CONSERVE
SOUTHWEST UTAH

September 7, 2020

Mr. Rick Baxter, Program Manager
Bureau of Reclamation
Provo Area Office
302 East Lakeview Parkway
Provo, Utah 84606
Comments sent via email: lpp@usbr.gov

RE: Conserve Southwest Utah Comments on the Draft Environmental Impact Statement for the Lake Powell Pipeline project proposed by the Utah Board of Water Resources.

Dear Mr. Baxter,

Conserve Southwest Utah (CSU) is a nonprofit environmental advocacy organization based in Washington County, Utah. Our vision is that Southwest Utah grows in a manner that enables conservation and restoration of its natural and cultural resources. Our mission is to advocate for conservation and stewardship of our area's natural and cultural resources and for implementation of the Smart Growth policies that enable conservation for the benefit of present and future generations. Our membership includes more than 2,000 individuals. Please accept and fully consider these comments on the Draft Environmental Impact Statement (DEIS) for the Lake Powell Pipeline project (LPP) and the Arizona Strip Field Office Draft Resource Management Plan (RMP) Amendment.

We could summarize our comments as: The LPP is unnecessary because, under any reasonable water management program, Washington County should not need more water in the next four decades than is now available in the Virgin River watershed. Even if we do, it's highly unlikely that water will be available from the Colorado River because of climate change and the over-allocation of the Colorado River. By then, we will have much better uses for the money it would have taken to build the Lake Powell Pipeline.

More formally, the proponents have not proven a need for more water. They have introduced, without justification, arbitrary requirements that only a pipeline from Lake Powell can satisfy, and the DEIS, in accepting these requirements without questioning their justification and ignoring the Council for Environmental Quality's regulations on analyzing reasonable alternatives even if the agency does not have the authority to implement them, has rejected out of hand any alternative that relies primarily on water conservation that would bring Washington County's per capita demand to a more reasonable level, similar to other, vibrant communities in the United States southwest.

The Bureau of Reclamation (BOR) has also failed to assess whether this project is ripe for EIS analysis when, even under the assumptions in the DEIS, the proponents have not demonstrated a need for water for many years or decades.

Thomas Butine
President

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1 Purpose and Need Arbitrary and Inadequate[1]

We find the purpose and need for the Lake Powell Pipeline project (LPP) to be contrived on arbitrary requirements and unsubstantiated assumptions. These include outdated thinking about demand for water, a new and arbitrary requirement for a "second source" of water, unreasonable "reserve buffer," and excessive "system loss" provisions, among other weaknesses and failures. We believe the DEIS should be withdrawn and re-defined.

1.1 Decoupling Population Growth from Assumed Demand for Water

The assumption that population growth requires a proportional increase in water demand is an antiquated notion. They are not directly connected in other places, so why begin with that assumption for this DEIS? According to the DEIS: [2]

> *"Despite the various conservation objectives listed in Chapter 5 of Appendix B, Purpose and Need Report, population growth will increase total annual water demand beyond the existing water supplies in Washington County."*

Put simply, southwest communities are consistently using less water even as populations grow. In almost all municipal areas served with Colorado River water, water use is going down, not up, despite population growth. A well-known expert recently remarked, "*We have been getting it wrong for a century*."[3] Indeed, some cities are growing rapidly while using less water.[4]

Add to that fact, in 2017 the Kem C. Gardner Policy Institute projected Washington County's 2060 population at 468,830[5], which is 400,000 less than the 860,378 that was predicted in UDWRe's Water Needs Assessment to the Federal Energy Regulatory Commission (FERC), just six years earlier.[6]

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1. On July 16, 2020, the Council on Environmental Quality issued a Final Rule amending its NEPA regulations, found at 40 C.F.R. Parts 1500-1508. See Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act, 85 Fed. Reg. 43304 (July 16, 2020) ("CEQ Final Rule"). While the CEQ Final Rule, which becomes effective September 15, 2020, makes a number of revisions and clarifications to regulations applicable to the LPP EIS process, it does not, nor can it, change the substantive statutory duties and obligations required of Reclamation under NEPA. Furthermore, to the extent that the CEQ Final Rule "updates, modernizes, and clarifies" CEQ's NEPA regulations in a legally defensible manner, it does so consistently with the wealth of case law and federal agency experience developed over the past fifty years, including the cases and guidance cited herein. Reclamation has no legal obligation to apply the CEQ Final Rule, which is subject to considerable criticism and potential challenge, to the LPP. To the extent it does, and interprets the CEQ Final Rule to alter longstanding standards by which this Project has been assessed up to this late stage, after a decade of consideration in various forms and production of a DEIS under existing regulatory standards, it could, in Conserve Southwest Utah's opinion, invite significant risk of judicial review on procedural grounds.
2. DEIS, Section 1.2 Statement of Purpose and Need, p. 8.
3. Kuhn, E. and J. Fleck, Science be Dammed, How Ignoring Inconvenient Science Drained the Colorado River, University of Arizona Press, 2019, p. 215.
4. Fast Company, article April 25, 2011, at: https://www.fastcompany.com/1749643/the-big-thirst-nothings-quite-so-thirsty-as-a-las-vegas-golf-course.
5. Kem C. Gardner Policy Institute, "Utah's Long-term Demographic and Economic Projections", July 1, 2017, at: https://gardner.utah.edu/wp-content/uploads/Kem-C.-Gardner-County-Detail-Document.pdf.
6. UDWRe, Lake Powell Pipeline Project: Water Needs Assessment, 2016, at https://conserveswu.org/wp-content/uploads/FERC-Water-Needs-ASSESSMENT-19-5-5-16.pdf.

Of more local interest, according to René Fleming, St. George City Water and Energy Conservation Coordinator, water use in St. George is not growing with population growth:[7]

> *"In 2010 water use reported on the annual reporting the state requires was about 27,000 acre-feet. In 2017 it was about 24,000 and population grew from roughly over 70,000 to above 80,000 in the same time period.*

She speculated that:

> *"Vegetative cover has decreased by about 16%. I have a power point slide with an aerial view of a home in 1998 with a lot of grass and a similar sized lot and home in 2018 that is mostly xeriscaped."*

In fact, St. George City was using the same amount of water in 2019 as it did in 2010, even though the population had grown from roughly over 70,000 to above 80,000 in the same period. The public's attitudes about need for vegetative cover—something that communities can influence—is apparently a major reason. Therefore, LPP proponents' claim that the demand for water will grow significantly with population growth needs to be reevaluated.

Another example of a community experiencing growth but using less water is Las Vegas.[8]

> *"In the last 20 years, per capita water use in Las Vegas for all purposes has fallen 108 gallons a day, from 348 gallons per person a day to 240 gallons.*
>
> *"You don't accomplish that by turning off the water while you brush your teeth (although that helps). You have to fundamentally change people's approach and attitude about water.*
>
> *"In the last 10 years, Las Vegas has grown by 50 percent in population, but the actual use of water hasn't changed at all. The conservation has, in fact, enabled the growth."*

The disconnect between growth and water use is also reflected in agriculture. Authors Eric Kuhn, retired General Manager of the Colorado River Water Conservancy District, and John Fleck, director of the University of New Mexico's Water Resources Program, in their book, Science Be Dammed, wrote:[9]

> *"The widespread presumption that population growth means growing water demand drives much of the politics of water planning in the Colorado River Basin. But it is wrong. Simply put, we are consistently using less water. In almost all the municipal areas served with Colorado River water, water use is going down, not up, despite population growth. Water use in the basin's major agricultural regions also is going down, even as agricultural productivity continues to rise. This is not limited to the Colorado River Basin. Such "decoupling" between water use, population, and economies is common across the United States."*

7. Email from René Fleming, Manager of Energy And Water Customer Services, Water and Power Administration, to Jane Whalen, dated September 24, 2019.
8. Fast Company, article April 25, 2011, at: https://www.fastcompany.com/1749643/the-big-thirst-nothings-quite-so-thirsty-as-a-las-vegas-golf-course.
9. Utah Public Radio interview with E. Kuhn and J. Fleck, authors of Science be Dammed, How ignoring Inconvenient Science Drained the Colorado River, 2019, p. 215, at: https://www.upr.org/post/science-be-damned-water-rights-and-scarcity-eric-kuhn-wednesdays-access-utah.

Major water providers elsewhere are adjusting their practices. Author John Fleck, in an interview with the Public Policy Institute of California[10], responding to a question, "What are the main reasons Californians are using less Colorado River water?", described the California's Metropolitan Water District (MWD) experience:

> *"Prior to the early 2000s, MWD generally took the maximum it could from the Colorado River, usually more than a million acre-feet per year. In recent decades, it has substantially reduced its dependence on the Colorado, only taking a full supply in years of State Water Project shortage. Water conservation has been an enormous success in Southern California. There was a lot of progress in conservation during the latest drought, and even after it ended. We're seeing a lot more effective use of water in the basin, with a growing emphasis on groundwater recharge, stormwater capture, and reuse efforts."*

1.1.1 Washington County's Wasteful Water Use[11]

It's past time when our own Washington County Water Conservancy District (WCWCD) should be rethinking its future needs. In a June 2018 press release,[12] WCWCD revealed that our 303 gallons per capita per day (GPCD) breaks down this way:

> *"The data reports that Washington County residents used **143 gallons** per person daily (also known as GPCD -- gallons per capita per day). **Factoring in all potable water use (second home, commercial, institutional and industrial), the total was 231 GPCD.** Unlike most other cities and states, Utah reports secondary (untreated) and reused water in its total GPCD numbers. Most of Washington County's **secondary water (72 GPCD)** is used to irrigate parks, cemeteries and golf courses."* (emphasis added)

WCWCD estimated that 70 GPCD of the county's culinary treated water use was applied to residential landscaping. However, Dennis Strong, former director of the Utah Division of Water Resources (UDWRe), said in a video that if people in southern Utah changed their landscaping, they wouldn't need the LPP.[13]

The state and WCWCD assert that mandating conservation would severely restrict outdoor watering, which would impact the region's economy, environment, quality of life, and tourism. CSU does not see it that way nor, apparently, do other desert cities that have vibrant economies with tourism while continuing to reduce their water demand through effective conservation, and which use less water now than the state plans for our area in 2065.

Our current 303 GPCD can and should be reduced. There have been several comparisons indicating that 175 GPCD has been achieved in several attractive, growing, popular, and economically thriving communities. Although it can be difficult to compare water use from various places because they may be measuring different things, there are comparisons available, one example of which comes from

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10. Public Policy Institute of California, interview with John Fleck, author of Science be Dammed, How ignoring Inconvenient Science Drained the Colorado River, March 2, 2020, at: https://www.ppic.org/blog/why-the-big-drop-in-californias-colorado-river-water-use/.
11. M&I: Municipal and Industrial = Residential + Commercial + Institutional + Industrial, both culinary and secondary; all human water use excluding agriculture (crops and stock), which is all secondary. Almost all Washington County M&I use is metered; however secondary water is not.
12. WCWCD, Press Release, June 15, 2018, at: https://www.wcwcd.org/wp-content/uploads/2018/06/2015-Water-Use-Numbers.pdf.
13. Utah Rivers Council, video recording, at: https://m.youtube.com/watch?v=oY_KXDS6hbQ.

USGS[14] and is reproduced from a report by Peter Mayer, WaterDM,[15] in graphical form in Figure 1. In a comparison of residential water use in 2015, it shows Utah having one of the highest use rates in the western United States.

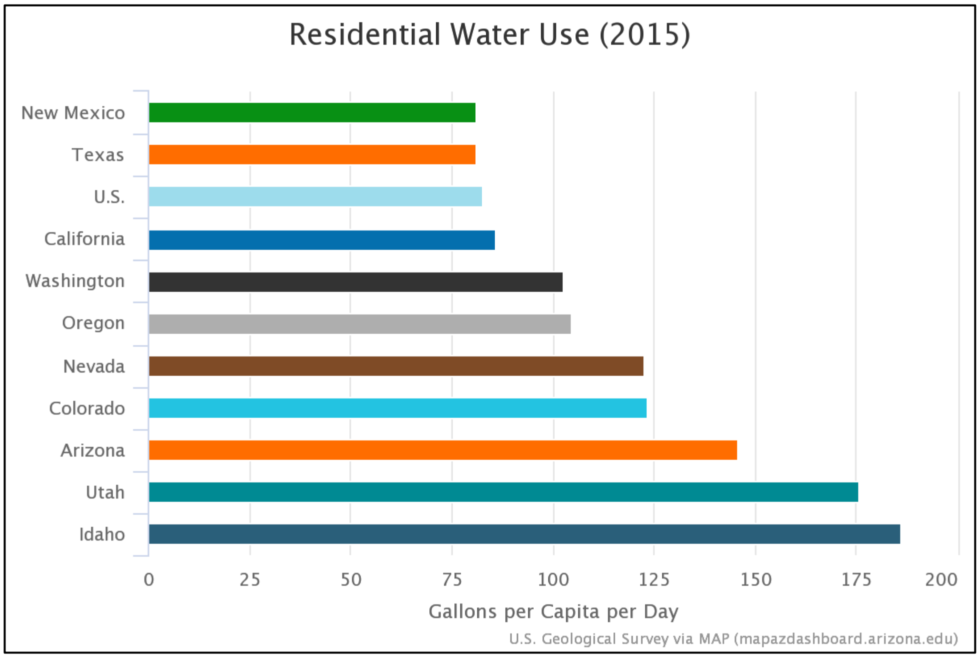

Figure 1. Comparison of residential water use in the United states, Utah, and other western states, reproduced from WaterDM report. (Source: U.S. Geological Survey via MAP, mapazdashboard.arizona.edu.)

