein, "The Upper Colorado River Basin Compact" [ca. April 1949], 8. ff. Upper Colorado River Commission - 47877, Box 47877, Breitenstein Admin Files, COSA [EX. H]. See also footnote 65 below.
[40] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, 110 [EX. K].
[41] UCRBCC *Official Record*, vol. I, "Governors' Conference in Re Colorado River Compact, held in The House of Representatives, Capitol Building, Cheyenne, Wyoming, on Monday, July 22, 1946," 8 [EX. AB].
[42] UCRBCC *Official Record*, vol. I, "Meeting No. 1," Salt Lake City, Utah, July 31, 1946, 33 [EX. AC].
[43] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 2, 1947, 79 [EX. K].

Breitenstein, for his part, in discussing how the states might apportion both "consumptive use of water and the division of the obligation to maintain the minimum flows at Lee Ferry," the Colorado legal advisor suggested that "curtailment" of Upper Basin water use – or at least by individual Upper Basin states' projects – would only come into play in the event of diminished Lee Ferry flows: "…there should be no question of curtailment arise [*sic*] unless there is a deficiency at Lee Ferry…."[44] Moreover, he insisted that "no state should be called upon to shut down any of its uses to supply a deficiency unless the main stem reservoirs have failed in the test."[45] "To me," Breitenstein went on,

> it is more than just saying that each state has so much water in a reservoir and that is released to satisfy the share of the state. The state has got to get the water down to the main stream reservoirs and if they fail, it has an obligation to reduce its uses so the deficiencies are met.[46]

The Colorado attorney was of the view, given "that the obligation under the Colorado River Compact is a joint and several obligation," that in the event of "a default" the Lower Basin states could "go after all the [Upper Basin] states or one of the [Upper Basin] states to make up that default."[47]

Other advisors and commissioners largely concurred and urged that satisfaction of the Lee Ferry and Mexican obligations, particularly during times of drought, be met by reservoirs and be widely distributed among the Upper Basin states if stored water proved insufficient. Viewing the Upper Basin's obligation more as a "duty," Utah jurist and legal advisor Judge J. A. Howell called upon the commissioners:

> to first of all establish it as a principle that this River should be so regulated that the obligation make up any deficit will be minimized to the greatest extent. What I mean by that is that the long-term storage facilities and whatever else may be done from an engineering point of view, which I wouldn't want to enter into, should be undertaken as a part of the plan so that the possibility of any deficit will be minimized to the very greatest extent, understanding however, all that may be done there still may be the possibility of a deficit.[48]

The Upper Basin states thus made "reservoir operation studies" a central task for the Engineering Advisory Committee during the Upper Basin Compact negotiations. As Riter informed the commissioners at the second meeting, the technical advisors supported building "reservoirs…so

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[44] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 1, 1947, Afternoon Meeting, 77 [EX. K].
[45] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 2, 1947, Afternoon Session, 101 [EX. K].
[46] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 2, 1947, Afternoon Session, 102 [EX. K].
[47] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, Afternoon Session, 109 [EX. K].
[48] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, Afternoon Session, 111 [EX. K].

that we can store water in years of plentiful runoff and release it in drought periods, to avoid depleting of the flow at Lee Ferry below the [1922] Compact requirements."[49]

Upper Basin Compact engineering advisors, such as Riter and Patterson, conceptualized holdover storage reservoirs on the main stem of the Colorado River and its major tributaries as the physical solution for meeting the Lee Ferry obligation and thus eventually allowing Upper Basin full development of the 7.5 MAF allotted by the 1922 Compact (Article III[a]) – even during a period of drought like 1931-1940. "In order to beneficially consume as much as possible all of the water allocated to the Upper Basin and still meet the Lee Ferry obligation of not depleting the flow at Lee Ferry in a low ten-year period such as from 1931 to 1940 inclusive," Riter told the commission, "it becomes necessary to consider main stem storage."[50]

Water stored in reservoirs generally located downstream from most Upper Basin irrigation projects was intended to be released to meet the Lee Ferry obligation during low-water years, preserving inflows of headwaters for use by the Upper Basin's own diversion projects. As Patterson opined, the "purpose" of building reservoirs was "instead of shutting off projects, we are going to rely on these reservoirs to make good on the obligations at Lee Ferry."[51] Operationally, he envisioned releases of holdover storage water from the reservoirs as occurring in a future eleventh hour – at the end of a ninth year of drought to prevent missing the 1922 Compact Article III(d) obligation to deliver 75 MAF to the Lower Basin in a 10-year period.[52]

The "concept of holdover reservoirs," furthermore – as Riter explained when questioned by H. Melvin Rollins, Wyoming's Assistant Interstate Streams Commissioner, as to whether "sufficient water can be stored to take care of our [i.e., the Upper Basin's] obligation" – was not limited to meeting a comparable set of flow conditions as 1931-1940 "just…once." The federal engineer could not be sure whether there would not be "a lower ten-year period" in the future than 1931-1940. He nevertheless believed that sufficient water could be stored to meet such conditions. More to the point, Riter believed that the contemplated reservoirs

> must be planned so they can be filled with the ultimate development you [i.e., the Upper Basin] plan to make. In other words, I don't envision these holdover reservoirs as just emptying them once. I envision after they are emptied they have got to be refilled again to prepare for another drought cycle…. I have in mind a cyclic operation following complete development.[53]

Arizona commissioner Charles A. Carson, for one, did not agree "that the obligation of the Upper Basin to deliver water at Lee Ferry is discharged when 75,000,000-acre feet every ten years is

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[49] UCRBCC *Official Record*, vol. I, "Meeting No. 2," Santa Fe, New Mexico, September 17, 1946, 9 [EX. AD]. See also Kuhn, Tara, and Fleck, "A Horse Named 'Stream Depletion,'" 87.
[50] UCRBCC *Official Record*, vol. I, "Meeting No. 2," Santa Fe, New Mexico, September 17, 1946, 9 [EX. AD].
[51] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 1, 1947, Afternoon Meeting, 30 [EX. K].
[52] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 2, 1947, 78 [EX. K].
[53] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 2, 1947, Afternoon Session, 102-103 [EX. K].

delivered" but he saw reservoirs as enabling both Upper and Lower basins as well as Mexico to make use of their apportioned waters. He thought with "main stem storage reservoirs," "that would accumulate water over and above that 7,500,000 acre-foot depletion in wet years for delivery to the Lower Basin and Mexico in dry years," the Upper Basin would be able to utilize its allocated 7.5 MAF "which is their right…."[54]

Reclamation Region IV Director E. O. Larson – regional director in the Upper Colorado River Region during the preparation of the March 1946 basin-wide study and the later 1950 CRSP report (discussed below) – envisioned "a pool of reservoirs" providing the necessary storage. Invited to address the commission by Carson, Larson projected storing as much as 35 MAF, or "a capacity sufficient to store the entire flow of the Colorado River above Lee Ferry over and above releases made to meet the Compact, Mexican Treaty, or other requirements." Region IV had developed "three general plans of operating a pool of main stem reservoir…starting at the lower end of the River beginning with Glen Canyon and going upstream as far as the Kendall on the Green and the reservoir on the Gunnison River in Colorado." These were all sites at which "reservoirs with a fairly good size" could be developed, "with the lowest evaporation and the greatest power head" yet would also provide "stream regulation to equate the stream…."[55]

Careful reservoir management was essential to this effort. Larson stressed the need "to operate the reservoirs very conservatively" to assure meeting the Lee Ferry obligation.[56] Upper Basin Compact Commission chair Harry Bashore similarly supported "maximum holdover" because of the potential for "variation" in the Colorado River.[57]

An Engineering Advisory Committee memorandum, presented at the July 1948 Vernal, Utah meeting and which formed the basis for the committee's final report in November 1948, recommended "main stem reservoir[s]" as a centerpiece of an Upper Basin Compact.[58] The committee acknowledged that "[t]he flow of the Colorado River is not uniform but varies from year to year." The lowest known year was 1934, during the 1931-1940 period, when the flow at Lee Ferry was approximately 4.4 MAF; the greatest year was 21.9 MAF in 1917. For 1931-1940, the engineers calculated that the average annual flow at Lee Ferry was 10,151,000 AF. In their analysis, without "replacement reservoirs" the Upper Basin's use of 1922 Compact Article III(a) water would be limited to 4.3 MAF (as Riter had warned). This was an amount that was far more than the basin

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[54] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, 114-116 [EX. K]. Neither Stone nor Watson concurred with Carson's characterization of the Upper Basin's 1922 Compact Article III(d) obligation. See UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, 115-116 [EX. K].
[55] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, 116 [EX. K].
[56] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, 118 [EX. K].
[57] UCRBCC *Official Record*, vol. I, "Meeting No. 5," Denver, Colorado, December 3, 1947, 119 [EX. K].
[58] Engineering Advisory Committee Memorandum, July 7, 1948, 8. ff. Upper Colorado River Commission, Upper Colorado River Compact, 1930, 1944-49, 1956, RG 0037, Box 11, WYSA [EX. T]; See also Kuhn, Tara, and Fleck, "A Horse Named 'Stream Depletion,'" 103-104, and 106.