Although it requires assumptions to compare water use between places, it can and should be done by Utah's water agencies to "normalize" the comparison before making generalized comments inferring that we are doing as well, conservation-wise. While normalizing this data doesn't seem to be especially onerous, neither the UDWRe nor the WCWCD has undertaken this task. This is a major point of contention that must be resolved. Even the State of Utah's own legislative auditors make comparisons. They stated:[16]

> *"According to the U.S. Geologic Survey, Utah has the highest per capita water use in the nation."*

And the U.S. Environmental Protection Agency (EPA) acknowledges that, like other western states, Utah's water usage is higher than most of the rest of the country:[17]

> *"The West also has some of the highest per capita residential water use in the nation. Lack of rain and its residents' landscaping preferences contribute to per capita water use in the West that far exceeds the national average of 179 gallons per day."*

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14. USGS, "Estimated Use of Water in the United States in 2015", Circular 1441, Supersedes USGS Open-File Report 2017–1131, at: https://pubs.usgs.gov/circ/1441/circ1441.pdf.
15. Mayer, P., WaterDM, "Expert opinion and analysis regarding water demands and statement of need for the Lake Powell Pipeline Project DEIS", September 4, 2020 (reproduced in Appendix C herein).
16. Office of the Legislative Auditor General, Audit Report No. 2015-01, "A Performance Audit of Projections of Utah's Water Needs," p. 28, at: https://olag.utah.gov/olag-doc/15_01rpt.pdf.
17. EPA, "Growing Toward More Efficient Water Use: Linking Development, Infrastructure, and Drinking Water Policies", Environmental Protection Agency, Publication 230-R-06-001 January 2006, p. 2, at: https://www.epa.gov/sites/production/files/2014-01/documents/growing_water_use_efficiency.pdf.

Moreover, water use has been declining in the United States in recent years, despite increasing population, as shown in Figure 2, from a report by WaterDM[18] (reproduced in Appendix C) and contrary to the assertions in the DEIS. In 2015, average consumption in the United States was less than 140 GPCD, compared with more than 300 GPCD in Washington County. Table 1 shows comparisons of communities by DeOreo et al. with Washington County's per capita consumption—even as projected decades hence—much higher than many other vibrant southwest communities. [19]

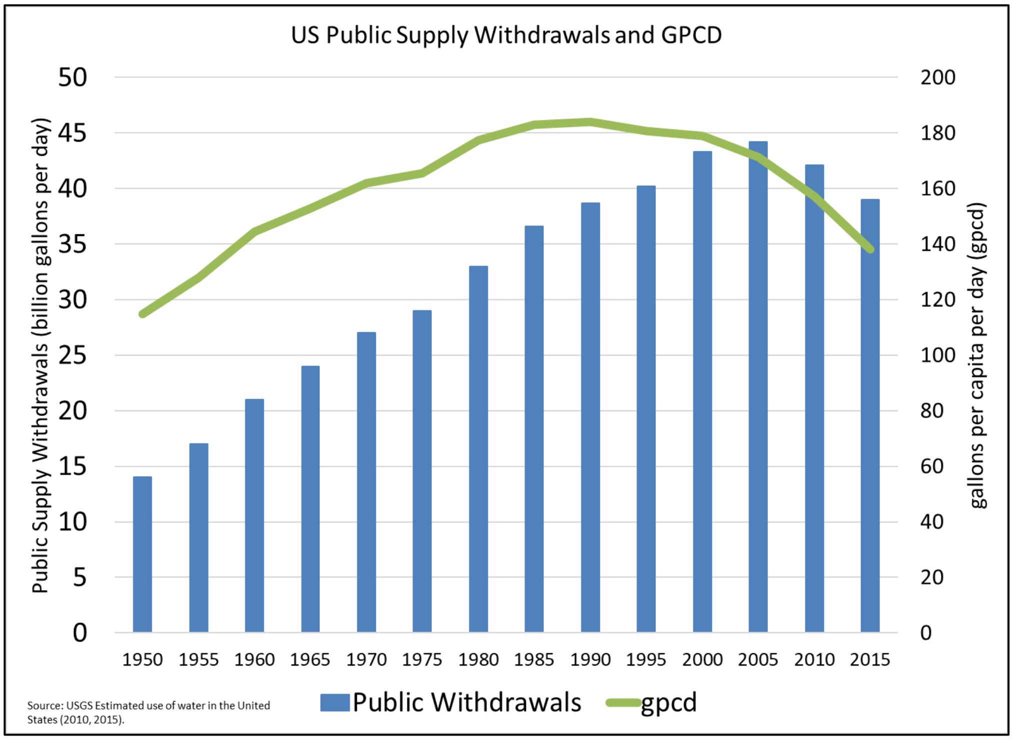

Figure 2. US Public Supply Withdrawals and GPCD, 1950 – 2015, reproduced from WaterDM report.

> *"To better understand the forecast GPCD values in the DEIS, these data were compared against per capita use from cities that participated in the 2016 Residential End Uses of Water Study. Per capita use was calculated for this study using the same approach as the DEIS with water losses explicitly excluded, but all other uses (residential, commercial, irrigation, etc.) included. The most "apples to apples" comparison of gpcd is to compare potable GPCD, as presented in Table 1 (from a report reproduced in Appendix C). In 2015, even potable water use by itself in Washington County averaged 231 GPCD, placing it among the highest levels of per capita use of comparable western cities, as shown in Table [1].*

18. Mayer, P., WaterDM, "Expert opinion and analysis regarding water demands and statement of need for the Lake Powell Pipeline Project DEIS", September 4, 2020 (reproduced in Appendix C herein).
19. DeOreo, W.B., P. Mayer, J. Kiefer, and B. Dziegielewski, "Residential End Uses of Water, Version 2". 2016, Water Research Foundation. Denver, CO.

Table 1. Per capita water use.		
Agency	**Population**	**GPCD**
Washington County WCD - 2015 potable + secondary + water loss	**151,360**	**348.2**
Washington County WCD - 2015 potable + secondary	**151,360**	**302.0**
Washington County WCD - 2075 potable + secondary + water loss forecast	**594,660**	**277.0**
Scottsdale, AZ – 2010 potable	217,385	273.1
Henderson, NV – 2010 potable	277,502	256.9
Washington County WCD - 2075 potable + secondary forecast	**594,660**	**240.0**
Washington County WCD - 2015 potable	**151,360**	**231.0**
Colorado Springs, CO – 2010 potable	441,000	212.3
Washington County WCD - 2075 potable forecast	594,660	190.0
Fort Collins, CO – 2010 potable	129,000	157.9
Denver, CO – 2010 potable	1,174,000	156.7
Tacoma, WA – 2010 potable	317,450	150.0
Otay, CA – 2010 potable	198,616	149.9
Tucson, AZ – 2010 potable	545,975	144.0
Mountain View, CA – 2010 potable	72,800	132.6
Aurora, CO – 2010 potable	325,078	126.6
Austin, TX – 2010 potable	886,768	121.9
San Diego, CA – 2010 potable	1,312,000	118.2
Santa Barbara, CA – 2010 potable	91,416	115.0
San Antonio, TX – 2010 potable	1,360,000	105.7
Philadelphia, PA – 2010 potable	1,500,000	104.5
Chicago, IL – 2010 potable	5,300,000	98.4
Sacramento, CA – 2010 potable	430,437	91.4
Portland, OR – 2010 potable	915,800	61.0

We cannot just pass off our area's higher water use by attributing it to a lack of rain. As noted by the EPA, above, landscape choices affect usage. Plantings that require more water than a semi-arid environment provides can greatly affect our usage. Add to that that Utahns generally over-water their lawns and landscape vegetation, as also noted in the 2015 Utah Legislative Audit of the UDWRe[20], and you have a recipe for unreasonably high consumption.

The state and WCWCD acknowledged in study reports to FERC, the federal LPP licensing agency from 2008-2019 before the application was withdrawn by UDWRe[21], that approximately 100,000 acre-feet per year (AFY) of water can be provided in the future without the LPP.[22] Table 2 shows how three water usage rates would allow growth to meet the 2065 projected population of 508,952.[23]

Table 2. Projected water use for population projections in Washington County.

Water Use (GPCD)	Projected 2065 Population	Total Water Use		
		Per Day (Gallons)	Per Day (Acre-Feet)	Per Year (Acre-Feet)
175	508,952	89,066,600	273.21	99,722
180		91,611,360	281.02	102,571
185		94,156,120	288.82	105,420

Western Resource Advocates (WRA), an organization with experts on water in the west, published a Local Waters Alternative[24] promoting the use of local water over building the LPP. WRA's study asserts that even more water will be available in the future through increased conservation measures, agricultural conversion due to growth, and additional water reuse.

WRA also found that Washington County used more water per capita than many communities in the southwest. Figure 1, below, from the *Local Waters Alternative*[25], shows a comparison of water use in various Southwest communities. Some of the differences in water use have been attributed to differences in demographics and climate, but these differences can be reconciled through a normalization process mentioned earlier. (Of note, a later analysis determined that Las Vegas is even now using less GPCD than Washington County; see below.)

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20. Utah Office of Legislative Auditor General, A Performance Audit of Projections of Utah's Water Needs https://le.utah.gov/audit/15_01rpt.pdf.
21. The UDWRe withdrew its application from FERC because they thought they could get faster approval from Bureau of Reclamation, "Notice of Effective Date of Withdrawal of License Application re Utah Board of Water Resources under P-12966," at: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20191016-3069.
22. UDWRe, Lake Powell Pipeline Project: Water Needs Assessment, 2016, at https://conserveswu.org/wp-content/uploads/FERC-Water-Needs-ASSESSMENT-19-5-5-16.pdf.
23. Kem C. Gardner Policy Institute, "Utah's Long-term Demographic and Economic Projections," University of Utah, July 1, 2017, at: https://gardner.utah.edu/wp-content/uploads/Kem-C.-Gardner-County-Detail-Document.pdf.
24. Western Resource Advocates, The Local Waters Alternative to the Lake Powell Pipeline, 2013, at: https://conserveswu.org/wp-content/uploads/2011/11/WRA-Local-Waters-Alternative-LPP-fact-sheet.pdf.
25. Western Resource Advocates, Local Waters Alternative to the Lake Powell Pipeline Fact Sheet, 2013, at: https://conserveswu.org/wp-content/uploads/2011/11/WRA-Local-Waters-Alternative-LPP-fact-sheet.pdf.

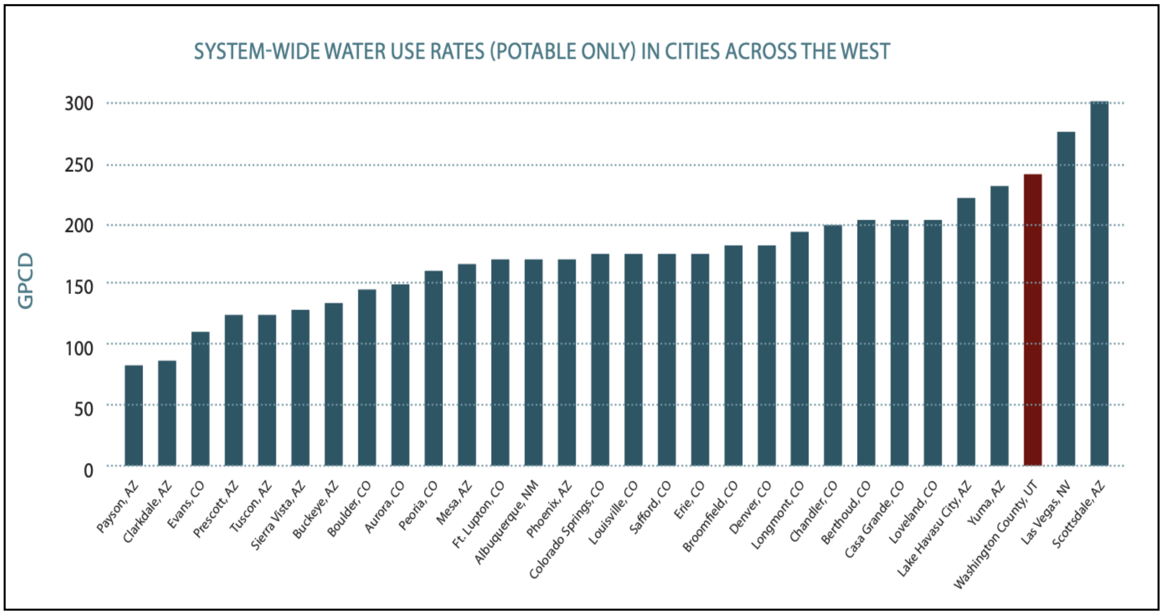

Figure 3. Reproduced from Figure 2 in Western Resource Associates Local Waters Alternative, showing Washington County's GPCD water use in red, nearly the highest of thirty communities they surveyed in the West.

The *Local Waters Alternative* demonstrates that local supplies could meet the projected demand in 2060 without the LPP. Figure 4, reproduced from comments submitted by the WRA to FERC on a 2018 evaluation of the LPP,[26] illustrates the feasibility of their Local Waters Alternative. It shows that the projected demand (yellow line) fits easily within the supply they calculated. The study, done several years ago in 2013, and using on an older, but higher, 2060 population projection, is based on a demand of 192 GPCD for a population of 576,850 and requires a water supply of just 115,000-140,000 acre-feet per year (AFY). Of note, current estimates of population growth have dropped to 468,830 in 2060, further extending the reach of our local water supply.

26. Western Resource Advocates, "Comments on the Preliminary Licensing Proposal for the Lake Powell Pipeline, Project No. P-12966-001", November 16, 2018, at: https://conserveswu.org/wp-content/uploads/2020/06/WRA-Locals-Water-Alternative-updated-2018.pdf.

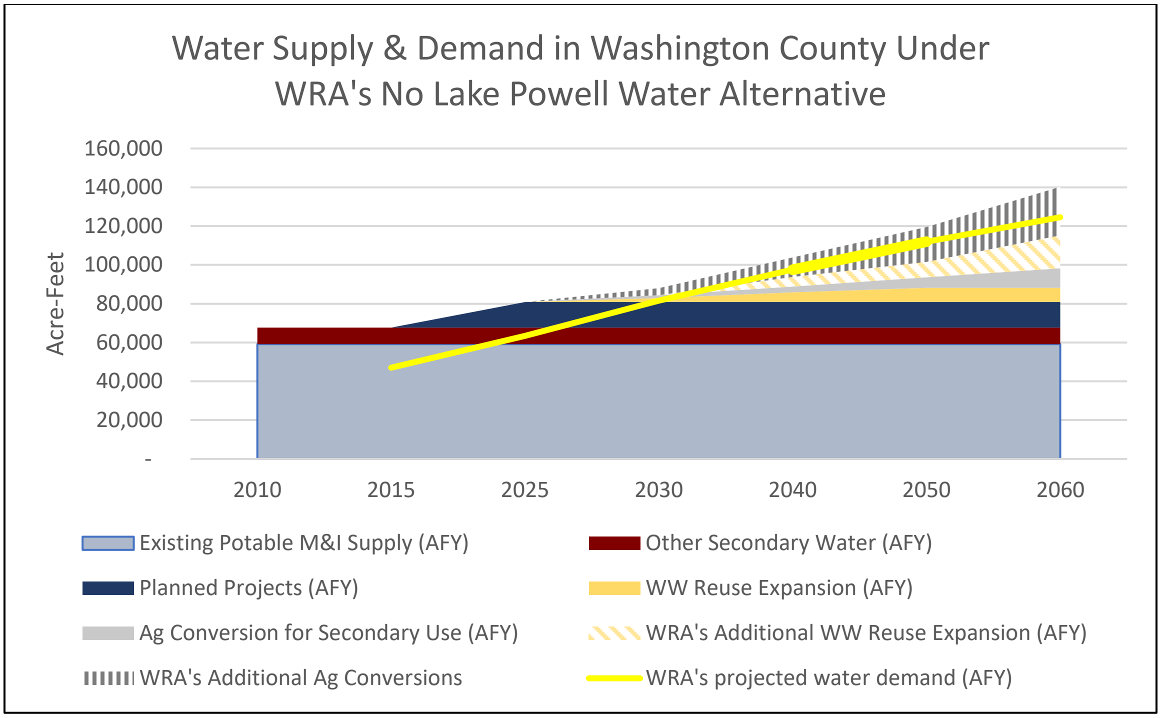

Figure 4. Projected supply and demand of M&I water. Reproduced from Western Resources Associates' Local Waters Alternative.

1.2 New Arbitrary Requirements Preclude Alternatives to the LPP

After years of working with FERC for approval of the LPP, and then abandoning that effort in order to work with an agency thought to be more willing to grant permission, the proponents have suddenly adopted several new "requirements" with little or no justification. They include:

- "Second source" for "water security"
- 15-year "reserve buffer"
- 15.4% provision for "system loss"

The effect of these new requirements precludes nearly any alternative but the LPP, and BOR capriciously accepted this to avoid any meaningful analysis of alternatives recommended by commenters in the past.

1.2.1 Second Source

The proponents and the DEIS state a "requirement" for a second source outside of the Virgin River watershed:[27]

> *"The purpose of the Proposed Project is to deliver a reliable annual yield of approximately 86,000 acre-feet of water per year from outside the Virgin River Basin into Washington County to meet projected water demands in 2060."*

1.2.1.1 Colorado River Compact

The definition of a "second source"—from outside the basin—is arbitrary, having little to do with whether it will be reliable. Indeed, the source sought by this project, the Colorado River, may be one of

27. DEIS, Section 1.2.3 Project Purpose, p. 9.

the least reliable sources in the West, depending as it does not only on flows in a declining and overallocated river, but also the vagaries of politics among the seven western states that have been vying for the same limited source of water for their respective economies for nearly a century.

Authors Eric Kuhn retired General Manager of the Colorado River Water Conservancy District, and John Fleck, director of the University of New Mexico's Water Resources Program, wrote in their book, Science Be Dammed[28], that even as early as 1922, scientists knew the flow of Colorado River was overestimated and over-allocated. With agreements on Compact allocations being complicated and the willingness of the federal government to pay for building the dams in the early 20th century, the allocations were agreed to anyway due to political pressure. They used a hypothetical river flow of ~17 million acre-feet per year (MAFY) at Lee Ferry to decide on how much they had to allocate to each basin. The Lower Basin states (Nevada, Arizona, and California) were to receive a fixed 75 MAF over any consecutive ten-year period. The Mexican Water Treaty of 1944 then allotted 1.5 MAFY to Mexico. Table 3 shows the resulting Colorado River Compact allocations between the major basins.

Table 3. Colorado River Compact allocations.

	Allocation (MAFY)
Upper Basin states	7.5
Lower Basin states	7.5
Mexico	1.5
Total	**16.5**

The problem is that Colorado River flows have historically only been about 13-14 MAFY, with some reports as low as 12.5 MAFY. It has been well-documented by BOR that there is more water allocated in the Colorado River than the river delivers annually, even without considering effects of a warming climate. The releases from Lake Powell and Lake Mead continue to exceed inflows such that the overallocation and overuse have created a functional deficit, which is draining the reservoirs faster than predicted. The Colorado River has reached its limit, yet Utah proposes to take even more water for the LPP.

1.2.1.2 Utah's 23% Colorado River Allocation

Twenty-six years after signing the Colorado River Compact, in 1948, the Upper Basin states of Utah, Colorado, Wyoming, and New Mexico entered into the Upper Basin Compact. The states realized an Upper Basin state's water right couldn't be a fixed amount as was the Lower Basin's right[29] because flows in the Colorado River are so variable. They also realized that, in addition to the Lower Basin's claim to the first 7.5 MAFY at Lee Ferry, Mexico now had a claim on 1.5 MAFY, which was to be shared equally by the Upper and Lower Basins. The Upper Basin states still assumed more than 16.5 MAFY as

28. Utah Public Radio interview with E. Kuhn and J. Fleck, authors of Science be Dammed, How ignoring Inconvenient Science Drained the Colorado River, 2019, at: https://www.upr.org/post/science-be-damned-water-rights-and-scarcity-eric-kuhn-wednesdays-access-utah.
29. California 4.4 MAFY, Arizona 2.8 MAFY, Nevada 0.3 MAFY.

the average flow at Lee Ferry. Consequently, Upper Basin states agreed to an allocation of the remaining flows, apportioned approximately by the percentage of the upper basin's watershed lying within each state.

Reasonable allocations are changing as the realities of lower Colorado River flows become apparent. In 1988 in connection with the Jicarilla Apache Nation's water rights settlement, a hydrologic determination was made for the Navajo Reservoir in a BOR service contract. The Department of Interior (DOI) determined that "*water depletions for the Upper Basin of the Colorado River can be reasonably allowed to rise to 6 million acre-feet (MAF) annually,*" suggesting concern on the part of DOI regarding security of the original allocation for the Upper Basin. Table 4 shows how much of this 6.0 MAFY Utah believes it has yet to use. During negotiations for allocations within the Upper Basin, Utah had accepted an allocation of 23% of the Upper Basin's remaining flow and the use of percentages in the apportionment reflected uncertainty over how much water remains after the Upper Basin had fulfilled its obligation to the Lower Basin. In times of shortage or drought, the Upper Basin River Commission is to decide any needed reductions and Utah's 23% remaining share of the Colorado River is particularly vulnerable because it's such a small percentage of the flow. Colorado's and Wyoming's claims to the Green River tributaries add an additional "upstream" uncertainty to the Law of the River that might affect the amount of water for the LPP, particularly in times of drought.

Table 4. Calculation of Utah's claim to Colorado River flows (assuming flow at Lee Ferry of ~15.0 MAFY for Upper and Lower Basin states, including Mexico's right to 1.5 MAFY).

Allocations	AFY
Total Upper Basin Allocation	6,000,000
Utah's Allocation	23%
Utah Allocation of Upper Basin Flow	1,369,000
Water Use, Depletion[30]	1,008,000
Utah's Calculation of Water Remaining in its Allocation and Available for LPP	361,000

Depending on this remaining share is risky because the water is not physically in the river system due to increased use, reduced snowpack and stream flows from rising temperatures, over-allocation, the junior priority of LPP's water right, and unsettled Federal Reserve Water Rights claims of Native American Tribes. Any rights for Upper Basin diversions, such as for the LPP, are uncertain and variable because the states are allocated only a percentage of what is left after obligations to the Lower Basin, Mexico, and other in-state senior water rights are met. Since flows in the Colorado River are less than originally hoped for, Utah may find that its claim to 361,000 AFY is only theoretical water and is not physically in the river. Every drop in the Colorado River is already being used; in fact, no Colorado River water actually reaches the sea. Still, Utah alleges it can develop 361,000 AFY of its remaining share of

30. UDWRi, in PowerPoint presentation on "Upper Colorado River Basin Current Water Rights Issues", April 2005, described Utah's Upper Colorado River Entitlement and Current Depletions; at: https://www.waterrights.utah.gov/meetinfo/m042005/jdo_2005.ppt.

the Colorado River, originally calculated at 1.369 MAFY, and it has allocated 86,249 AFY of that amount for the Lake Powell Pipeline (LPP).

CSU used a Government Records Access and Management Act (GRAMA) request to the UDWRe years ago and asked for the specific water rights that Utah claims it is using of its 1.369 MAFY compact allocation. The state has not responded.

1.2.1.3 Utah's Colorado River Rights are in Disarray

Utah's web site of Upper Basin Water Rights lists 2.5 million acre-feet (MAFY) of approved depletions. But Utah is only supposed to deplete less than 1.4 MAF. However, data from the Utah Division of Water Rights (UDWRi) website shows "rights" far exceed available water[31]:

- 6,450,413 AFY diversion; and
- 2,542,092 AFY depletion

There are significantly more approved water right applications which, if developed, could exceed Utah's Compact entitlement.[32] [33] There is no guarantee that the LPP water right will be "wet" when it's needed, since senior rights could deplete Utah's allocation.

1.2.1.4 LPP Water Right Faces Shortage: Is Utah's Water Allocation Wet?

Utah water law is based on the Doctrine of Prior Appropriation, the principle of *first in time, first in right*. This means those users holding a water right with the earliest priority date, and who have continued "beneficial use" of the water, have the right to water from a certain source before those with later priority dates. As water supplies decline Utah must apply this principle to decide whose water gets shut off when flows are insufficient to satisfy all rights holders.

An important aspect of a water right due diligence investigation is determining whether the water is "wet." That is, even if the water right exists on paper, is there adequate water available in priority to satisfy the paper entitlement. Many water rights exist that have little or no value because of their legal and physical limitations. There are two principal factors that make a water right just a "paper" right. First, whether the water right has a sufficient priority to allow it to divert water that may be physically available. Second, whether the water is physically available when the water right is in priority. If the answer to either question is "no," then the water right may exist on paper, but have no real value or use. It appears that the LPP water right is likely only a "paper water right."

A 2014 Deseret News article attempted to explain Utah's difficulty in determining water rights:[34]

> *"'Your paper water right may look very big and supply everything you are asking, but the wet water, in reality, can be very different', Kent Jones, the state engineer over water rights, said.*
>
> *"The Colorado River, for example, holds 1.4 million acre-feet of water for Utah to put to use. There are applications approved for more than 2 million acre-feet, and about one half of that is currently in use. Jones said the imbalance has yet to be a*

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31. UDWRi, "Colorado River Water Rights", Updated June 3, 2009, at: https://www.waterrights.utah.gov/distinfo/colorado/WRPriorityDDview.asp.
32. UDWRi, "Water Right Issues in the Upper Colorado River Basin of Utah", 2005, at: https://www.waterrights.utah.gov/meetinfo/m042005/summary.htm.
33. Ibid.
34. O'Donoghue, A., "The water question: The staggering problem of determining water rights", Deseret News, December 15, 2014, at: http://www.deseretnews.com/article/865617715/The-water-question-The-staggering-problem-of-determining-water-rights.html.

problem because the water has not been developed—but the struggle will come with time, and those holding "junior" rights will go wanting."

1.2.1.5 The Colorado River Storage Project (Water Right 41-2963)

In 1956, the federal Colorado River Storage Project (CRSP) Act authorized construction of dams in the upper Colorado River watershed, including Flaming Gorge and Glen Canyon dams. Such a system was necessary to capture spring high water in reservoirs so that the Upper Basin could meet its obligation to deliver 75 MAF over any ten consecutive years (~7.5MAFY) to the Lower Basin and 1.5 MAFY to Mexico. Seventeen additional impoundments and subsystems were completed on various tributaries. One of these projects was the Central Utah Project (CUP), which transfers water from the Uinta Basin to the Wasatch Front from Green River tributaries.

The federal government sought to recoup the cost of the projects by selling hydropower and irrigation water. For the first 60 years after the CRSP Act was passed, Utah had a disagreement with the BOR and didn't want to be required to buy water from the BOR's CRSP, maintaining that it was already Utah's water. Finally, in 2016 Utah agreed to a purchase contract to buy water from the CRSP for the Lake Powell Pipeline at an estimated annual cost of approximately $19 per acre foot.

In exchange for water for the Lake Powell Pipeline, Utah agreed to supply to the Green River an amount equal to the water it will receive from Flaming Gorge Reservoir. This replacement supply is supposed to come from "excess spring run-off" from the Green River tributaries. However, the likelihood of these excess springtime run-offs is significantly decreased, perhaps eliminated, by climate change impacts and senior rights previously allocated to other uses. The Lake Powell Pipeline water right has a priority date of 1958 (though it is unclear why, because the Flaming Gorge Dam wasn't built until 1964). Over the next 60 years the BOR and Utah kept extending this water right without putting it to beneficial use, and the right is scheduled to expire on October 31, 2020 unless extended again. In the meantime, Utah allocated spring runoff flows to other water right holders, such as the CUP's Bonneville Unit, and irrigation companies, which are therefore senior to the water right used for the LPP. If annual water flows decline as expected, the BOR may be forced to deny water for the Lake Powell Pipeline.