was annually using in the 1930s (as noted above)[59] but less than the 1922 Compact allocation (Article III[a]). "To permit full use of the Upper Basin allocation of 7,500,000 acre-feet annually during drought cycles," the Engineering Advisory Committee concluded, "holdover reservoirs must be constructed in the Upper Colorado River Basin to impound water in years of high runoff and to release such stored water in critical periods of low runoff, such as 1931-40, to help meet the Upper Basin obligation at Lee Ferry."[60] "Operation studies…assuming that all holdover storage would be provided at the Glen Canyon reservoir site on the Colorado River" indicated that "storage capacity of 34,200,000 acre-feet (live capacity 29,200,00 acre-feet) [to accommodate "power head and sediment," and consistent with the studies made by Larson's Region IV]" would be sufficient.[61]

As noted above, satisfaction of the Lee Ferry obligation went hand-in-hand with divvying up the waters apportioned by the 1922 Compact. After endorsing holdover storage to satisfy the downstream obligation, the engineers turned their attention to matters pertaining to utilization of water in the Upper Basin. Both the endorsement and this latter issue were largely worked out during the three-week Vernal meeting.[62] The Upper Basin states not only agreed to a percentage apportionment of the Upper Basin's 1922 Compact Article III(a) allocation, but also adopted a system for measuring Upper Basin water use known as the "stream depletion theory" to be implemented by the "'inflow-outflow' method" advocated by Tipton.[63] The Commissioners agreed

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[59] H. Doc. 419, *The Colorado River* (March 1946), 151 [EX. I]; and Engineering Advisory Committee Memorandum, July 7, 1948, 6-8. ff. Upper Colorado River Commission, Upper Colorado River Compact, 1930, 1944-49, 1956, RG 0037, Box 11, WYSA [EX. T].

[60] Engineering Advisory Committee Memorandum, July 7, 1948, 8-9. ff. Upper Colorado River Commission, Upper Colorado River Compact, 1930, 1944-49, 1956, RG 0037, Box 11, WYSA [EX. T].

[61] Engineering Advisory Committee Memorandum, July 7, 1948, 9. ff. Upper Colorado River Commission, Upper Colorado River Compact, 1930, 1944-49, 1956, RG 0037, Box 11, WYSA [EX. T].

Although for the purposes of these operational studies a Glen Canyon Dam was assumed to provide all holdover storage to meet the Lee Ferry obligation during a 1931-1940 drought condition, as discussed below, CRSP envisioned multiple reservoirs – including Glen Canyon – as furnishing that storage.

[62] Breitenstein, "The Upper Colorado River Basin Compact" [ca. April 1949], 6. ff. Upper Colorado River Commission - 47877, Box 47877, Breitenstein Admin Files, COSA [EX. H].

[63] Kuhn and Fleck, *Science Be Dammed*, 144-146.

In terms of the Upper Basin Compact, adoption of "stream depletion theory" as the measure of the Upper Basin's "consumptive use" of Colorado River flows and the "'inflow-outflow' method" to account for such depletions enabled the states to maximize their permitted utilization of Colorado River water under the 1922 Compact. Tipton laid these ideas out in detail, with reference to data from other watersheds, the Rio Grande and the South Platte River. See UCRBCC *Official Record*, vol. II, "Meeting No. 7," Vernal, Utah, July 8 (Forenoon) 9:30 a. m., 42-63 [EX. AE] and Breitenstein, "The Upper Colorado River Basin Compact" [ca. April 1949], 10-11 [EX. H]. ff. Upper Colorado River Commission - 47877, Box 47877, Breitenstein Admin Files, COSA. See also Kuhn and Fleck, *Science Be Dammed*, 144-146; and Kuhn, Tara, and Fleck, "A Horse Named 'Stream Depletion,'" 82-83 and 108-109.

The "stream depletion theory" defined "consumptive use" "'in terms of man-made depletions of the virgin flow at Lee Ferry.'" "Virgin flow," according to Tipton, "in 1922 was called 'reconstructed flow.' Both terms meant the flow of the river as it was in the state of nature before man entered the picture." To assess depletion, the engineer in turn proposed, "measur[ing]…the change in relation between the runoff at certain key gaging stations location around the rim of the basin above the major development and the outflow from the basin as measured at Lee Ferry." See UCRBCC *Official Record*, vol. II, "Meeting No. 7," Vernal, Utah, July 8

to adopt the inflow-outflow method in the Upper Basin Compact but shunted the formulation of the method to a later date. The first "Inflow-Outflow Manual" established a mathematical relationship between annual inflow into the Colorado River Basin and outflow at Lee Ferry to calculate Upper Basin uses of water.[64]

The Upper Basin Compact commissioners proceeded on the basis that they were dividing the water remaining after the Lee Ferry obligation was met, as Breitenstein later memorialized.[65] The resulting compact thus emphasized the obligation to the Lower Basin under the 1922 Compact to ensure that 75 MAF passed Lee Ferry in 10 years (Article III[d]), an emphasis that the recent 1931-1940 dry cycle had underscored. In line with Patterson's conceptualization of using regulatory storage to avoid missing the delivery of 75 MAF during a 10th year of drought, the Upper Basin Compact specifically addressed a scenario whereby curtailments to meet the Lee Ferry obligation would be based on the 10 years preceding the shortfall (Upper Basin Compact Article IV[b]).

During congressional hearings leading to the ratification of the Upper Basin Compact in 1949, Upper Basin representatives, such as Tipton, sought to allay Lower Basin concerns about the potential impacts of Upper Basin development under the Upper Basin Compact. As noted above, the Upper Basin in the 1940s was not utilizing its 7.5 MAF 1922 Compact allocation (Article III[a]) nor was it using an amount that threatened the Lower Basin's allocation. Tipton, among others, emphasized that future development notwithstanding, the Upper Basin would meet the Lee Ferry obligation in compliance with the 1922 Compact.

Reviewing Article IV of the Upper Basin Compact, for instance, the Colorado engineering advisor highlighted the need for these facilities "along the main stream of the Colorado River and some of its tributaries… in order to enable the upper basin to make use of its apportioned water." He acknowledged that the reservoirs would be constructed "long before" they were going to be needed to satisfy the Lee Ferry obligation, so they would be used "for the generation of hydroelectric energy." Tipton's rationale was that operating the reservoirs for hydroelectric power generation – an activity that demands a steady supply of water – would equate the river so that the Upper Basin obligation at Lee Ferry would be "taken care of." Therefore, he argued that operating the reservoirs

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[1948] (Forenoon) 9:30 a.m., 43 and 48 [EX. AE]; and Breitenstein, "The Upper Colorado River Basin Compact" [ca. April 1949], 10. ff. Upper Colorado River Commission - 47877, Box 47877, Breitenstein Admin Files, COSA [EX. H].

[64] Upper Colorado River Compact Commission Inflow-Outflow Manual, Prepared by Engineering Advisory Committee, August 1949. ff. Upper Colorado River Compact Commission Inflow-Outflow Manual 1949 August, Box 48, Harry W. Bashore Papers 2783, AHC [EX. AA].

[65] Kuhn, Tara, and Fleck similarly point out that Stone, in his report on the Upper Basin Compact (later included in the congressional hearing record on the compact), observed that "The water available for us in the Upper Basin is that remaining after the Lee Ferry delivery requirements are satisfied." See "A Horse Named 'Stream Depletion,'" 114.

for the purposes of satisfying the obligation and for power generation (that would financially subsidize construction of Upper Basin consumptive use projects) would be compatible.[66]

Tipton also clarified in response to a question by California representative Clair Engle (D.) that Article V(c) of the Upper Basin Compact, which gave "preference" to "storage of water for consumptive use in a State of the Upper Division," was an intra-basin measure that would not affect the Lee Ferry obligation. "'[P]reference,'" he explained,

> meant that each upper-basin State has a superior right to use a storage site for consumptive purposes within that State, and it may not be deprived of that right by the desire of other upper-division States to utilize the same site for the impoundment of water which will be released to meet the Lee Ferry obligations of the upper-division States.
>
> The exercise of such a preference right must not violate or have the effect of violating the delivery obligations imposed by article III (d) of the Colorado River compact.[67]

The engineer further stressed that in "the distant future" should "the upper basin…reach the limit of its development" and "capacity" in the "replacement reservoirs" was needed for "consumptive purposes" by an Upper Basin state, "one of two things must happen, or a combination of them: Additional capacity must be provided to take care of the Lee Ferry obligation, or curtailment must be made, if necessary, as provided for under article IV of the upper Colorado River compact."[68]