1.2.1.6 Central Utah Project (CUP); Water Right 43-3822[35], Priority Date 1964

The LPP water right is even more risky because it's junior to the Central Utah Project (CUP) water right. The CUP water right is not part of the Colorado River Storage Project (CRSP) water right because it did not buy water from the CRSP system and instead diverted surplus high spring flows to canals that go to the Wasatch Front.[36]

> *"The Central Utah Project (CUP) is one of the largest water development projects undertaken by the Bureau of Reclamation in the state of Utah. Region-wide, the CUP is not the largest project, but the initial plans for the CUP were among the most complex, especially given the amount of water the project was originally intended to deliver. The project is a network of tunnels, pipes, canals, pumps, and reservoirs that supply water from the east side of the Wasatch Front [Colorado River Basin] to the Salt Lake City area [Great Basin] along the west side.*
>
> *"The CUP was officially authorized by Congress for construction in 1956 under provisions of the CRSP (43 USC 620). Because of its size and complexity, Reclamation divided CUP into six units to facilitate planning and construction: Vernal, Jensen, Bonneville, Upalco, Ute Indian, and Uintah. The Vernal, Jensen,*

35. UDWRi, "Water Right Details; Water Right: 43-3822, at: https://www.waterrights.utah.gov/asp_apps/wrprint/wrprint.asp?wrnum=43-3822.
36. CUP, " The Central Utah Project - An Overview", at: https://cupcao.gov/TheCUP/overview.html.

Bonneville, and Upalco Units were authorized by the 1956 CRSP Act. The Uintah and Ute Indian Unit were later authorized by the 1968 Colorado River Basin Project Act.

"Over the decades since the CUP's authorization, the changing political climate, budget priorities, and emerging environmental concerns have resulted in many changes to the project. The Vernal and Jensen Units were completed; plans for the Upalco, Uintah, and Ute Indian Units were never realized and the Ute Indian Unit was de-authorized; the purpose and components of the Bonneville Unit have evolved; and the passage of the Central Utah Project Completion Act in 1992 has altered the planning, oversight, and areas of responsibility for the Bonneville Unit."

1.2.1.7 Ultimate Phase[37] (Water Right 41-3479)

The CUP's Ultimate Phase, the UTE Indian Unit, was intended to satisfy the Northern Ute Tribe's water rights, which are senior rights from the Green River.[38] The Ultimate Phase water right (number 41-3479) is for approximately 157,000 AFY of depletion (447,000 AFY diversion). The challenge for Utah is that it has to show that amount of extra water is actually in the system to exchange with BOR to get Lake Powell Pipeline water out of Flaming Gorge Reservoir. Most importantly, water rights for the CRSP and the CUP and its Ultimate Phase depend on surplus, unused spring runoff from lakes, streams, and reservoirs high in the Green River tributaries.

Thus, the Northern Ute Tribe holds rights senior (circa 1861) to the 1922 Colorado River Compact rights which in turn are senior over the LPP water right. However, Utah wants to move half of that Ultimate Phase water right to the south for Washington County instead. The LPP water right was segregated from water right 41-2963, a 1958 water right authorizing the building of the dams on the Colorado River in the CRSP Act.[39] The LPP water right number 41-3479[40] has been split to allow 86,249 AFY for the LPP, and about 72,000 AFY for local water districts in the Uinta Basin, leaving none for the Northern Ute Tribe. The conditions applied to this right include control by the BOR, subject to reduction based on CRSP shortages, and that an equal amount of water is released by Utah from excess spring run-off from the Green River tributaries. Hence, there is no guarantee that the water will be there for the LPP over the long term. The last paragraph of this contract only commits BOR to give Utah notice if there is a shortage of water availability:[41]

"(n) Constraints on the Availability of Water

"In its operation of the Project, the Contracting Officer will use all reasonable means to guard against a condition of shortage in the quantity of water to be made available to the Contractor pursuant to this Contract. In the event the Contracting Officer determines that a condition of shortage appears probable, the Contracting Officer will notify the Contractor of said determination as soon as practicable.

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37. BOR, Bureau of Reclamation, "Central Utah Project Ultimate Phase: Inventory of Available Data" (1965). Elusive Documents. Paper 97, at: http://www.riversimulator.org/Resources/Pipelines/UltimatePhase/CentralUtahProjectUltimatePhaseInventoryAvailableData1965.pdf.
38. Native American Water Rights Settlement Project, "Ute Indian Water Compact; Approval of Ute Indian Water Compact, Utah Code 73-21-1", at: https://digitalrepository.unm.edu/nawrs/73/.
39. BOR, "Colorado River Storage Project", at: https://www.usbr.gov/uc/rm/crsp/index.html.
40. UDWRi, Water Right Details, Water Right: 41-3479, at: https://www.waterrights.utah.gov/asp_apps/wrprint/wrprint.asp?wrnum=41-3479.
41. BOR, "Contract for Exchange of Water, Green River Block", 2017, p. 17, at: https://www.usbr.gov/uc/provo/pdf/GreenRiver_ExchangeContract_V2.pdf.

"If there is a condition of shortage because of inaccurate runoff forecasting or other similar operational errors affecting the Project; drought and other physical or natural causes beyond the control of the Contracting Officer; or actions taken by the Contracting Officer to meet current and future legal obligations, then no liability shall accrue against the United States or any of its officers, agents, or employees for any damage, direct or indirect, arising therefrom."

Therefore, the LPP's water right is controlled by the BOR, not by Utah, and is subject to reduction or elimination by likely shortages in the CRSP due to the general over-allocation of the river in all compact states and the impacts of climate change. There have been discussions resulting in the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead December 2007 (Interim Guidelines).[42] These Interim Guidelines will be reviewed and updated in 2026. The Interim Guidelines manage the operation of Lake Mead and Lake Powell as one reservoir in times of drought. The recent Drought Contingency Plan[43] was agreed to as a bridge to the Interim Guidelines discussions. Arizona and Nevada are expected to face their first-ever cuts in Colorado River water next year.

1.2.1.8 LPP's Junior Water Right Status

Colorado River flows are likely to diminish over time and Utah's junior priority water right of 1958 for the Lake Powell Pipeline will be subordinated to senior water rights holders. The LPP water right is junior to the following water right holders:

- Northern Ute Tribe
- Navajo and other tribal rights
- Lower Basin states
- Mexico
- Other Federal Reserved water rights, not yet determined
- Other water rights established before 1958
- Central Utah Project Bonneville Unit

The question is, as water supplies decline, how much water can Utah plan on using and who has senior priority right to use it for the long-term?

1.2.1.9 Utah's Water Exchange with BOR to Buy Water for the LPP

One of the purposes of the Draft Environmental Impact Statement (DEIS) for the LPP is to approve the State of Utah's request to buy water out of CRSP's Flaming Gorge Reservoir for the Lake Powell Pipeline: [44] (p. 4)

"UBWR has requested a water exchange contract with Reclamation. Under the exchange contract, UBWR would forbear the diversion of a portion of the natural flows to which UBWR is entitled and allow these flows to contribute to meeting the Endangered Species Act Upper Colorado River Recovery Implementation Program

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42. Bureau of Reclamation, "Record of Decision Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead", December 2007, at: https://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf.
43. Agreement Concerning Colorado River Drought Contingency Management and Operations, Signed May 29, 2019, at: https://www.usbr.gov/dcp/finaldocs.html.
44. BOR, "Notice of Intent to Prepare a Draft Environmental Impact Statement and Public Scoping Period for the Lake Powell Pipeline Project", December 6, 2019, at: https://s3.amazonaws.com/public-inspection.federalregister.gov/2019-26357.pdf.

requirements in the Green River. In exchange, UBWR would deplete an equal amount of water released from Flaming Gorge Dam throughout the year and available at Lake Powell."

However, the Utah Board of Water Resources (UBWR) has never disclosed where this extra "exchange" water is located. CSU's preliminary research indicates that the UDWRi has over-allocated the Green River tributaries so there isn't any extra unused springtime "high water" to exchange for this contract. The annual flow of the river has declined, and all the high water is being fully utilized by the CUP and other senior water rights holders. The State of Colorado is also intending to develop its water rights to the Green River tributaries. More importantly, the CRSP is already failing to meet its deliveries of water to the Lower Basin.

CSU submitted a GRAMA request from the (UDWRe) years ago to ask for the specific rights they are exchanging. Their response thus far is that the records from the UDWRe and the UDWRi do not agree with each other, reaffirming CSU's position that the LPP's water right is risky and not secure.

1.2.1.10 Upper Basin Water Right Used in Lower Basin

As proposed, the LPP would move an Upper Basin water right (from Lake Powell above Lee Ferry) for use in the Lower Basin (Virgin River watershed). Arizona objected, reminding BOR and Utah that this transfer violates the Colorado River Compact:

> *"…it is ADWR's position that water from Utah's Upper Basin Allocation may not be transported from Lake Powell to communities in southern Utah located in the Lower Colorado River Basin, including St. George, without specific authorization from Congress. This is because of the 'exclusive beneficial use' language in Article III(a) of the Colorado River Compact of 1922, which allocates water from the Colorado River System to the Upper Basin for exclusive use in that basin and to the Lower Basin for exclusive use in that basin."*[45]

As an interstate compact, this transfer must be approved by Congress and all seven Colorado River Basin States, which seems unlikely now that the states are facing times of shortage.

1.2.1.11 Climate Change to Further Reduce Colorado River Flows

The DEIS claims the LPP is needed because climate change may reduce flows from the Virgin River Basin. BOR ignores that these effects will also be felt int he Colorado River Basin. Harding[46] points this out, citing Milly and Dunne[47] and Udall and Overpeck[48]:

> *"The DEIS cites recent published research by Udall and Overpeck (2017) and Milly and Dunne (2020) to support projections of lower flows on the Virgin River, and thus larger WCWCD supply shortfalls. However, the results in both Udall and Overpeck and Milly and Dunne encompass the entire Upper Colorado River Basin, and can be directly applied to natural flow at Lee Ferry."*

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45. UDWRi, Exhibit A, letter from Thomas Buschatzke, Director of the Arizona Department of Water Resources to Eric Millis, Director of UDWRe, dated July 18, 2017, at: https://www.waterrights.utah.gov/docImport/0624/06246283.pdf.
46. Harding, B., Lynker Technologies, LLC "Lake Powell Pipeline, Draft Environmental Impact Statement", Unpublished memorandum to Jane Whalen, July 28, 2020.
47. Milly, P.C.D. and Dunne, K.A. 2020. Colorado River flow dwindles as warming-driven loss of reflective snow energizes evaporation. Science 367 (6483), 1252-1255. DOI: 10.1126/science.aay9187.
48. Udall, B. and Overpeck, J., "The Twenty-First Century Colorado River Hot Drought and Implications for The Future", Water Resources Research online journal, Vol. 53 Issue 3, March 2017, at: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2016WR019638.

BOR (and Utah) is not adequately considering the impact of climate change on the water availability for the LPP. Udall and Overpeck[49] (abstract) concluded:

> *"Between 2000 and 2014, annual Colorado River flows averaged 19% below the 1906–1999 average, the worst 15-year drought on record. At least one-sixth to one-half (average at one-third) of this loss is due to unprecedented temperatures (0.9°C above the 1906–1999 average), confirming model-based analysis that continued warming will likely further reduce flows…*
>
> *"Recently published estimates of Colorado River flow sensitivity to temperature combined with a large number of recent climate model-based temperature projections indicate that continued business-as-usual warming will drive temperature-induced declines in river flow, conservatively −20% by midcentury and −35% by end-century, with support for losses exceeding −30% at midcentury and −55% at end-century."*

Harding also takes another look at the data provided by the DEIS concerning the probability that Lake Powell would fall below minimum power pool, the lowest elevation level at which Glen Canyon Dam could be used to generate power. He notes (see Appendix B):

> *"…the probability that Lake Powell would be at or below minimum power pool increases with time, and reaches 40% at 2060."*

1.2.2 15-Year Reserve Buffer

The DEIS makes a new claim, not found in Utah's previous applications regarding the LPP to FERC:[50]

> *"Water demand in 2060 must include population projections out to 2075 because the WCWCD incorporates a 15-year reserve buffer."*

There is no justification for the need for a buffer 40 years in the future, or for the period chosen. Why 15 years, as opposed to 10, 20, or even 50 years? Presumably, as population projections for 2060 and beyond and per capita water use have decreased over the last 15 years, the proponents have needed a contrivance to increase demand to justify the LPP. **The buffer arbitrarily increases the demand by nearly 40,000 AFY and is arbitrary and capricious.**

1.2.3 15.4% System Loss

The proponents and BOR insist, reasonably, that estimates of demand include a factor to account for system loss, presumably as a result of leaks or reservoir evaporation. The value they apply—15.4%—however, is never justified. The WCWCD claims nearly $60 million of conservation expenditures over the last twenty years and counts toward that some $13 million which went toward leak detection, or leak prevention. In public meetings WCWCD has claimed substantial work done to control leaks, begging the question of why they still expect to lose nearly a sixth of the water they transport.

To compare this value to other systems, the EPA estimates:[51]

> *"Average water loss in [public water] systems is 16 percent - up to 75 percent of that is recoverable."*

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49. Ibid.
50. DEIS, Appendix B: Purpose and Need Report, Section 6.2.2 Future Water Requirements, p. 13.
51. USEPA, "Water Audits and Water Loss Control for Public Water Systems", 2013, at https://www.epa.gov/sites/production/files/2015-04/documents/epa816f13002.pdf, citing Thornton, J., et al. Water Loss Control Manual (2nd Edition), McGraw-Hill, 2008.