Under questioning from Arizona's representative John R. Murdock (D.), chair of the House Subcommittee on Irrigation and Reclamation, as to whether the Upper Basin "will ultimately be able to use its apportionment of 7,500,000 acre-feet of water annually and, at the same time, be able to deliver…an average of 7,500,000 acre-feet for the lower basin," Tipton was unsure of the former but confident of the latter. "I am not sure that the upper basin can utilize 7 ½ million acre-feet," the engineer told Murdock, but "[i]n any event, it will always make its required delivery at Lee Ferry." Storage was critical to accomplishing both, he emphasized:

> The very development of the basin itself by the construction of the substantial hold-over reservoirs for the direct use of the upper basin above the points of use, the effect of that will be to equate to some extent the flow of the river at Lee Ferry. That always happens, but in addition to those reservoirs, and the effect they will have upon the flow at Lee Ferry there will be required additional reservoirs with an aggregate substantial capacity below our points of use to complete the balance of the equation that is necessary to take care of our obligation...[69]

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[66] Congress, House, Committee on Public Lands, *The Upper Colorado River Basin Compact: Hearings Before a Subcommittee on Irrigation and Reclamation of the Committee on Public Lands, House of Representatives, Eighty-First Congress First Session on H.R. 2325, H.R. 2326, H.R. 2327, H.R. 2328, H.R. 2329, H.R. 2330, H.R. 2331, H.R. 2332, H.R. 2333, H.R. 2334 Bills to Grant the Consent of the United States to the Upper Colorado River Basin Compact*, Serial No. 5, March 14, 15, 16, 17, and 18, 1949 (GPO, 1949) [hereafter *The Upper Colorado River Basin Compact Hearings*], 37 [EX. AF].
[67] *The Upper Colorado River Basin Compact Hearings*, 45 [EX. AF].
[68] *The Upper Colorado River Basin Compact Hearings*, 45 [EX. AF].
[69] *The Upper Colorado River Basin Compact Hearings*, 49 [EX. AF].

The notion of storage capacity below Upper Basin points of use for the purposes of meeting the Lee Ferry obligation and generating power to fund Upper Basin irrigation projects above points of use was the blueprint for the CRSP "units" and "participating projects" that followed in the wake of the Upper Basin Compact's ratification.[70]

"To Permit the States of the Upper Division to Meet Lee Ferry Flow Obligations and Utilize the Full Consumptive Use Apportioned Them": The Intent of CRSP

Reclamation Region IV (based in Salt Lake City and encompassing the Upper Basin states) and the Upper Basin states intended CRSP to abate the consequences to the Upper Basin of a future scenario of low inflow to the basin whereby the Upper Basin would not be able to divert enough Colorado River water to meet its demand because of 1922 Compact obligations for flow at Lee Ferry. In a run-of-the-river state absent of main stem storage reservoirs, the Upper Basin could not plan for the development of water uses above the approximately 2 MAF it reportedly depleted the river during the 1930s and 1940s without risking violation of the 1922 Compact. Constructing storage reservoirs – or "units" – in the Upper Basin to regulate the flow of the river downstream and out of the basin would allow the Upper Basin the flexibility to store water to ensure that it could meet its 1922 Compact requirements to Lee Ferry during years of low basin inflow while also developing its own uses. As Breitenstein recognized during congressional hearings on the CRSP legislation, "[w]ithout these enormous dams, the upper basin cannot use its allotted share of water. This is a condition precedent, a prerequisite, to the use by the upper basin of the water allocated to it."[71] The storage units were also designed to benefit the Upper Basin through generation of hydroelectric power, the revenues of which would fund irrigation projects, or "participating projects" for consumptive uses in the Upper Basin.

With their compact signed, the Upper Basin immediately shifted its focus to pursuing a federal project to implement the scheme of development contemplated by the Upper Basin Compact Commissioners and its engineering committee. CRSP was the Upper Basin's answer to the recommendations of the 1946 Regional Directors' report: Having determined their "respective rights to deplete the flow of the Colorado River," CRSP was the Upper Basin states acting jointly to "recommend for construction, as the next stage of development, a group of projects."[72] As stated in Region IV's initial draft of a CRSP report, the aim of the storage project was "to permit the States of

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[70] Kuhn and Fleck, *Science Be Dammed*, 152.

[71] Congress, House, Committee on Interior and Insular Affairs, *Colorado River Storage Project: Hearings Before the Subcommittee on Irrigation and Reclamation on H.R. 4449, H.R. 4443, and H.R. 4463 To Authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects and for Other Purposes*, 83rd Cong., 2d sess., January 18, 19, 20, 21, 22, 23, 25, 26, 27, and 28, 1954 (GPO, 1954) [hereafter *H.R. 4449 Hearing*], 314 [EX. AG].

[72] H. Doc. 419, *The Colorado River* (March 1946), 21 [EX. I]; See also Reid Jerman, United States, Department of the Interior, Bureau of Reclamation, Region 4, Letter Report, ff. Upper Colorado River Commission, Correspondence, Jan. 24 - March 30, 1949, RG 0037, Box 1, State Engineer, Upper Colorado River Commission, General Correspondence, 1945-1954, WYSA [EX. AH].

the upper division to meet Lee Ferry flow obligations and utilize the full consumptive use apportioned them under the terms of the Colorado River Compact."[73]

In March 1949, just six months after ratification of the Upper Basin Compact, Reclamation Region IV released for internal review a preliminary and draft "Interim Report Colorado River Storage Project and Participating Project, States of the Upper Division, Upper Colorado River Basin" that outlined the Upper Basin's joint recommendations for federal projects in the Upper Basin. The draft was the first iteration of the CRSP report that became the basis of the CRSP bill approved by Congress in 1956.[74]

Region IV finalized the report for transmittal to the Reclamation Commissioner and the Secretary of the Interior in December 1950. The agency prepared a supplemental CRSP report in 1953 and submitted both the 1950 and 1953 reports to Congress in 1954 (H. Doc. 364, 83rd Cong., 2d sess.). Reclamation assumed full authorship of the CRSP reports but acknowledged that both the Upper Basin states and the Upper Colorado River Compact Commission contributed to the report and substantiating materials.[75] Upper Basin legislators introduced the first versions of the legislation to Congress in 1953.[76]

Upper Basin recognition that its water resources could not be developed fully while meeting the 10-year Lee Ferry obligation during a future decade of flow conditions like 1931-1940 framed the problem that CRSP was designed to address. Water development in the Upper Basin had been accomplished primarily through "numerous small private enterprises and 13 projects of various sizes undertaken by the Bureau of Reclamation" at the least expensive and most convenient locations.[77] The Upper Basin's uses in 1950 were estimated to deplete to flow of the Colorado River at Lee Ferry by slightly more than 2.5 MAF annually.[78] "Present flows in the upper basin," were therefore "adequate to meet the 10-year Lee Ferry obligation." In fact, Reclamation concluded that at the 1950 rate of Upper Basin use, no curtailment of water would be required "[u]nless future

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[73] Region 4, "Interim Report," March 1949, Substantiating Report, 39 [EX. Q]. ff. 21, Box 21, Harvey Papers, CSUFC.
[74] Region 4, "Interim Report," March 1949, Substantiating Report, 10-12 [EX. Q].
[75] United Staes Department of the Interior, Douglas McKay Secretary, Bureau of Reclamation, W.A. Dexheimer, Commissioner, Region 4, E.O. Larson, Regional Director, "Regional Director's Report of December 1950 on Colorado River Storage Project and Participating Projects Upper Colorado River Basin." [hereafter 1950 Region 4 Director's Report on CRSP] in Congress, House, House Document No. 364, *Colorado River Storage Project Letter from Assistant Secretary of the Interior Transmitting A Report on the Colorado River Storage Project and Participating Projects, Providing for the Development and Utilization of the Water and Related Resources of the Upper Colorado River Basin, Pursuant to the Federal Reclamation Laws*, 83d Cong., 2d sess., April 6, 1954, Referred to the Committee on Interior and Insular Affairs and ordered to be printed, with illustration [hereafter H. Doc. 364], 70 [EX. AI].
[76] Terrell, *War for the Colorado River, Vol. Two*, Appendix A.
[77] Region 4, "Interim Report," March 1949, Memorandum, From: Regional Director, To: Commissioner, Subject: Interim Report on Colorado River Storage Project and Participating Projects in the States of the Upper Division – Upper Colorado River Basin, March 31, 1949, 6. ff. 21, Box 21, Harvey Papers, CSUFC [EX. Q].
[78] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 148 [EX. AI].

droughts are much more severe than that of 1931-40."[79] "Within 20 or 25 years, however," Reclamation anticipated that without "some storage water…available for delivery to the lower basin," "curtailment of consumptive uses will be necessary in protracted dry periods."[80] In essence, CRSP was intended to meet a future problem resulting from a drought like 1931-1940.