If applicable to the WCWCD's systems, the recoverable percentage would reduce system loss to less than 4%, and water demand by their own calculations by more than 35,000 AFY. In any case, such a large factor adding to forecast demand must be justified by the WCWCD and vetted by BOR before it can be used to justify a nearly $2 billion investment in the LPP. Until then, claims for additional supplies to fill in for 15.4% water loss are capricious and unsubstantiated.

And it should be obvious that, for a project expected to cost nearly $2 billion, expecting a system loss factor of 15.4% is essentially **admitting to an immediate loss of $300 million in today's funds,** which should be sufficient incentive to develop and implement a system with less loss. For more incentive, that 15.4% should be applied to the expected operation, repair, and maintenance costs over the life of the pipeline.

1.3 Conclusion Regarding Purpose and Need

BOR has glibly accepted the proponents' claims regarding demand for water by residents in Washington County. They seem unable to conceive of the possibility that conservation measures in Utah could reduce GPCD to levels already found—and well-documented—in other southwest communities.

BOR also accepts, without challenge, proponents' assertions regarding new and arbitrary "requirements" for water supply that prevent consideration of any alternative other than the LPP. BOR provides no explanation or justification for what characteristics a watershed should have to qualify as "reliable," or when a community needs a "second source"; in fact, that second source would still be just a "single source" of water—an overallocated Colorado River watershed that does not satisfy the Purpose and Need for a "reliable" source. **The need for a "second source" is arbitrary. The proposal to use Lake Powell as that "reliable" "second source" is capricious, even absurd.** In order to satisfy the analysis requirements for an EIS, BOR must withdraw this DEIS and reevaluate the security of this proposed "second source" for the long term.

BOR must also demand water use projections that are reasonable and in keeping with modern planning and expectations, as described in USGS reports and findings. Expecting conservation to reduce use to 240 GPCD by 2045 and then no further is beyond capricious and ignores nearly all current analyses and data.

Finally, BOR must require proponents to deliver a better plan for how they will reduce the "system loss" factor. Continuing to use 15.4% is irresponsible in the light of improving technology and, indeed, the $300 million of costs associated with this loss.

2 BOR's Rejection of a Viable Water Conservation Alternative

2.1 DEIS Inappropriately Rejects Reasonable Water Conservation Alternative

It is certainly not the case that there are no other alternatives to supplying adequate water for Washington County's forecasted growth which can ensure a vibrant, healthy, and attractive community for decades to come. NEPA regulations require that agencies conduct scoping to: "*Determine the scope…and the significant issues to be analyzed in depth in the environmental impact statement.*"[52] It is presumed that agencies will then analyze those alternatives, rather than go out of their way to avoid giving them an "honest look."

52. 40 CFR § 1501.7 Scoping. (a)(2).

Indeed, BOR notes in the DEIS that:[53]

> *"Many comments were received regarding a water conservation alternative through the various public meetings and comment periods held through the NEPA and FERC application processes. Eventually, FERC requested that the UBWR provide a detailed analysis of an action alternative that eliminated the LPP and consisted of additional conservation actions, building additional water storage, and constructing advanced treatment plants. This alternative was called the No Lake Powell Water Alternative. The Local Waters Alternative, presented by Western Resource Advocates in 2013 (WRA 2013) with updates in 2018 (WRA 2018), was also brought forward through the public scoping process and is discussed in this DEIS."*

BOR then goes out of its way to reject the No Lake Powell Water Alternative and the Local Waters Alternative (LWA) proposed by Western Resource Advocates (WRA), claiming:[54]

> *"This alternative would fail to fully meet the need or accomplish the purpose of the Proposed Project. However, the Local Waters Alternative could partially meet the need and achieve part of the purpose of the Proposed Project (meet future water demands in 2060) if all the supply and demand assumptions can be met. One of the assumptions of the Local Waters Alternative is that the WCWCD would have to require a higher rate of water conservation (1 percent per year for 40 years) than what is found in the Proposed Project, which is 20 percent over a 40-year period.* ***Although the WCWCD encourages conservation through conservation rebate programs, they do not have the ability or authority to require Washington County residents to xeriscape their properties to more water efficient environments*** *or nearly eliminate outdoor water use. This DEIS has been prepared in response to the Proposed Project and* ***does not attempt to compel Washington County residents to modify, change, or curtail their current culture, lifestyle or social expectations****."* [emphasis added]

It appears that the proponents, and BOR in cahoots with them, discount the LWA's conservation goals with no reason, and have forgotten an important requirement in NEPA; i.e., requiring the analysis of:[55]

> *"Alternatives including the proposed action…" that "Include reasonable alternatives not within the jurisdiction of the lead agency."*

Apparently, a review of the LWA is necessary here.

2.1.1 LWA Supplies Meet Reasonable Need

In 2013, WRA submitted a proposal that would enable Washington County to thrive using only water available from its local watershed.[56] That proposal was updated in 2018, but the update reached the same conclusions.[57] In these alternatives, they describe "a realistic No Action Alternative that properly

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53. DEIS, page 13.
54. DEIS, page 15.
55. 40 CFR § 1502.14(c)
56. Nuding, A., "The Local Waters Alternative To the Lake Powell Pipeline", Western Resource Advocates, March 13, 2013.
57. Western Resource Advocates, "Comments on the Preliminary Licensing Proposal for the Lake Powell Pipeline, Project No. P-12966-001", November 16, 2018, at: https://conserveswu.org/wp-content/uploads/2020/06/WRA-Locals-Water-Alternative-updated-2018.pdf.

accounts for current and future water demands, reasonable water conservation, reasonable reuse, and more agricultural water transfers."[58]

It is incumbent on BOR to investigate and present the possibilities for treatment of waters high in TDS so that an intelligent evaluation can be made.

For their 2018 comments to FERC, WRA updated its previous analysis of water supply and demand, summarized and reproduced in Figure 4 above.[59] Updates included new population projections revised by the Gardiner Institute; using most of the water supplies as reported in later WCWCD reports but recognizing reduced reuse water resulting from increased conservation; referencing the Water Needs Assessment on water supplies from Study Report #19[60], including potable M&I supply, planned projects, wastewater reuse expansion, and other secondary water; incorporating "additional water resources from expanded agricultural water conversions, as would be expected from the significant population growth that would occur on agricultural lands, permanently changing the use of those lands"; and using "*the more recent and accurate 2015 water demand from the Division of Water Resources as the baseline for water demand, instead of the less accurate 2010 baseline provided by UBWR.*"[61] WRA applied a 1% per capita conservation rate per year, explained below. The result shows demand to be well within available supply, which is, perhaps, one reason the proponents introduced requirements for a "reserve buffer" and "15.4% system loss" described above, because, without those new factors and the new requirement for a "second source," it's clear that the LPP would not be needed.

2.1.2 Undeclared Local Water Supply Sources by WCWCD

The WCWCD itself reports that the cities have additional supplies not identified as future water by the WCWCD:[62]

> *"Based on the Utah Division of Water Rights point of diversion coverage, there are 1,276 active underground water rights with points of diversion within the Navajo/Kayenta and the Upper Ash creek aquifers. These water rights claim 590 cfs or 332,760 acre-feet/year from the petitioned aquifers. Accounting for the fact that some water rights declare more than one type of use, there were 160 commercial water rights, 249 stock watering rights, 296 domestic rights, and 969 irrigation rights (DWR Database, 2000). The Utah Division of Drinking Water indicated there are 23 public water systems with 49 public drinking water wells with water quality data."*

While Washington County's water rights are probably over-allocated, WCWCD only claims 35,452 AFY from cities will be used as supply by 2060.[63] However, the report above reveals the cities may have much more than 35,452 AFY of water which they could develop in the future. The problem is the WCWCD doesn't consider all the water supplies in the county that could convert to culinary or

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58. Ibid, page 2.
59. Ibid, page 8.
60. MWH, "Lake Powell Pipeline Project Water Needs Assessment" aka Study Report #19, UDWRe, April 2016, at: https://conserveswu.org/wp-content/uploads/2018/03/FERC-Water-Needs-ASSESSMENT-19-5-5-16-1.pdf.
61. Ibid.
62. Washington County Water Conservancy District Petition for Classification of the Navajo/Kayenta and Upper Ash Creek Aquifers Chapter VI, p. VI-1, at: https://www.wcwcd.org/wp-content/themes/wcwcd/pdf/Classification%20Petition_2005.pdf.
63. UDWRe, "Lake Powell Pipeline Project Water Needs Assessment-FINAL", April 2016, at: https://conserveswu.org/wp-content/uploads/2018/03/FERC-Water-Needs-ASSESSMENT-19-5-5-16-1.pdf.

secondary use by 2060. Table 5, reproduced from Table 7 in the 2013 *Local Waters Alternative* study[64], shows estimates of Washington County's future supply that include more agricultural water conversion and more reuse than reported in the DEIS; this is significantly more water than the WCWCD included.

Table 5. Water supply alternatives from the Local Waters Alternative analysis.		
Supply Alternative	**Culinary (AFY)**	**Secondary (AFY)**
WCWCD Current Supplies and Ash Creek	78,400	7,500
Reuse	---	16,900
Agricultural Water Transfers	---	13,700-35,200
Sub-Totals	78,400	38,000-59,600
Total	**116,300-138,000**	

Additional supplies could include:

1. Increased efficiency of the WCWCD's current water projects because the water provided for use from their projects is very low.
2. Other, nonagricultural private landowners may hold water rights and as they develop their land more water becomes available for development.
3. Increased reuse[65] and treatment of abundant brackish water.
4. Inventory of all water resources in the county not counted by the WCWCD as supply, including cities' ability to provide future water supplies not counted by the WCWCD.
5. Stormwater capture. [66]
6. Rainwater harvesting. [67]
7. Grey water.

2.1.3 Additional Local Water Supplies – Agricultural Water

The DEIS rejects, appropriately, forcing agricultural landowners to give up their water, "*It is not the disposition or mission of the WCWCD to develop or condemn land to obtain water rights.*"[68] While CSU agrees with this stance, WCWCD seems to ignore the fact that population growth will, necessarily, consume agricultural land, which in turn will naturally convert agricultural water use. Once a rural place dominated by irrigated agriculture, southern Utah is now in transition to a more urban community. This

64. Western Resource Advocates, "The Local Waters Alternative to the Lake Powell Pipeline", 2013, p. 24, at: https://westernresourceadvocates.org/publications/the-local-waters-alternative/.
65. EPA, "Water Reuse and Recycling", 2020, at: https://www.epa.gov/waterreuse.
66. Shimabuku, M. et al., "Stormwater Capture in California: Innovative Policies and Funding Opportunities", Pacific Institute, June 2018, at: https://pacinst.org/wp-content/uploads/2018/07/Pacific-Institute-Stormwater-Capture-in-California.pdf.
67. Poindexter, J. "23 Awesome DIY Rainwater Harvesting Systems You Can Build at Home", Morning Chores, at: https://morningchores.com/rainwater-harvesting/.
68. DEIS, page 15.

transition must follow a 21st century model to make our communities more sustainable and affordable places for our children and grandchildren to live. Water use efficiency is only one component, but an essential one.

We repeat that **CSU is not advocating for agricultural water conversion**; indeed, it would be beyond our power to stop it. We are simply noting that, as development occurs on agricultural lands, water will be used for housing as has been seen elsewhere in Utah as well as in many other desert communities. When the first settlers arrived in southern Utah after 1857 the surface waters of rivers and streams were allocated by the Church of Jesus Christ of Latter-Day Saints. It wasn't until the early 1900s that Utah developed a water rights system. The water rights were given to irrigation companies and those companies sold shares to raise money for dams, ditches, and other improvements. Over time the agricultural lands were developed, and cities acquired those rights for their secondary water systems.

The debate is where all the irrigation water is included in the supply. CSU doesn't think it is all accounted, so we believe there is more supply than the WCWCD reports. UDWRe's 2011 Water Needs Assessment[69] estimated the amount of agricultural water to be 86,760 AFY in 1990. The WCWCD, on the other hand, only claims about 20,000 AF of agricultural water will convert to residential use by 2060. The LWA estimates about 30,000 acre-feet will convert to residential use by 2060. Therefore, CSU estimates there would be more agricultural water for use in the future than the 10,080 AFY that the state and county are including in future supply estimates in the DEIS.

The 2016 Water Needs Assessment (WNA)[70] shows:

> *"2.5 Agricultural Conversion for M&I Supply*
> *"As municipal development occurs over existing agricultural lands, water will be converted from agricultural to municipal uses. To estimate the amount of water that might be obtained from these conversions, the State of Utah duty of water values were used. Water quality concerns and groundwater sustainability were not considered in this computation."*

The WCWCD is already anticipating agricultural water conversions as farmland is sold and developed. CSU has concerns about the underestimation of this water. To prove such an underestimation, an analysis would have to determine which farmland is likely to be converted in the next 50 years, the reliable water available from the related water rights, and the quality of the water. From that analysis, the quantity and cost of conversion could be determined much more accurately.

2.1.4 Additional Local Water Supplies – Reuse

In 2006 when the Lake Powell Pipeline Development Act was passed, the Utah Legislature also passed the Wastewater Reuse Act[71]. Reuse had been officially authorized by the Legislature in 1995.[72] A May 2018 reuse presentation[73] to the governor's Executive Water Finance Board (EWFB) showed that twelve reuse projects were filed in eleven years under the 1995 version of the law. However, after the repeal of the Wastewater Reuse Act in 2006 only seven reuse projects had been filed in twelve years.

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69. UDWRe, Lake Powell Pipeline Study Water Needs Assessment, March 2011, p. 4-42, at: https://conserveswu.org/wp-content/uploads/2012/04/19DraftWaterNeedsAssessmentReport-1.pdf.
70. UDWRe, Lake Powell Pipeline Study Water Needs Assessment, April 2016, p. 2-14, at: https://conserveswu.org/wp-content/uploads/FERC-Water-Needs-ASSESSMENT-19-5-5-16.pdf.
71. Utah State Legislature, Wastewater Reuse Act, 73-3c-101, 2006, at: https://le.utah.gov/xcode/Title73/Chapter3C/C73-3c_1800010118000101.pdf.
72. Utah State Legislature, Utah Business Trust Registration Act, 16-15-101, 1995, at: https://le.utah.gov/xcode/Title16/Chapter15/C16-15_1800010118000101.pdf.
73. Hartvigsen, D., "Why aren't we reusing more water?", Smith Hartvigsen, PLLC, at: https://www.utah.gov/pmn/files/399003.pdf.

The mayor of South Jordan, Utah, also presented to the EWFB regarding her city's reuse project[74], fashioned on a reuse facility in Altamont, Florida[75, 76] that does not use reverse osmosis; treatment costs are half of what they would be if reverse osmosis was used.

Table 6 shows the demand for M&I water in Washington County based on an even higher-than-projected average three percent population growth rate at two different per capita use (demand) rates. Note that the Water Needs Assessment estimated 98,707 AF would be available by 2060, more than demand similar to other southwestern communities, which does not include extraordinary conversion efforts such as reuse which could further extend supplies. It suggests that, even with such a robust population growth, there should be adequate local water with reasonable water conservation achievements.

Table 6. Demand for M&I water based on the projected average 3% population growth rate with different per capita use (demand) rates.

Year	Population (Kem Gardner)	Demand at 200 GPCD (AFY)	Demand at 150 GPCD (AFY)
2050	391,468	87,660	65,745
2065	508,952	113,968	85,476

2.1.5 LWA Conservation Targets Achievable

WCWCD and UDWRe have a long history of exaggerating real water demand and downplaying the efficacy of water conservation programs that alter individuals' behavior. And now, BOR joins them in beginning with the assumption that population growth translates directly into increased water demand (see discussion above). The DEIS accepts WCWCD's self-congratulations for reducing water demand since the year 2000 but ignores its starting point and a legislative audit that cast great doubts over the accuracy of that data.[77] Indeed, the audit strongly suggested that UDWRe revise its data collection protocols to improve the quality of that data, which was presumably improved in its 2015 reckoning.

WRA pointed out flaws in proponents' assumptions about water conservation, and the DEIS continues to underestimate this factor, allowing for demand reductions of only 20% between now and 2045, and oddly, after reaching 240 GPCD, expecting no further reductions in use, plateauing at that level for the next 20 years (30 years if one considers 2075 as the period for calculating the "reserve buffer" in demand). Such profligate water use is inconsistent with trends across the United States and, as pointed out in Figure 1, already much higher than many other communities in the southwest. WRA argues for assuming a 1% per year per capita reduction in demand.

74. South Jordan City, "Overview of South Jordan Water Conservation Program & DPR Demonstration Project", 2019, at: https://www.utah.gov/pmn/files/505541.pdf.
75. Altamonte Springs City, Florida, city website, at: https://www.altamonte.org/754/pureALTA.
76. Florida Potable Reuse Commission, "Framework for the Implementation of Potable Reuse in Florida, January 2020, at: http://www.watereuseflorida.com/wp-content/uploads/Framework-for-Potable-Reuse-in-Florida-FINAL-January-2020-web10495.pdf.
77 Office of the Legislative Auditor General, Audit Report No. 2015-01, "A Performance Audit of Projections of Utah's Water Needs," page 28, at: https://olag.utah.gov/olag-doc/15_01rpt.pdf

The DEIS, in contrast, lauds WCWCD's efforts:[78]

> *"The WCWCD and its municipal partners have invested over $60 million in recent conservation efforts. Washington County was the first Utah county to meet the statewide water conservation goal of reducing per capita water use 25 percent by 2025. In August of 1993, facing rapid population growth and a limited water supply, WCWCD approved a Water Resource Management, Development, and Protection Plan, which states, 'The District shall develop a water conservation plan which promotes public education and information dissemination concerning water conservation; and promotes the adoption of technologies, practices, and devices which will yield improvements in the efficiency and management of water use.' That same month, the WCWCD board called on community citizens to form a Water Conservation and Drought Management Committee. Their efforts resulted in the 1996 Water Conservation Plan, the first of its kind in Utah, followed by updates in 2005, 2010, and 2015."*

But the DEIS not only ignores doubts about the starting point in 2000, but also ignores that so much of the purported $60 million in "conservation efforts" went to expenses such as demonstration gardens ($3.6 million); new and improved meters, pipes, and booster stations ($7.4 million); leak detection, prevention and repair ($13.3 million); and pressurized irrigation systems ($19.4 million). Very little actually went into programs to change individuals' water use behaviors.

A disappointing objection of the DEIS to a reasonable water conservation alternative was mentioned previously, to wit: "*This DEIS has been prepared in response to the Proposed Project and does not attempt to compel Washington County residents to modify, change, or curtail their current culture, lifestyle or social expectations.*"[79] And that, as noted previously, directly conflicts with regulations implementing NEPA.

On balance, therefore, it appears that BOR has not given an "honest look" at conservation programs and practices as they might be applied to Washington County, but has accepted without question WCWCD's assertions of only weak conservation savings.

2.1.6 Local Water Management

Instead of a $2 billion pipeline to a dubious source of contested water, CSU would advocate for an alternative that could be described as a "Local Water Management program," which would engage stakeholders (water agencies, local governments, the legislature, citizens, conservation groups, water experts, etc.) using standard program management practices to set goals for water supply and demand; establish strategies to achieve the goals; identify, evaluate, and select solutions using the strategies; define the logical steps to implement the solutions; define projects to implement the steps with specific objectives, timeframes, and budgets; plan and execute the projects with tasks, schedules and responsibilities to meet the objectives; and then account that the objectives have been met. An initial example[80] of such a plan was developed and presented to members of the Washington County Water Conservancy District in 2019. And this is an alternative that the DEIS should have derived on its own.

78 DEIS, page10.
79. DEIS, page 15.
80. Butine, T., "Washington County Integrated Water Management Plan", distilled from presentation to and discussions with WCWCD, 2019, at: https://conserveswu.org/wp-content/uploads/2020/06/Washington-County-Water-Management-Plan-2020.pdf.

While these practices are common in industry, they have not been employed in Utah to manage one of its most precious resources, water. State law[81] requires each water district and city to create and maintain a water conservation plan, hinting that it must contain the key elements listed above. While the law covers only the "demand" side of the water management scope (ignoring the "supply" side), it is a good start. Unfortunately, the UDWRe's guidance[82] for water conservation planning does satisfy the state's requirements, omitting very basic planning elements, leading Washington County, like most other counties in the state, to also miss the boat. A comparison of the guidance to normal planning elements was presented to members of the Washington County Water Conservancy District to illustrate the difference[83], followed by a report to the state's EWFB[84]. For context and definition of terms, see our paper on "The Water System".[85]

As a result of the UDWRe's inappropriate guidance, there is no comprehensive program for the management of Washington County's water. Stakeholders need to be identified and engaged, goals set by them, strategies articulated, alternative solutions openly evaluated, implementation steps defined, and projects defined, planned, executed, and evaluated. Certainly, projects are being defined and executed, but without the prerequisite management steps it is equally certain that the necessary projects are not being defined and that necessary objectives are not being accomplished to achieve improvements to supply and demand. The current approach yields expensive strategic errors.

While Washington County—the water district and the cities within—execute many projects (with little evidence of coordinated plans), there is very limited focus on demand reductions; i.e., conservation. An accounting of the county's "conservation" expenditures[86], based on their own compilation boasting over $56 million in conservation expenditures since 2000, indicates that 91 percent of the expenditures were on supply improvements rather than on conservation. Of the remaining nine percent spent on conservation, none was spent on "active" conservation, promoting changes in users' behavior to reduce water use. The "passive" conservation expenses were educational programs and media campaigns, which have little effect when inexpensive and flat-tiered water pricing provides little incentive for most citizens.

The Local Water Management program's scope would be the management of water for human uses (M&I and agriculture) and for "nature." The Virgin River Program[87] was established to manage the balance of human and natural system requirements for water from the Virgin watershed. This program would be an element of the overall Local Water Management program. A Virgin River Management Plan[88] was created to define specific goals to be achieved. But it is unclear how projects are defined, managed, and accounted for in this plan.

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81. Utah Code 73-10-32, "Definitions -- Water conservation plan required", at: https://le.utah.gov/xcode/Title73/Chapter10/73-10-S32.html, see item (2)(a)(i).
82. Conserve Southwest Utah, "Sample Water Conservation Plan", 2014, at: https://conservewater.utah.gov/pdf/MaterialsResources/Templates/Our%20City.pdf.
83. Butine, T., "Water Conservation Plan Content Analysis", January 10, 2019, at: https://conserveswu.org/wp-content/uploads/2020/01/Water-Conservation-Plan-Content-Analysis.docx.
84. Butine, T., "Strategic Water Planning Analyses, Planning and Decision-Making", presentation to the EWFB, July 19 2019, at: https://conserveswu.org/2019/07/10/strategic-water-planning-a-presentation-given-to-the-executive-water-finance-board-7-9-19/ .
85. Butine, T., "The "Water System Context, Scope and Terminology, and Implications to Water Conservation Goals", March 6, 2019, at: https://conserveswu.org/wp-content/uploads/2019/03/Water-Management-Context-Scope-Terms-Implications-1-1.pdf.
86. Butine, T., "Integrated Water Management Plan - Projects by Category and Summary of Project Costs and Benefits", spreadsheet example, at:https://conserveswu.org/wp-content/uploads/2019/03/Water-Management-Plan-Project-Accounting-rev-1-1.xlsx.
87. Virgin River Program websites, at: https://virginriverprogram.org/.
88. WCWCD et al., "Virgin River Management Plan", June 1999, at: https://www.wcwcd.org/wp-content/themes/wcwcd/pdf/virginRiver/VRMPFinal5.PDF.

One of the first steps in developing a program plan would be to identify all key stakeholders and engage them in setting goals. We propose a goal (a desired future state) something like:

> **Washington County manages its local water such that people can live here if they wish, in a vibrant and attractive community that blends with and conserves its beautiful natural desert environment.**

Whatever goal is finally adopted, it must be supported by all stakeholders—water agencies, local governments, the legislature, citizens, conservation groups, and water experts. It would require that we balance our water demand with our water supply, and that we grow in a manner that enables that balance, while supporting the natural environment. The plan would define the strategies that must be implemented in order to achieve the goal.

Steps to implementing Local Water Management in Washington County would include the following:

- Step 1: Local elected officials and our water agencies realize that our water is a strategic resource and decide to manage it as such. This initiates strategic management practices for water; that is, improving and balancing local water supply and demand using strategies driven by goals embraced by all stakeholders. This is not happening.
- Step 2: We establish realistic long-term goals for local water supply and demand. A recent estimate projected future reliable water supply at approximately 100,000 acre-feet per year (AFY), without the LPP, by 2060 available for M&I uses. The estimate for agriculture use is not as clear. These estimates should be updated and verified in an open setting. A practical future demand goal can be calculated using projected future supply and population. If we assume a 2060 supply of 100,000 AFY and use the state's population projection of 500,000 for Washington County, the goal for 2060 water demand would be about 178 GPCD, equivalent to the national average. (The UDWRe took a step along this path by developing Regional Water Conservation Goals[89], which could have set appropriate demand goals had the project been properly initiated, engaged diverse stakeholders, and used appropriate analyses. Instead, without those critical components, it resulted in a 2065 goal of 237 GPCD.[90] [91] Goals should be validated prior to defining strategies by comparisons to similar communities[92] and a local check can be made by establishing rough guidelines, such as suggesting that a wise per capita residential use should not be exceeded by the corresponding per capita commercial, institutional, and industrial (CII) use. For example, if a practical individual residential use is calculated at 90 GPCD, the goal for total M&I use, including CII, might be 180 GPCD.)
- Step 3: Determine the strategies to achieve the goals and evaluate and select solution concepts for those strategies in terms of costs and yields.

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89. UDWRe, Utah's Regional M&I Water Conservation Goals", November 2019, at: https://water.utah.gov/wp-content/uploads/2019/12/Regional-Water-Conservation-Goals-Report-Final.pdf.
90. CSU, "CSU Comments on Utah's Regional M&I Water Conservation Goals Summary Conclusions and Recommendations, March 17, 2019, at: https://conserveswu.org/wp-content/uploads/CSU-Comments-on-Utah%E2%80%99s-Regional-MI-Water-Conservation-Goals-Summary-Conclusions-and-Recommendations.pdf.
91. Conserve Southwest Utah, "Comments on Utah's Regional M&I Water Conservation GoalsDetailed Comments-March 17, 2019", at: https://conserveswu.org/wp-content/uploads/2019/03/CSU-Comments-on-Utah%E2%80%99s-Regional-MI-Water-Conservation-Goals-Detailed-Comments.pdf.
92. Conserve Southwest Utah, "Comparison of Per Capita Water Use in Southwestern Counties", May 30, 2017, at: https://conserveswu.org/wp-content/uploads/2017/07/Comparison-of-GPCD-Water-Usage-across-the-West.pdf.

- Step 4: Define and sequence projects to implement the selected solution concepts, defining an objective and assigning a budget, and at the appropriate time per the project sequencing in the program's plan, initiate planning and approval of the project; staff and fund it; kick off each project in sequence, then monitor its progress, adjust the plan as necessary, measure its performance, and adjust the overall program plan as necessary.