As noted above, the Lower Basin was not on the receiving end of multiple shortfalls of 1922 Compact water deliveries between 1931 and 1940. Rather, the decade was marred by one particular year (1934) where the "estimated virgin flow" of water passing Lee Ferry was a little more than half of 7.5 MAF.[81] In fact, when the CRSP report was drafted, the Lower Basin was in a comparatively good position on the river: as noted above, Hoover Dam was providing for storage, regulation, and flood control below Lee Ferry and water annually passing Lee Ferry typically exceeded the Lower Basin's 1922 Compact allocation (Article III[a]).[82] With no storage reservoirs on the main stem above Lake Mead, the Lower Basin did not have to contend with an upstream release schedule for its supply. Unsurprisingly then, opposition to the CRSP legislation came from the Lower Basin and from outside the Colorado River Basin – especially with regard to the proposed Echo Park Dam in Dinosaur National Monument.[83] As discussed further below, Lower Basin opponents of the legislation, especially Californians, disputed fundamental components of the Upper Basin's implementation and interpretation of its obligations under the 1922 Compact.[84]

Reclamation Region IV, working with the Upper Basin states, designed CRSP to meet the theoretical inability of a fully developed Upper Basin to meet its downstream obligations during the 1931-1940 conditions. Calculating that the virgin flow of the Colorado River during this decadal dry cycle was approximately 118,320,000 acre-feet, Reclamation concluded that during that time, the Upper Basin "could have depleted the river flow during the 10-year drouth period by only 43,320,000 acre-feet in terms of man-made depletions at Lee Ferry" and still met the Lee Ferry obligation.[85] As discussed above, the Upper Basin had not reached a stage of infrastructural development that utilized that quantity of water. Looking to the future, however, Reclamation and the Upper Basin recognized that without river regulation, new projects in the Upper Basin would be limited to those

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[79] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 148 [EX. AI].
[80] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 105-106 [EX. AI].
[81] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 150 [EX. AI].
The "estimated virgin flow" for 1931 was identified as slightly above 7.5 MAF. See Computation of Virgin Flow at Lee Ferry," in Region 4, "Interim Report," March 1949, Substantiating Report, 32 [EX. Q].
[82] "Computation of Virgin Flow at Lee Ferry," in Region 4, "Interim Report," March 1949, Substantiating Report, 32. ff. 21, Box 21, Harvey Papers, CSUFC [EX. Q].
[83] In 1965, Terrell provided a detailed account of this opposition, especially to Echo Park. See Terrell, *War for the Colorado River, Vol. Two*, Parts Two through Seven. An interpretive history of the origins of this fight and its relationship to the post-World War conservation movement is Harvey, *A Symbol of Wilderness* (reprint, 2000).
[84] See Digest of comments and recommendations by States and Federal agencies on CRSP report, H. Doc. 364, 52-58 [EX. AI].
[85] Region 4, "Interim Report," March 1949, Substantiating Report, 38. ff. 21, Box 21, Harvey Papers, CSUFC [EX. Q]; 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 148 [EX. AI].

that did not consume more water than required to meet the 10-year Lee Ferry obligation and the US commitment to Mexico.[86]

The CRSP report sought congressional authorization for a plan of development that would finance irrigation development (through power revenues) in the Upper Basin and provide for regulatory storage capacity in the Upper Basin to allow it to meet its downstream delivery obligations at Lee Ferry during periods of drought like 1931-1940.[87] Despite a name that suggests a Colorado River Basin-wide undertaking, CRSP was an Upper Basin / Region IV project whose works were located exclusively in the Upper Basin. From the geographical perspective of the Lower Basin, the "storage" component of the project was upstream on the Colorado River and its major tributaries; however, the plan of development within the Upper Basin placed much of the storage too far downstream to provide water directly to irrigable land and industrial centers in the Upper Basin. In fact, in 1953 the Secretary of the Interior recommended initial authorization of only two storage units, Glen Canyon and Echo Park, both of which were located too far downstream to capture water for Upper Basin consumptive use.[88]

The plan provided for two classes of reservoirs that reflected Tipton's explanation of the development plan during the Upper Basin Compact hearings. Ten "units" – with most of the storage capacity downstream from Upper Basin points of use – would each include a dam, reservoir, and hydroelectric power generating facilities.[89] Eight of the units would provide for river regulation. Total storage capacity of the storage units was 48,555,000 AF with 37,530,000 AF active storage capacity.[90] These units "constituted the Colorado River storage project."[91] The other class of reservoirs that Reclamation Commissioner Michael Straus described as an "element in the plan" were participating irrigation projects. Participating projects generally consisted of reservoirs, diversion, and distribution works – the projects that facilitated Upper Basin consumption of water.[92]

The 1931-1940 period of record figured prominently in both setting the design criteria for CRSP and in recommendations for the initial authorization of units. In both the preliminary draft of its

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[86] Region 4, "Interim Report," March 1949, Substantiating Report, 38-39. ff. 21, Box 21, Harvey Papers, CSUFC [EX. Q]; 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 148-149 [EX. AI].
[87] Region 4, "Interim Report," March 1949, 1-11. ff. 21, Box 21, Harvey Papers, CSUFC [EX. Q]; 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 105, 148-149 [EX. AI]; Michael Straus, Commissioner, Bureau of Reclamation to Oscar L. Chapman, Secretary of the Interior, December 22, 1950 in Department of the Interior, Bureau of Reclamation, *Colorado River Storage Project and Participating Projects Upper Colorado River Basin*, December 1950, Project Planning Report No. 4-8a.81-1, Salt Lake City, Utah, Region 4, Exhibit 197, Box 58, Arizona v. California: Cases 8, 9, & 10, Series Original Jurisdiction Case Files, 1792-1998, Entry 26, National Archives Building [hereafter Straus to Chapman, December 22, 1950] [EX. AJ].
[88] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 105 [EX. AI]; "Supplemental Report on Colorado River Storage Project and Participating Projects, Upper Colorado River Basin, 1953," approved and adopted by Secretary of the Interior, Douglas McKay December 10, 1953 [hereafter 1953 Supplemental CRSP Report] in H. Doc. 364, 39-51 [EX. AI]; *H.R. 4449 Hearing*, 91-92 [EX. BD], *H.R. 4449 Hearing*, 314-315 [EX. AG].
[89] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 71-72 [EX. AI].
[90] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 72 [EX. AI].
[91] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 71 [EX. AI].
[92] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 107 [EX. AI].

interim report and the 1950 CRSP report, Region IV posited that 23 MAF "of active aggregate capacity" would be required for "long-time hold-over purposes" or "long-time regulatory storage" in the Upper Basin to meet the Lee Ferry obligation during a future drought event comparable to the drought recorded between 1931 and 1940.[93] Operationally, Reclamation envisioned a system where "water stored would be released as needed in drought periods to meet the compact obligations at Lee Ferry. The reservoirs would be refilled during years of favorable water supply. In a dry decade such as that of 1931-40, release of the entire 23 MAF would be necessary to meet the Lee Ferry obligation."[94] The regulation provided in the storage units would be required in addition to any regulating effects caused by storage in the smaller reservoirs of the participating projects. Additional storage capacity above the 23 MAF would provide for power head, fish propagation, and sediment deposition.[95]

In preparing a request for initial authorization of components of CRSP, Reclamation drew a distinction between known and unknown factors. Straus wrote that "[i]t is possible at this time to foresee rather clearly the needs of the Upper Basin in terms of storage requirements for purposes of river regulation, although facilities for utilization of the last drops of water cannot be seen with any clarity."[96] In other words, the obligation to deliver water to Lee Ferry was an absolute that could be planned for while the future water demands of the Upper Basin remained unpredictable. This echoed Tipton's acknowledgment during the Upper Basin Compact hearings, noted above – that in the future, if the Upper Basin withdrew storage capacity from reservoirs for consumptive use in the Upper Basin, additional capacity or curtailment must be made.[97]

Between the 1950 CRSP report and the 1956 passage of CRSPA, Reclamation and Congress recommended and proposed the adoption of various combinations of units and participating projects for initial authorization.[98] Every major proposal had one thing in common: recommendation of Glen Canyon Dam. The dam site had long been considered a suitable one for the overall development of the Colorado River Basin. Situated just 17 miles upstream from Lee Ferry (and far downstream from Upper Basin points of use), the dam had the potential to create "more initial storage capacity than all others combined." It was the only one of the 10 units identified in the CRSP report that was on the Colorado River; all others were sited on major tributaries.[99] Initial designs for the dam set the capacity at 26 MAF, inclusive of 20 MAF active capacity.[100] This was less than what the Upper Basin Compact Engineering Advisory Committee had analyzed in

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[93] Region 4, "Interim Report," March 1949, 7-9, and Substantiating Report, 14. ff. 21, Box 21, Harvey Papers, CSUFC [EX. Q]; 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 105 [EX. AI].
[94] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 105 [EX. AI].
[95] *H.R. 4449 Hearing*, 52-53 [EX. BD].
[96] Straus to Chapman, December 22, 1950 [EX. AJ].
[97] *The Upper Colorado River Basin Compact Hearings*, 45 [EX. AF].
[98] Terrell, *War for the Colorado River, Vol. Two*, Appendices C and D; 1953 Supplemental CRSP Report] in H. Doc. 364, 39-51 [EX. AI].
[99] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 104 [EX. AI].
[100] 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 118 [EX. AI].

1948, discussed in the section above, but nearly enough to satisfy a future drought scenario like 1931-1940 according to that analysis.

During 1953-1955 hearings for the proposed CRSP legislation, Department of Interior officials spoke favorably of the project, highlighting how it provided for a system that served both the Upper and Lower basins. Larson, Reclamation's Region IV director, likened the project to other mid-century Reclamation projects describing it as a "replacement practice quite common on western streams where water is diverted upstream in exchange for storage water releases from downstream reservoirs."[101] Both Larson and Ralph Tudor, the Under Secretary of the Interior, promoted a vision of additional authorizations of storage reservoirs following on to the initially authorized units.[102]

Californians like Northcutt Ely, attorney for the Colorado River Board of California, and conservationists led by David Brower, executive director of the Sierra Club, were the primary objectors to CRSP during the congression hearings in the 1950s, with the former expressing concerns about the impact of the project on the Lower Basin water supply and the latter stressing the impact to Dinosaur National Monument. Operationally, Ely objected to CRSP plans for construction of storage reservoirs on the grounds that holdover storage would not be necessary for many years – as Tipton himself had conceded during the 1949 compact hearings. Ely noted that it would take decades of Upper Basin development before the flow at Lee Ferry was reduced below 75 MAF over 10 years. He therefore argued that it would be wasteful to begin filling reservoirs before they were needed because of evaporative losses. The attorney further alleged that proponents of the holdover storage were seeking to subsize irrigation projects with power revenues.[103] While Ely was instrumental in introducing language to direct the Secretary of the Interior to operate CRSP reservoirs within compliance with the 1922 Compact and other elements of "the law of the river" and Brower's efforts prompted the elimination of the proposed Echo Park Reservoir, neither managed to defeat congressional approval of CRSPA.[104]

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[101] Congress, Senate, Committee on Interior and Insular Affairs, *S. 500: A bill to authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects, and for other purposes: Hearing before the Subcommittee on Irrigation and Reclamation*, 84th Cong., 1st sess., February 28, March 1, 2, 3, 4, and 5, 1955 [hereafter *S. 500 Hearing*], 47 [EX. AK].
[102] *S. 500 Hearing*, 47 [EX. AK]; and Congress, Senate, Committee on Interior and Insular Affairs, *S. 1555: A bill to authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects, and for other purposes: Hearing before the Subcommittee on Irrigation and Reclamation*, 83rd Cong., 2d sess., June 28, 29, 30, July 1, 2, and 3, 1954 [hereafter *S. 1555 Hearing*], 44 [EX. AL].
[103] *S. 1555 Hearing*, 585-587 [EX. BF]; and *S. 500 Hearing*, 573 [EX. BH].
[104] *H.R. 4449 Hearing*, 706-708 [EX. BE]; and Terrell, *War for the Colorado River, Vol. Two*, 251-252.

After multiple hearings, revisions, and amendments, Congress approved a House-Senate conference report on the bill in March 1956 and President Eisenhower signed Public Law 84-485 on April 11, 1956.[105] As all iterations of the bill had done, the final bill provided for construction of Glen Canyon Dam as one of four units authorized for initial construction, along with Navajo, Flaming Gorge, and Curecanti. **Figure 2** is a map prepared by Reclamation showing the authorized initial units and participating projects as well as sites investigated as potential future projects.[106] Eleven participating projects were part of the initial authorization, including the first phase of the large Central Utah project. The bill further authorized priority planning for another storage reservoir and an additional 24 participating projects.[107]

Although several participating projects were authorized in the 1960s, most were scaled back or never developed because of the absence of economic feasibility or challenges with bringing more land under irrigation. No new CRSP storage reservoirs, moreover, have been constructed in the Upper Basin since completion of Morrow Point Dam in 1968, an element of the Curecanti Unit, today known as the Aspinall Unit.[108]

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[105] *An Act To authorize the Secretary of the Interior to construct, operate, and maintain the Colorado River storage project and participating projects, and for other purposes* (S. 500), Public Law 84-485, 70 Stat. 105, April 11, 1956 [EX. AN].

[106] Congress, Senate, Document No. 77, *Colorado River Storage Project and Participating Projects Letter from the Secretary of the Interior Transmitting the First Annual Report on the Status of the Colorado River Storage Project and Participating Projects Together with a Statement on Hydrologic Bases for Financial Studies, Colorado River Storage Project, Pursuant to Public Law 485 of the Eighty-Fourth Congress*, 85th Cong., 2d sess., January 16, 1958, facing 1 [EX. AM].

[107] For information related to CRSP and to each of the authorized participating projects, see *Project Data, 1981* [EX. R]. See also Terrell, *War for the Colorado River*, *Volume Two* for a detailed presentation of the hearings on various iterations of the CRSPA legislation; and 1950 Region 4 Director's Report on CRSP in H. Doc. 364, 72-73 [EX. AI].

[108] *Project Data, 1981*, 361 [EX. R]. See also Kuhn and Fleck, *Science Be Dammed*, 155.

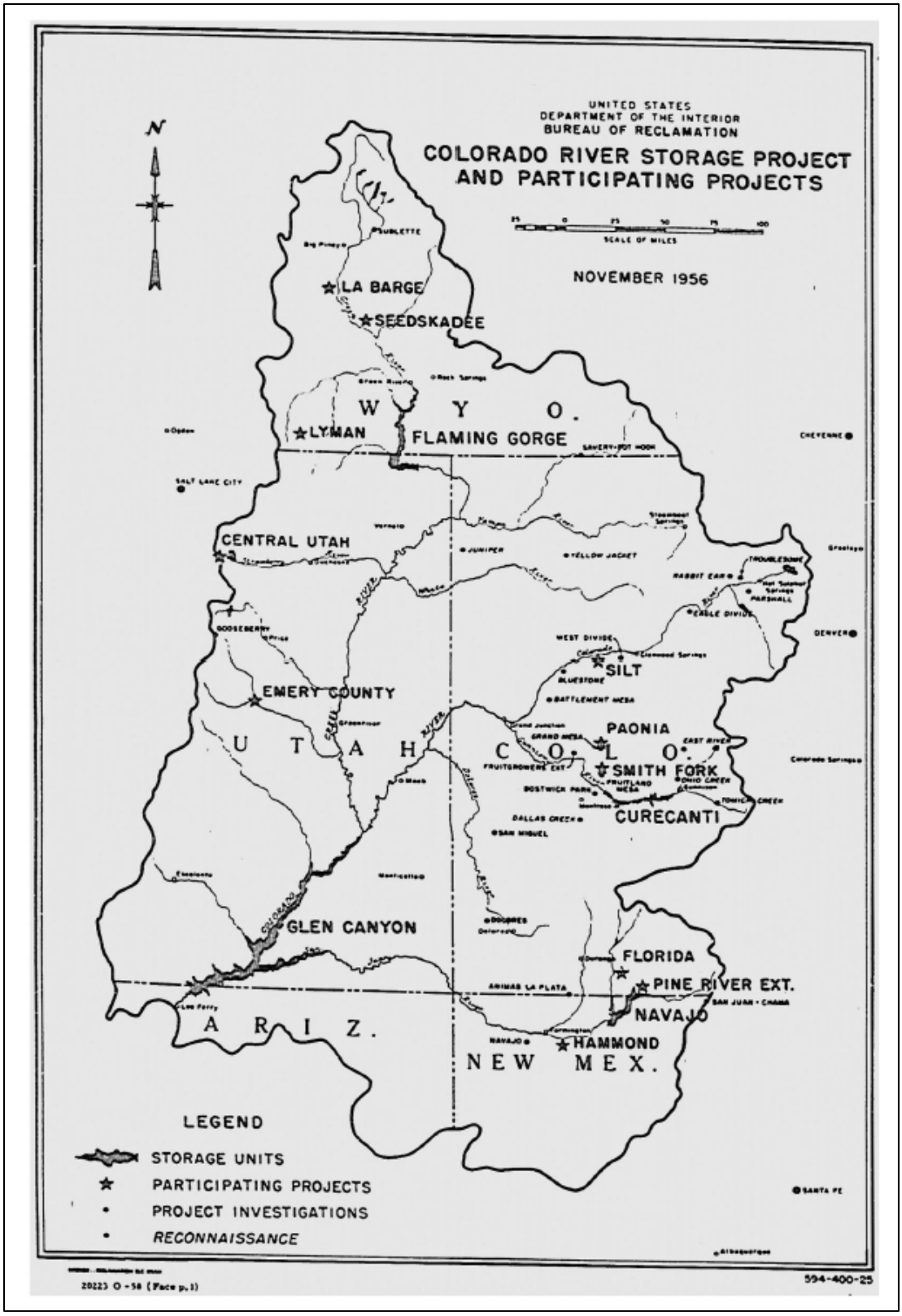


Figure 2. Reclamation map showing authorized Colorado River Storage Project units and participating projects, November 1956.