Our county's water future and, indeed, our state's future demand a management plan that is consistent with twenty-first century water supply, need, and use. We cannot rely on past practices when water was abundant for our small population to map our future.

2.2 Conclusion Regarding Bureau of Reclamation's Rejection of a Conservation Alternative

Proponents' "purpose and need," and BOR's unchallenging acceptance of that purpose and need, seem designed to preclude any alternative other than the LPP. Perhaps this is because Utah's water policymakers are fixated on "getting our share" of Colorado River water at any cost. It may, in fact, be the case that they never intend to build the LPP (we certainly hope not) and are simply putting down a marker—dibs, if you will—as a sort of interstate priority claim on Utah's share of 23% of whatever water is left for the Upper Basin allocation.

However, instead of continuing to pursue a LPP project that will likely not have water available for it, the BOR should have encouraged the proponents to articulate a local water management program whereby Washington County could live within its (water) means, an approach much more in keeping with fundamentally conservative values and attuned to the water realities of a semi-arid environment.

3 Challenges to "Chapter 3 Affected Environment"; address selected studies of analyzed alternatives; follow sequence in DEIS

3.1 Premature to evaluate Highway vs Southern alternatives when similar and fatal flaws (CO River, CO River Compact, Upper Basin CRC, cost, conservation alternatives, etc.)

Insofar as the DEIS is insufficient in terms of its purpose and scope or consideration of a conservation alternative, it seems somewhat irrelevant to comment on the effects of the two "build-the-LPP" alternatives on particular resources. However, some aspects are germane.

3.2 DEIS Section 3.4 Land Use

Were the LPP to be built, it would have enormous adverse effects over its 140-mile length. The disturbance and footprints will be severe from the six hydroelectric plants and five pump stations with related power lines, high steel power poles connecting them to existing power grids, parking lots, substations, lights, new access paved roads, regulating tanks and reservoirs, manholes, air release values, vacuum relief values, blow off valves, fencing, buried forebay tanks, buried surge tanks, pipeline inspection gauge (pig) retrievals used to clean the pipe, and surface overflow detention basins, all of which require weekly maintenance.

The arid nature of these lands would render the visual disturbance from this infrastructure nearly impossible to mitigate. Facilities would be visible from US Highway 89 and other highways along vast, scenic areas, compromising viewscapes for untold thousands of visitors, and affecting tourism. These lands draw American tourists from around the country and provide valued outdoor recreation opportunities; they would be permanently scarred by LPP's infrastructure. The scenic beauty of our public lands in Washington and Kane counties is world-renowned and drives our economies, providing thousands of jobs in hospitality and tourism. Visitors driving to different National Parks and the Grand

Staircase Escalante National Monument would be adversely affected by the visible scars from building the LPP and the infrastructure to support it. Scars from the LPP would harm scenic beauty important to Utah's economy which is transitioning to tourism and outdoor recreation, an industry that provides 110,000 direct jobs and $3.9 billion in wages in the state of Utah in 2017.

3.3 DEIS Section 3.8 Hydrology

In reviewing the analysis of hydrology, we were struck with how the DEIS analyzed impacts in only one direction, impacts to levels in Lake Powell if water was diverted into the LPP. Never was there an adequate analysis of how predicted climate impacts would reduce Colorado River flows that would deny water to LPP in the first place.

As noted above, the DEIS did not adequately evaluate conditions where Native American Tribes actually began depleting their full water rights.

This DEIS is remiss in not attempting to determine whether water will, actually, be available for the LPP. (See discussion in Section 1.3.1 above.)

3.4 DEIS Section 3.9 Water Quality

The DEIS failed to assess the potential impact of using chemicals to control quagga mussels to Quail Lake [93]and Sand Hollow Reservoirs.

The WCWCD captures most of the Virgin River water and delivers it to the cities and its reservoirs. Therefore, there is a concern that the byproducts of chemicals added to control quagga mussels could add excessive nutrients to surface waters that would create more toxic algae in WCWCD reservoirs.

About four million people visit Zion National Park a year, and the water quality in the Virgin River is becoming degraded. A new concern about the water quality in the Virgin River has developed. The North Fork of Virgin River is the largest watershed providing water to the Virgin River. A Salt Lake Tribune article detailed there is a severe problem to human health with the water quality of the North Fork of the Virgin River:

> *"The harmful algae was found in multiple spots in the river.*
>
> *"Why is it showing up now? We can't answer that," Gaddis said. "It's a new area for Utah. These sorts of blooms can be triggered by disturbances in the watersheds. It's not tightly linked to nutrient loads like blooms in lakes.*
>
> *"The state has previously issued health warnings for E. coli impairment in the North Fork.*
>
> *"The Southwest Utah Public Health Department has issued a public health warning for the affected areas of the river. The regional health department will post signs warning people of the risks of exposure to the river water."*[94]

According to the Utah Department of Environmental Quality:

> *"Harmful algal blooms (HABs) develop when naturally occurring cyanobacteria in the water multiply very quickly to form green or blue-green water, scum, or mats.*

93. The Spectrum, "Quail Creek Reservoir to close for chemical treatment", July 8, 2018, at: https://www.thespectrum.com/story/news/2018/07/09/quail-creek-reservoir-close/768620002/.
94. The Salt Lake Tribune, "Dangerous algal bloom turns up in Zion National Park after dog dies in North Fork of the Virgin River," July 4, 2020, at: https://www.sltrib.com/news/environment/2020/07/13/dangerous-algal-bloom/.

These blooms can produce potent cyanotoxins that pose serious health risks to humans, pets, and livestock."[95]

The DEIS is deficient for not considering the impact of chemicals used to prevent quagga mussels on the Sand Hollow aquifer project.[96] Included at the end of Study Report 5 is a study on the Sand Hollow's aquifer. See:

- Appendix A Revised Technical Memorandum 5.13C Aquifer Recharge Issues
- Appendix A Lake Powell Pipeline Phase I - Preliminary Engineering and Environmental Studies Task 5 - Develop and Analyze Alternatives Revised Technical Report 5.13C Aquifer Recharge Issues Prepared for Utah Division of Water Resources May 2009 Prepared by MWH

The report states that additional information is needed.

3.5 DEIS Section 3.10 Aquatic Invasive Species

The DEIS did not do an adequate analysis of a possible quagga mussel infestation that could threaten the pipeline, local reservoirs, municipal infrastructure, businesses, and homes, and reduce our water quality. It fails to adequately address the potential cost to eradicate quagga mussels in systems operated by either WCWCD or municipalities or in individual homes and businesses. It failed to analyze the effect and cost of chemicals used to eradicate quagga mussels and the potential impact on the quality and safety of drinking water. It did not address the threat that treating quagga mussels with chemicals poses to drinking water quality. Chlorine use may create trihalomethane (THM) when chlorine reacts with organic matter in the water, which may be toxic to human health and impair our drinking water quality. BOR did not analyze the effects on water quality from quagga mussel waste products (e.g., sulfites, sulfates, nitrogen, ammonia, etc.) and decomposition within the pipeline and their ability to spread toxic algae.

UDWRe's "November 2015 Draft Study Report 2 Aquatic Resources" noted, "[quagga mussels] have demonstrated the potential to both damage ecosystems and to require significant and costly, but often fruitless, investment to manage and control their effects on structures and equipment in the water supply industry."

In 2016, the National Park Service (NPS) expressed concerns to the Utah Department of Water Resources (UDWRe) about transferring water from Lake Powell to Sand Hollow. Utah Water Development Commission members also voiced concerns about the spread of quagga mussels to municipal and industrial water systems.

It is alarming to note that the proponents' March 2011 Draft Study Report 2 Aquatic Resources[97] to FERC devoted about 10 pages to the quagga mussel issue, but the November 2015 Draft Study Report 2 Special Status Aquatic Species and Habitats[98] devoted only one paragraph to the quagga mussel situation. Then, the issue became more critical, judging by the April 2016 Final Study Report Aquatic Resources, which devoted extensive coverage to the subject[99], dedicating nearly a third of the 2016 107-

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95. The Utah Department of Environmental Quality, Harmful Algal Blooms, at: https://deq.utah.gov/water-quality/harmful-algal-blooms-home.
96. Final Study Report 5 Groundwater Resources April 2016, Page 1-21 at, https://water.utah.gov/wp-content/uploads/LPP-Reports/GroundWater/20160430-05-Final-Groundwater-Resources-Study-Report_FINAL.pdf.
97. Utah Board of Water Resources, "Draft Study Report 2 Special Status Aquatic Species and Habitats", November 2015, at: https://conserveswu.org/wp-content/uploads/2020/06/20160430-02-Aquatic-Resources-Study-Report_FINAL.pdf.
98. Ibid.
99. UBWR, "Lake Powell Pipeline Project Final Study Report 2 Aquatic Resources", April 2016, at: https://conserveswu.org/wp-content/uploads/2020/06/20160430-02-Aquatic-Resources-Study-Report_FINAL.pdf.

page document to the quagga mussel problem and efforts to control them. Since the LPP efforts began. this has become a much more serious problem than is indicated in the DEIS.

3.6 DEIS Section 3.14 Sensitive Species – Fish and Wildlife

CSU disagrees with BOR's decision to drop any further analysis of the impact of building the LPP on Kaibab-Paunsaugunt Wildlife Corridor. The DEIS does not consider the large amount of infrastructure that has to be built to support the LPP and its impact on the corridor. The DEIS failed to include this information on the Kaibab-Paunsaugunt Wildlife Corridor. It failed to take into account the Bureau of Land Management's requirements to protect the Kaibab-Paunsaugunt Wildlife Corridor. It didn't evaluate environmental impacts of the proposed Lake Powell Pipeline on the biological connectivity value of the scientifically established significance of the Kaibab-Paunsaugunt Wildlife Corridor. It failed to consider the Best Available Science Regarding Identification nor Protection of Wildlife Connectivity Requirements. The DEIS also failed to include information on the Kaibab-Paunsaugunt Wildlife Corridor.

Arizona's mule deer migrate off the high Kaibab Plateau (North Rim, Grand Canyon National Park; North Kaibab Ranger District, USFS) to winter range on either side of the mountain.[100] While researchers believe most of the winter range for the Kaibab herd is on the western side of the Plateau,[101] U.S. Highway 89 (U.S. 89) east of Kanab, Utah, bisects the seasonal migration of the Paunsaugunt mule deer (*Odocoileus hemionus*) herd. This large herd is composed of dozens to hundreds of smaller herds of deer that total thousands of animals. The herd overall, travels south toward Arizona in the winter, and north toward the Paunsaugunt area near Bryce Canyon National Park and Cedar Mountain in the summer.[102]

Paunsaugunt mule deer use the same migration corridors during autumn and spring when moving to or from winter range in the Buckskin Mountains.[103] Mule deer movements were likely restricted to limited breaks in the almost vertical White Cliff and separate the Skutumpah and Wygaret terraces; further, movements likely occurred through limited breaks in the precipitous Vermilion Cliffs that separate Wygaret Terrance from the valley to the south. Main drainages through these cliffs provide the easiest access. Researchers believe Johnson Canyon and Deer Springs Wash are the primary routes through the White Cliffs for mule deer traveling to and from winter range.[104] Deer Springs Wash seemed the primary route thorough the Vermilion Cliffs.[105] For mule deer that migrated to and from Wygaret Terrace just north of Kanab, researcher suggest Kanab Creek is their route through the White Cliffs.[106]

The DEIS failed to take into account the Bureau of Land Management's requirements to protect the Kaibab-Paunsaugunt Wildlife Corridor. The first goal of the President's National Fish, Wildlife, and

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100. Haywood, D.D., R.L. Brown, R.H. Smith and C.Y. McCulloch. 1987. Migration Patterns and Habitat Utilization by Kaibab Mule Deer. Arizona Game and Fish Department Federal Aid in Wildlife Restoration Project W-78-R Report, Phoenix. 29 pages.
101. Carrel, William K., Richard A. Ockenfels, and Raymond E. Schweinsburg. 1999. An Evaluation of Annual Migration Patterns of the Paunsaugunt Mule Deer Herd Between Utah and Arizona. Arizona Game and Fish Department Technical Report 29. Phoenix. 44 pages.
102. Cramer, Patricia. 2016. US 89 Kanab-Paunsaugunt Wildlife Crossings and Existing Structures Research Project. 2016 Spring Report. https://wildlifeobserver.net/resources/us-89-wildlife-crossings-and-existing-structures-research-project-2016-spring-report.
103. Carrel, William K., Richard A. Ockenfels, and Raymond E. Schweinsburg. 1999. An Evaluation of Annual Migration Patterns of the Paunsaugunt Mule Deer Herd Between Utah and Arizona. Arizona Game and Fish Department Technical Report 29. Phoenix. 44 pages.
104. Ibid.
105. Ibid.
106. Ibid.

Plants Climate Adaptation Strategy is to build or maintain ecologically connected network of terrestrial, coastal, and marine conservation areas that are likely to be resilient to climate change and support a broad range of fish, wildlife, and plants under changing conditions.[107] Major reviews of climate change conservation management options generally identify increased habitat conservation and establishing or restoring habitat connectivity as the top, if not the top, options to pursue.[108] Identifying such priority areas, in this case, the Kaibab-Paunsaugunt Wildlife Corridor, also benefits wildfire management, mitigation investments, restoration efforts, and water and air quality.