The Origin and Intent of Section 14 of CRSPA

Under Section 14 of CRSPA, "the Secretary of the Interior is directed to comply with the applicable provisions" of the 1922 Compact, the Upper Basin Compact, the BCPA, BCPAA, and the 1944 Mexican Treaty "in the storage and release of water from reservoirs in the Colorado River Basin."[109] Lower Basin interests introduced the provision what would become Section 14 as a check against the possibility of the Secretary of the Interior operating the project in a manner inconsistent with the "Law of the River," or in a manner that harmed any state bound by the 1922 Compact. The Upper Basin initially opposed such a provision but eventually came to support it, adding to the Upper Basin Compact to the list of specific agreements, laws, and the treaty to which the Secretary of the Interior was to adhere.

The first CRSP bill lacked any mechanism for enforcing the United States to operate project storge reservoirs in compliance with the "Law of the River." This concerned Californians who feared that increased storage and use of water in the Upper Basin would decrease their supply and diminish the quality of water reaching the state. As noted above, during the 1954 CRSP hearings, Northcutt Ely was among the principal Lower Basin opponents of CRSP. His objections centered on what he characterized as "erroneous interpretations of the Colorado River compact built into the planning of the Colorado River storage project,"[110] and from him, Section 14 originated.

The California attorney saw the potential for successive Secretaries of the Interior to interpret the 1922 Compact as part of the operations of CRSP's Upper Basin holdover reservoirs to the detriment of the Lower Basin. He therefore recommended an amendment – "Amendment No. 5" – in House hearings on bills H.R. 4449, 4443, and 4463 in January 1954. The proposed amendment was composed of two parts that captured four fundamental ideas:

1) Accountability in the form of an "Integrating Committee," with a representative from each basin state to advise the Secretary of the Interior "in programming the storage and release of water from main stream reservoirs located in the Upper Basin, for use in the Lower Basin";
2) Direction to the Secretary of the Interior to comply with the Law of the River documents in storage and release of water;
3) Authorization for any state in the basin to sue the Secretary of the Interior in the Supreme Court if the Secretary of the Interior did not comply with the Law of the River documents; and

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[109] 70 Stat. 105 §14 (1956) [EX. AN].
[110] *S. 1555 Hearing*, 592 [EX. B].

In the attorney's estimation, the two most "intolerable" aspects of the proposed legislation were how Reclamation intended to measure beneficial consumptive use in the Upper Basin, and Reclamation's apparent endorsement of the idea of treating the 7.5 MAF apportionment as an annual average rather than a maximum. Ely feared that the Lower Basin would be deprive of access to surplus water and the delivery of water to Mexico under the 1944 Treaty would be compromised as a result. *S. 500 Hearing*, 587-595 [EX. BH].

4) Consent for the United States to be joined as a party in any such suit.[111]

In his written explanation of the need for Amendment No. 5, Ely argued:

> A provision of this sort is absolutely essential to all seven states of the Basin. Under the Upper Basin Storage Project plan the Secretary of the Interior would build a gigantic reservoir at Glen Canyon and perhaps also at Echo Park, capable of impounding the whole flow of the river for several years If there is no control over him as to the rates at which he accumulates water in these reservoirs, and releases it, he has the whole interpretation of the Colorado River Compact in his own hands. These reservoirs are too far down stream to impound water for actual diversion by the Upper Basin, yet are outside of the Lower Basin. As no state can sue the United States without its consent, if the Secretary builds up storage in these reservoirs more rapidly than the Lower Basin States think he is entitled to do under the Compact, they have no way of controlling him. Conversely, if he releases water in larger quantities than the Upper Basin States think he should, they have no control over him. Both groups of states are entitled to this protection against the United States.[112]

Clair Engle introduced Ely's recommended amendment to H.R. 4449 in April 1954 during a House subcommittee meeting. The amendment specified that in the storage and release of water, the Secretary of the Interior must comply with the Colorado River Compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act, and the Treaty with Mexico. As introduced, the provision did not include the Upper Basin Compact.[113]

The ensuing subcommittee debate of the amendment divided along basin lines with Californians supporting inclusion of the amendment and Upper Basin representatives viewing it with skepticism.[114] Engle, along with fellow Californian Craig Hosmer (R.), argued that the amendment served the interests of all seven basin states because at a future point, any of the states could object to the way the Secretary of the Interior operated the CRSP reservoirs. The amendment, they asserted, would give any state recourse to the Supreme Court to resolve conflicts of interpretation. Engle, echoing Ely's arguments in favor of the amendment, warned of the potential dangers of the Secretary of the Interior having sole control over the storage and release of water and being the sole interpreter of the Law of the River where such operations were concerned. He cited future possibilities of Arizona arguing about interpretation of law or the Upper Basin finding itself faced with a Californian as Secretary of the Interior.[115]

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[111] *H.R. 4449 Hearing*, 706-708 [EX. BE].
[112] Northcutt Ely, "Explanation of Proposed Amendments to H.R. 4449 and Companion Bills, to Authorize Construction of the Colorado River Storage Project," March 18, 1954, 6-7, ff. 1 Colorado River 1951-1954, Engle, Upper Colorado River Storage Projects, Box 143, Clair Engle Collection, California State University, Chico [EX. AO].
[113] Congress, House, Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, Meeting [unpublished], H.R. 4449 Colorado River Storage Project and Participating Projects [hereafter *H.R. 4449 House Subcommittee Meeting*], April 14, 1954, 1822 [EX. AP].
[114] Representatives from outside the basin, such as John R. Pillion (R., NY) and John Saylor (R., PA) considered the amendment in terms of how it could expose the Secretary of the Interior (and consequently the federal government) to greater liability for operation of the project. See, for example, *H.R. 4449 House Subcommittee Meeting*, April 14, 1954, 1824-1826 [EX. AP].
[115] *H.R. 4449 House Subcommittee Meeting*, 1829-1830 [EX. AP].

Upper Basin congressional representatives William Dawson (R., UT) and Wayne Aspinall (D., CO) remained unpersuaded. Aspinall dismissed the Californians' concerns, stating that at present "the only obligation on the Upper Basin is to deliver waters in certain amounts at Lee Ferry."[116] He objected to the proposed "Integrating Committee" as constituting unwanted and unwarranted interference.[117] The amendment failed to pass the subcommittee by a vote of 7 in favor and 8 opposed. No Upper Basin representative voted in favor of it and no Lower Basin representative voted against it.[118]

When the Committee on Interior and Insular Affairs convened in May, Engle introduced another version of his amendment to H.R. 4449 with revisions suggested by Aspinall. These included elimination of the proposed Integrating Committee. Additional changes shifted the focus of the amendment from enforcement of release of water "from reservoirs in the Upper Basin for use in the Lower Basin" to the more expansive "storage and release of water from reservoirs in the Colorado River Basin."[119] Engle advocated for the bill on the grounds that "there have been reoccurring disagreements as to what the Compact means and what the law of the river is," insisting that the amendment would benefit all basin states, not just California, Arizona, or Nevada.[120] The revised amendment required the Secretary of the Interior to comply with the documents that comprised the Law of the River – not including the Upper Basin Compact – and permitted any state in the basin to maintain an action in the Supreme Court if the Secretary of the Interior failed to comply, and gave consent "to the joinder of the United States" as a party to any such suit.[121] Despite Engle's case for the measure, it too failed to pass the committee.[122]

Ely nevertheless persisted in pursuing an amendment that explicitly mandated the Secretary of the Interior to operate the proposed CRSP in accordance with the Law of the River and providing recourse if they did not. The California attorney appeared before a Senate subcommittee hearing on another iteration of the CRSP bill, S. 1555, in July with the admonition that the proposed bill "makes no provision for enforcement of the compact by any State against the United States, which will accumulate and hold this water in its reservoirs and release it subject to the decision of a long succession of Secretaries of the Interior."[123]

He tied his concern to the observation that the proposed storage capacity of CRSP was "enough to intercept the whole flow of the river for several years," which in Ely's view would serve no purpose other than power generation and would result in substantial evaporative losses. He reminded the

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[116] *H.R. 4449 House Subcommittee Meeting*, 1833 [EX. AP].
[117] *H.R. 4449 House Subcommittee Meeting*, 1834 [EX. AP].
[118] *H.R. 4449 House Subcommittee Meeting*, 1838-1839 [EX. AP].
[119] *H.R. 4449 House Subcommittee Meeting*, 1822; House, Committee on Interior and Insular Affairs, Meeting [unpublished], H.R. 4449 To Authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storge Project and Participating Projects, and for Other Purposes [hereafter H.R. 4449 *House Committee Meeting*], May 18, 1954, 108-109, 114 [EX. AQ].
[120] *H.R. 4449 House Committee Meeting*, 108 [EX. AQ].
[121] *H.R. 4449 House Committee Meeting*, 110 [EX. AQ].
[122] *H.R. 4449 House Committee Meeting*, 118 [EX. AQ].
[123] *S. 1555 Hearing*, 587 [EX. BF].

subcommittee that at the present time the Colorado River flowed freely into the Lower Basin through Glen Canyon. After construction of the proposed CRSP, however, the water would be stopped in the Upper Basin at Glen Canyon Dam (Lake Powell). Ely questioned how rapidly storage water that would have otherwise flowed to Lake Mead (in the Lower Basin) would be impounded in Lake Powell (in the Upper Basin) and who was "to determine how rapidly and on what terms releases are to be made." "Presumably," he supposed, such operations would be the responsibility of the Secretary of the Interior, and unless there was a mechanism for a state to sue the United States over operations, he argued that all states in both basins were at risk of "abdicat[ing] the administration of their compact to the United States."[124]

To illustrate the potential risk to the Lower Basin, Ely posited the example of the Upper Basin operating under the interpretation that 75 MAF over 10 years must be "let down" but that "all else can be retained upstream." For the Upper Basin, he pointed to a circumstance in which the Secretary of the Interior was not impounding water as rapidly in Green Canyon as they would like. All states, Ely argued, needed a way to get into the Supreme Court to "test" interpretations of the 1922 Compact.[125]

Arguably the most vehement objector to Engle (and Ely's) amendment was Jean Breitenstein. Breitenstein's greatest concern seemed to be the potential for the amendment to provide CRSP opponents with a vehicle to slow construction of the project through litigation. By the time of the S. 1555 hearings in June and July, the attorney and former Colorado Upper Basin Compact legal advisor had been appointed a federal judge for the District of Colorado but he appeared at the hearing as a private citizen.[126] He argued that it was improper to assume that the Secretary of the Interior would not comply with the Law of the River. Breitenstein took the position that in the event the Secretary of the Interior did not perform a "ministerial act" or "ministerial duty" in compliance with the Law of the River, the Secretary could be sued as a federal official without suing the United States. Inclusion of the proposed amendment, in his view, was thus superfluous.[127]

As the CRSP legislation made its way closer to passage, both support for and opposition to the amendment shifted. During an Executive Session committee hearing on S. 1555, for instance, John G. Will, Chief Counsel and Secretary of the Upper Colorado River Commission, spoke in favor of "the provision," deeming it "highly desirable to expedite matters." He acknowledged the merits of Breitenstein's solution but noted that path for resolving disputes would likely lead to an appeals process that would end in the Supreme Court anyway.[128]

Colorado Representative Byron G. Rogers (D.) subsequently introduced a version of the CRSP bill, H.R. 4488, in February 1955 that added the Upper Basin Compact to the list of compliance

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[124] *S. 1555 Hearing*, 594 [EX. BF].
[125] *S. 1555 Hearing*, 594 [EX. BF].
[126] Breitenstein provided a letter signed by five judges of the United States Court of Appeals, Tenth Circuit, which found no impropriety in his participation in the subcommittee hearing. See *S. 1555 Hearing*, 281-282 [EX. BG].
[127] *S. 1555 Hearing*, 293-296 and 305 [EX. BG].
[128] *S. 1555 Stenographic Transcript*, 53-54 [EX. AR].

documents as part of Section 12.[129] In House subcommittee hearings the following month, the Chief of Water Development, Wyoming Natural Resource Board, Paul Rechard, spoke in favor of the proposed CRSP legislation that included Rogers' provision. Rechard assured the subcommittee, "[w]e are going to live within the terms of the laws of the river which include the 1922 and 1948 compacts."[130]

Ely, by contrast, came to oppose congressional authorization of the project altogether and believed that mandating the Secretary of the Interior to operate CRSP in accordance with the Law of the River did not effectively protect either his state or the Lower Basin. During Senate subcommittee hearings in early March 1955, Ely stated that legislative direction to the Secretary of the Interior to conform to the Law of the River was "estimable" but "does us no good if the Secretary of the Interior, with the control of these dams in his hand, is in fact interpreting the law of the river" to the harm of the Lower Basin.[131]

The Department of the Interior offered its official views on the amendment in March 1955 as various iterations of the CRSP bill were before the House. The department was skeptical of building a "waiver of immunity of the United States from suit in the Supreme Court" into any legislation. It nevertheless signaled that it would offer no objection if the provision was limited "to storage and release of water," "that it be made clear that the waiver runs only in favor of a State adversely affected by the storage and release of water."[132]

Will was not the only one to recognize the benefit of permitting the Colorado River Basins states to go immediately to the Supreme Court. During an Executive Session of the House subcommittee in June 1955, Hosmer introduced another version of the amendment. He remarked on how long *Arizona v. California* had been proceeding and expressed "hope by this kind of an amendment to bring to quicker decision any suit that might be brought" in the future.[133] Hosmer's version would have permitted any Colorado River Basin state to initiate an action in the Supreme Court "to enforce any of the provisions" of the compacts, the Boulder Canyon acts, and the Mexican Treaty.[134] Committee members, however, voted down the provision, arguing that it was too broad and fearing it would

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[129] *S. 500 Hearing*, 157-161 [EX. BI].
[130] Congress, House, Committee on Interior and Insular Affairs, *Colorado River Storage Project: Hearings Before the Subcommittee on Irrigation and Reclamation on H.R. 270, H.R. 2836, H.R. 3383, H.R. 3384, and H.R. 4488 To Authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects and for Other Purposes*, 84th Cong., 1st sess., March 11, 14, 16, 17, 18, 19, and 28, 1955 (GPO, 1955), 626 [EX. AU].
[131] *S. 500 Hearing*, 587 [EX. BH].
[132] Congress, House, Committee on Interior and Insular Affairs, *Colorado River Storage Project: Hearings Before the Subcommittee on Irrigation and Reclamation on H.R. 270, H.R. 2836, H.R. 3383, H.R. 3384, and H.R. 4488 To Authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects and for Other Purposes*, 84th Cong., 1st sess., March 9 and 10, April 18, 20, and 22, 1955 (GPO, 1955), 27- 28 [EX. AT].
[133] Congress, House, *Executive Session, H.R. 3383 and Related Bills Colorado River Storage Project* [unpublished] [hereafter *Executive Session, H.R. 3383*], June 13, 1955, 450-452 [EX. AS].
[134] *Executive Session, H.R. 3383*, 451 [EX. AS].

create an avenue for power operators or water districts to pursue litigation in the Supreme Court.[135]

The CRSP bill that prevailed – introduced as S. 500 in January 1955 by senators from New Mexico, Colorado, Wyoming, Utah, and Arizona and which became Public Law 84-485[136] – featured a provision that reflected three of the four ideas expressed in Ely's "Amendment No. 5" from a year earlier. Under Section 12 of S. 500 as introduced, the Secretary of the Interior was to operate and maintain CRSP facilities in compliance with the 1922 Compact, BCPA, BCPAA, and the 1944 Mexican Treaty. Any basin state could "maintain an action in the Supreme Court" if the Secretary of the Interior failed to do so and consent was "given to the joinder of the United States as a party in any such suit or suits." Section 12 additionally denied to hydropower rights, "regardless of the date of origin of such use," a "priority over…domestic or agricultural purposes within any of the States of the Upper Colorado River Basin."[137]

The Senate Committee on Interior and Insular Affairs subsequently revised the bill in March 1955 to incorporate – as Rogers had proposed in his CRSP bill, HR 4488 – the Upper Basin Compact among the documents with which the Secretary of the Interior was to comply in Section 12. The committee also elected to revise the language in the provision that specified that water for power must not be given priority over domestic or agricultural uses in the Upper Basin to include the entire "Colorado River System."[138]

The conference committee of the House and Senate made further slight alterations to Section 12, rendering it as Section 14. The language regarding priority of water impounded for power generation was revised slightly and moved into a different section,[139] while reference to the Upper Basin Compact was retained. The compact was identified as among the documents the provisions of which the Secretary of the Interior was to adhere. The language regarding the ability of Colorado River Basin states to "maintain an action in the Supreme Court," should the Secretary of the Interior fail "to so comply" was likewise kept.[140] The conference report offered only a limited explanation for these revisions. It stated succinctly that Section 14 was "amended to make clear the intent of Congress that the United States may be joined as a party" in any suit filed by "any State of the

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[135] *Executive Session, H.R. 3383*, 452-466 [EX. AS].
[136] Terrell, *War for the Colorado River, Vol. Two*, Appendix B.
[137] *S. 500 Hearing*, 9 [EX. BI].
[138] Congress, Senate, Committee on Interior and Insular Affairs, Report No. 128, 84th Cong., 1st sess., *Colorado River Storage Project: Report of the Committee on Interior and Insular Affairs, United States Senate, Together With Separate and Minority Views to Accompany S. 500 A Bill to Authorize the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects in the States of Arizona, Colorado, New Mexico, Utah, and Wyoming*, March 30 (legislative day March 10), 1955, 27 [EX. AV].
[139] It became part of Section 7, and was expressed this way: "Subject to the provisions of the Colorado River Compact, neither the impounding nor the use of water for the generation of power and energy at the plants of the Colorado River storage project shall preclude or impair the appropriation of water for domestic or agricultural purposes pursuant to applicable State law." See 70 Stat. 105 §7 (1956), 109-110 [EX. AN].
[140] 70 Stat. 105 §14 (1956), 110-111 [EX. AN].

Colorado River Basin asserting noncompliance with the provisions of the law made applicable to this section."[141]

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Significantly, in the years following passage of CRSPA as the CRSP units and participating projects were constructed, there is historical evidence that satisfaction of the 75 MAF over 10 years Lee Ferry obligation remained an article of faith and policy for the Upper Basin states and Reclamation in the operation of the units. Reclamation and the basin states entered a phase of extended negotiations over the initial filling of the units and the criteria for their operation that lasted through the 1960s. Given that compliance with the 1922 Compact was central to the project – and required by Section 14 – Reclamation consistently recognized that any operational regime must meet the Lee Ferry "obligation." In a Reclamation study of the finances and economics of CRSP transmitted to the Senate by then-Secretary of the Interior Fred A. Seaton in February 1958, Reclamation wrote that "[t]he holdover reservoirs in the Upper Colorado River Basin are designed to impound water in years of high runoff and release such water during prolonged dry period to permit the upper basin to increase its uses and still meet its compact obligations for flows at Lee Ferry for the benefit of the lower basin and Mexico."[142]

In 1964, when CRSP became operational yet the question of filling criteria for Glen Canyon Dam remained, Colorado Upper Basin commissioner (and former US Senator and Colorado governor) Edwin Johnson took the opportunity to opine at length to his fellow commissioners on his understanding of the Upper Basin's obligation under the 1922 Compact:

> The Colorado River Compact imposes a terrifying burden on the Upper Basin. Before the people of Denver or Colorado Springs or the Air Force Academy can take a drink of Colorado River water, before Northern Colorado or the Arkansas Valley can turn a drop of Colorado River water on their parched crops, to say nothing of the Western Slope of Colorado, the State of Utah, Wyoming and New Mexico, 7,500,000 acre-feet of water must be delivered to the Lower States at Lee Ferry. Of course, we know that is on a ten-year basis, 75,000,000 acre-feet in those ten years, but that is a terrible burden.
>
> I was in the Colorado Legislature when this Compact was ratified by the State of Colorado, and I objected strenuously to that provision. Instead of dividing it so each of them would get their water, we gave the Lower Basin the preference.
>
> But Delph Carpenter, a brilliant lawyer and a great patriot, and Ward Bannister, another great water lawyer, called on me and said, "We don't want you to oppose it, we want you to go along because we are getting some advantages too. We are in a bad position with the Lower States because they are in shape to go ahead with the development, and under our doctrine of first-in-time, first-in-right, with this kind of a doctrine we are in grave danger."

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[141] Congress, House, Report No. 1950, 84th Cong., 2d sess., Conference Report [To accompany S. 500] *Authorizing the Secretary of the Interior to Construct, Operate, and Maintain the Colorado River Storage Project and Participating Projects*, March 27, 1956 – ordered to be printed, 10 [EX. AW].

[142] Congress, Senate, Document No. 101, *Financial and Economic Analysis Colorado River Storage Project and Participating Projects: A Study prepared by the United States Department of the Interior, Bureau of Reclamation*, February 1958, 85th Cong., 2d sess., 13-14 [EX. AX].

> And then they pointed out a recent decision that shook all of Colorado and that was the Wyoming-Colorado case in which the first-in-time was the first-in-right was extended interstate and made available to the lower states on a river.
>
> It is not a share and share alike proposition; it is a preference arrangement--a preference arrangement, mind you. Can we be blamed if we try to protect ourselves and the Lower Basin? Protecting them too, trying to give them good water service, that is what Glen Canyon will do for them....[143]

Johnson was especially concerned that the criteria for filling Lake Powell was compliant with the 1922 Compact. He posed the question to the then-Commissioner of Reclamation Floyd Dominy and Reclamation counsel Edward Weinberger as to whether or not "such delivery – and we are talking about the delivery of 75,000,000 acre-feet – takes precedence over the 7,500,000 acre-feet of water the Upper Basin is authorized to consume each year?" To this, Weinberg replied:

> Senator, if it comes down to a question of whether there is enough water for 7,500,000 acre-feet of beneficial consumptive use in the Upper Basin and the meeting of the 75,000,000 acre-foot guarantee, I have never heard anyone express any other opinion than that the 75,000,000 acre-foot guarantee is the first responsibility.[144]

Reclamation and the Upper Colorado River Commission affirmed the fundamental nature of meeting the Lee Ferry obligation in discussions that took place during the period between passage of the Colorado River Basin Project Act ("CRBPA") in 1968 and adoption of the "Long-Range Operating Criteria" ("LROC," prescribed by Section 602 of the act) in 1970. CRBPA carried forward some of the language of CRSPA Section 14 in its Section 601(c) that directed all federal officials and agencies to comply with the "Law of the River" documents in "the storage and release of water from all reservoirs and in the operation and maintenance of all facilities in the Colorado River system under the jurisdiction and supervision of the Secretary...."[145] In February 1969, D.L. Crandall, Region IV Director reminded the Upper Colorado River Commission that "[t]he key factor on the Lake Powell operation, of course, is the delivery to the Lower Basin."[146] Later that year, Ival Goslin (now serving as the UCRC Executive Director) reported that one of the Upper Basin's objectives for LROC was "to maintain the required stored water in Colorado River Storage Project reservoirs to guarantee that 75,000,000 acre-feet of water can be delivered at Lee Ferry in every period of ten consecutive years without impeding the desired rate of resource development in the Upper Basin or curtailing consumptive uses."[147]

By early 1970, on the eve of the adoption of LROC, the Upper Basin states opposed some of the "general principles" being proffered by the Secretary of the Interior that seemingly privileged

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[143] Upper Colorado River Commission, [hereafter UCRC] *Official Record*, vol. 16 (1964), Meeting No. 88, Denver, Colorado, April 14 and 15, 1964, 72 [EX. AY].
[144] UCRC *Official Record*, vol. 16 (1964), Meeting No. 88, Denver, Colorado, April 14 and 15, 1964, 178-179 [EX. AY].
[145] *An Act To authorize the construction, operation, and maintenance of the Colorado River Basin project, and for other purposes* (S. 1004), Public Law 90-537, 82 Stat. 885, September 30, 1968 [EX. AZ].
[146] UCRC *Official Record*, vol. 21 (1969), Meeting No. 108, Denver, Colorado, February 13, 1969, 48 [EX. BA].
[147] UCRC *Official Record*, vol. 21 (1969), Meeting No. 111, Denver, Colorado, October 1, 1969, 20-21 [EX. BB].

power production in the Lower Basin over water for irrigation and domestic uses. Colorado, New Mexico, Utah, and Wyoming in a statement of "Comments and Recommendation" asserted that the 1922 Compact "recognizes that due to the erratic flows of the river the Upper Basin without storage cannot use consumptively its full apportionment of water, or so much of it as may be available, and at the same time deliver an average of 7.5 million acre-feet of water per year to the Lower Basin." "Even if it is conceded that the Art. III (d) obligation of the Upper Division States to deliver an average of 7.5 million acre-feet of water per year at Lee Ferry gives the Lower Division a priority on the available water supply," the states argued that "priority is certainly limited by Art. III (e) [of the 1922 Compact] to domestic and agricultural purposes."[148]

[148] "Comments and Recommendations of Colorado, New Mexico, Utah, and Wyoming on the Secretary of the Interior's December 16, 1969 Proposed Long-Range Operating Criteria for Colorado River Reservoirs," March 26, 1970, 1 and 2. ff. 43, Box 51, Goslin Collection, CSUFC [EX. BC].

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