The BLM has broad authority to administratively designate wildlife corridors (similar to the Centennial Mountains ACEC,[109] Trappers Point [Path of Pronghorn],[110] and Sonoran Desert designations,[111] for mitigation of existing and potential wildlife habitat fragmentation. Under the Federal Land Policy and Management Act (FLPMA), the BLM is charged with identifying, inventorying, and protecting important natural resources, such as wildlife corridors, on the public lands. FLPMA requires that the BLM identify and inventory the public lands for resources and important values, giving priority to designation of areas of critical environmental concern, and manage the lands pursuant to resource management plans (RMPs) that are based on this inventory.[112] FLPMA directs the BLM to manage the public lands in a manner "*that will **protect** the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values."*[113] Furthermore, the BLM is expected to preserve "*certain lands in their natural condition; that will provide food and habitat for fish and wildlife.*"[114]

The DEIS didn't evaluate environmental impacts of the proposed Lake Powell Pipeline on the biological connectivity value of the scientifically established significance of the Kaibab-Paunsaugunt Wildlife Corridor. U.S. 89 bisects this historic and ecologically significant migration route. In 2013, Utah Department of Transportation (UDOT) and Utah Division of Wildlife Resources (UDWR) worked together with multiple partners to create the U.S. 89 Kanab-Paunsaugunt Project. The goal of the project was to funnel a portion the Paunsaugunt mule deer herd through the new wildlife crossing culverts and three existing culverts and bridge to help reduce the mule deer- vehicle collisions in this area.[115] Subsequent study results from 2016 reveal increasing mule deer numbers through the structures and

107. Council on Climate Preparedness and Resilience [Council]. 2014. Priority Agenda: Enhancing the Climate Resilience of America's Natural Resources. https://www.adaptationclearinghouse.org/resources/priority-agenda-enhancing-the-climate-resilience-of-america-s-natural-resources.html, Accessed 11-13-14.
108. Establishing or restoring habitat connectivity as the top, if not the top, options to pursue: Mawdsley, J. R., R. O'Malley, and D.S. Ojima. 2009. A Review of Climate Change Adaptation Strategies for Wildlife Management and Biodiversity Conservation. Conservation Biology 23(5):1080-1089. Available at: http://nctc.fws.gov/courses/climatechange/climateacademy/documents/Mawdsl_et_al_2009%20(2).pdf.
109. Bureau of Land Management. 2006. Record of Decision and Approved Dillon Resource Management Plan. February 2006. http://www.blm.gov/style/medialib/blm/mt/field_offices/dillon/rmp/rod.Par.10875.File.dat/ApprovedPlan.pdf
110. Bureau of Land Management. 2008. Record of Decision and Approved Pinedale Resource Management Plan. https://www.blm.gov/sites/blm.gov/files/Pinedale_RMP_Directors_Protest_Resolution_Report.pdf.
111. Bureau of Land Management. 2012a [BLM]. Lower Sonoran and Sonoran National Monument Proposed Resource Management Plan and Final Environmental Statement. June 2012. https://www.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=21457. Accessed 04/11/2016.
112. 43 U.S.C. §§ 1711(a), 1712.
113. 43 U.S.C. § 1701(a)(8).
114. Ibid.
115. Cramer, Patricia. 2016. US 89 Kanab-Paunsagunt Wildlife Crossings and Existing Structures Research Project. 2016 Spring Report. https://wildlifeobserver.net/resources/us-89-wildlife-crossings-and-existing-structures-research-project-2016-spring-report.

throughout other portions of the year rather than just during migrations.[116] Other wildlife species benefit from these wildlife crossing installations. The proposed pipeline also bisects this migration route and, as noted in the DEIS, “pipeline trenching during construction may cause temporary barriers to sensitive species moving through an area that are unable to cross the trench during construction.”[117] While the agency assures us this situation would be short term and localized within the ROWs,[118] they estimated that “final design would take approximately two years post-ROD and construction would begin after that and is anticipated to occur over a six-year period.”[119] The DEIS also points out “*[v]arious components of the LPP may be constructed simultaneously throughout the Project Area during this period.*” Mule deer exhibit high fidelity to their migration routes and seasonal ranges.[120] Migration is learned,[121] and herd mammals, like mule deer, follow historic routes passed along by the mother to their young until it becomes instinctually ingrained in the animals.[122] *Prolonged disruption of movement across the proposed pipeline project area most likely will adversely affect the various herd’s viability and must be evaluated resulting in effective mitigation measures before construction begins.*

The DEIS failed to consider the best available science regarding identification or protection of wildlife connectivity requirements. The Department of Interior (DOI) was clearly committed to implementing a policy of using the best available scientific information (BASI) for planning documentation, a principle foundation for establishing wildlife corridors. The DOI Policy for the Integrity of Scientific and Scholarly Activities posits as its central tenet at §3.4 Policy “The Department… will not tolerate loss of integrity in the performance of scientific and scholarly activities or in the application of science and scholarship indecision making…” This policy further requires that scientific findings and conclusions be made subject to public vetting: *§ 3.4.C “Document the scientific and scholarly findings considered in decision making and ensure public access to that information and supporting data through established Departmental and Bureau procedures….”* In another DOI example of applying the BASI—the National Landscape and Conservation System (NLCS) was legislatively established by the Omnibus Public Land Management Act of 2009[123] *in order to conserve, protect, and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations*. The BLM policy manual describes how “*the BLM will use the best available science in managing the NLCS”* and how *“science and the scientific process will inform and guide management decisions concerning NLCS units*.”[124] Providing a scientific foundation for decision-making is also a goal identified in the NLCS 15-Year Strategy (Goal 1C).

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116. Ibid.
117. Bureau of Reclamation. 2020. Lake Powell Pipeline Project Draft Environmental Impact Statement. June 2020. https://www.usbr.gov/uc/DocLibrary/EnvironmentalImpactStatements/LakePowellPipeline/docs/20200600-LakePowellPipelineProject-DraftEIS-508-PAO.pdf.
118. Ibid.
119. Ibid.
120. Kauffman, Matthew J., James E. Meachham, Hall Sawyer, Alethea Y. Steingisser, William J. Rudd, and Emilene Ostlind. 2018. Wild Migrations: Atlas of Wyoming’s Ungulates. Corvalis: Oregon State University Press. 181 pages.
121. Ibid.
122. New Tracking Technology Reveals Hidden Animal Migration Routes, Kristen A. Schmitt, January 8, 2019, Smithsonian Magazine, https://www.smithsonianmag.com/science-nature/technology-gps-collar-reveals-hidden-animal-migration-routes-180971185/: “It takes generations and generations for herds to learn migration corridors,” According to Matthew Kauffman, professor of zoology and physiology at the University of Wyoming and director of the Wyoming Migration Initiative. “If you wipe out a herd that has knowledge of a specific migration, then you lose all the knowledge that those animals have of how to make that migration.”
123. Public Law 111-11.
124. BLM Manual §6100(1.6)(A)(9) and (1.6)(F)(1).

3.7 DEIS Section 3.15 Threatened and Endangered Species

After release of the DEIS in June 2020, nearly 14,000 acres of the Red Cliffs Desert Reserve, an area near St. George established to protect the Mojave desert tortoise, was destroyed in wildfires. Unknown are how many tortoises were killed in the fire, nor whether the impacts to their habitat will stress these threatened animals beyond their survival capacity.

Since, even under the proponents' assumptions, Washington County will have more than sufficient water for decades, it is imperative to revisit the analysis of impacts to the Mojave desert tortoise before finalizing the EIS.

3.8 DEIS Section 3.16 Visual Resources

The southwest United States is in the throes of a megadrought, which started almost two decades ago. This is likely not just a megadrought but a long-term aridification due to anthropomorphic climate change. The DEIS does not acknowledge this or address contingencies for mitigating the scars left on the land if the trend continues. For example, what would be the added cost of providing water to remediation areas along the pipeline's route if the trend continues and vegetation is not reestablishing itself, especially along historic trails with high visual resource management values?

3.9 DEIS 3.20 Socioeconomics

3.9.1 Benefits Transfer

The DEIS attempts to justify the LPP as providing more benefits that it will cost. It does so via a concept known as "benefits transfer," that is, transferring benefits calculated elsewhere to what is posed as a similar project for Washington County. However, while in the proponents' eyes, the No Action Alternative provides less security, it's important that BOR address the lack of security in thinking there will be water available from the Colorado River for the LPP, when many experts are now warning about reductions in flow resulting from climate change. If Washington County continues to ignore the need to develop in water-conserving ways, it will find it hard to reverse course when it becomes clear that the LPP will not provide water.

In its calculus, BOR assume benefits from water reliability based on people's hypothetical valuation of water "security." But the DEIS treats the $2 billion in local economic benefits as if it dropped from the sky. Although the project is to be funded by the state of Utah, the state is to be reimbursed by the residents of Washington County, which means less local consumer demand for other things. It is equivalent to buying a house for $510,000 and taking out a mortgage for $500,000. It may seem the day one signs the contract that one is $500,000 richer since there is this fine house, but, of course, one has to start making mortgage payments which is an additional cost, and a drain on the local economy.

The DEIS uses the IMPLAN model to assess reliability benefits, hoping to justify a $2 billion expense to build the LPP. IMPLAN is a commonly used model to evaluate public projects but input-output models are a poor choice for analyzing economic impacts (and economists rarely use them). They are more accurate for small projects and shouldn't be used for large projects with huge impacts on the local economy because the model assumes fixed coefficients per definition. For example, the city of St. George could hire a local excavation company to dig the hole for a public swimming pool. But it is ridiculous to think that a local company could easily expand their businesses and equipment and add staff to build the LPP. The result is that most of the money would probably flow to outside companies and workers for the pipeline, compared to what happens with a smaller project, which means more money would leave the local economy (and state) than predicted by the model. Further, there is no rationale given for using a period of 100 years in the analysis of benefits.

In addition, BOR fails to justify why it chose to use as the “best” estimates of benefits values at the high end of the residential range ($300 from a range of $89-360) and the very highest value in the commercial range ($1,800 from a range of $360-1,800).

3.9.2 No Financing Terms Analyzed

BOR failed to critically evaluate assumptions by the proponents regarding ability to repay the debt. The state of Utah, through the UDWRe, is proposing to construct the LPP, but is to be repaid by residents of Washington County, via the WCWCD, through increased water rates, higher property taxes, and higher impact fees. BOR’s analysis finds that the project only has a net positive value if growth exceeds 2.5% per year. However, as Figure 4 shows (data from Kem C. Gardner Institute[125], although growth projections exceed that value in the next decade, by the mid-2030s growth rates are expected to drop below 2.5%, making a net benefit doubtful. Indeed, the DEIS points this out:[126]

> *“The estimated current ability to pay is not representative of conditions that would be expected in the future with growth in population. Kem C. Gardner Policy Institute projections of growth in the number of households to 2065 for Washington County is 2.526 percent. Future ATP for the WCWCD is estimated by applying this growth rate to the estimate of current ATP. Applying this growth rate to current ATP assumes that future growth in commercial output and sales would be the same as the growth in the number of households. As a sensitivity analysis growth rates of 2 percent, 1.5 percent, and 1 percent were also applied to recognize that the projected level of growth is not a guarantee of future conditions. Based on the assumptions described above, future annual ability to pay is projected to range from $124.91 million based on 1 percent growth to $268.38 million based on the Kem Gardner projections by 2070. Future total water related charges for WCWCD water users is estimated to be $210.34 million by 2070.*
>
> *“The estimated ATP for the WCWCD study area based on the Kem C. Gardner projections indicates ATP is sufficient to cover all water service costs, including pipeline alternative costs, through 2070. Under the 2 percent growth scenario ATP is sufficient to cover all water service costs until 2067 and under the 1.5 percent growth scenario ATP is sufficient to cover costs until 2045. Under the 1 percent annual growth scenario ATP would not be sufficient to cover costs by 2039. Under a no growth scenario ATP would not be sufficient to cover all costs after 2032 if a pipeline project were built.”*

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125. Kem C. Gardner Institute, “Utah's Long-Term Demographic and Economic Projections Summary”, University of Utah, July 2017, at: https://gardner.utah.edu/wp-content/uploads/Kem-C.-Gardner-County-Detail-Document.pdf.
126. DEIS, page 243.

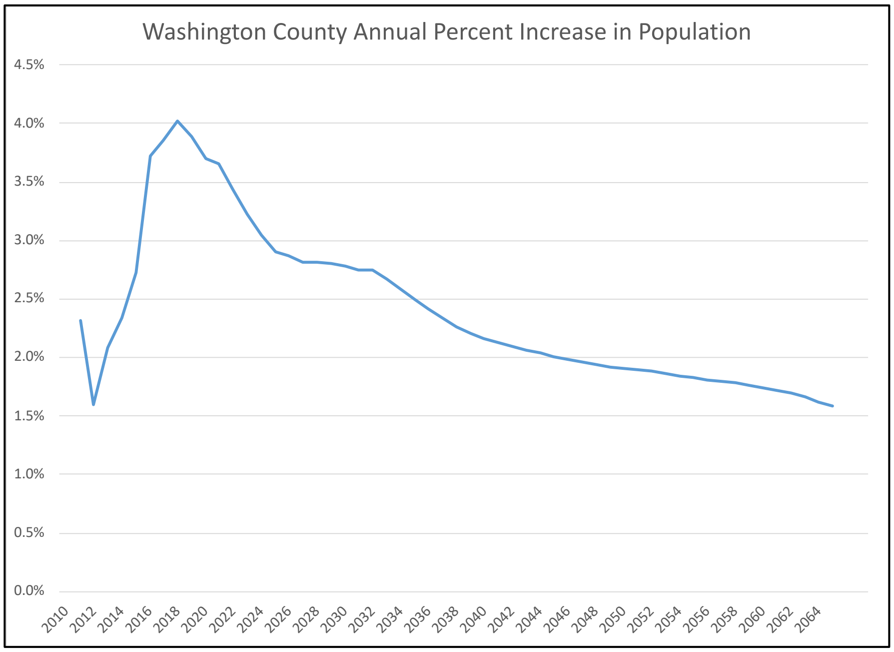

Figure 5. Washington County rate of population growth (in percent on y-axis).

The state of Utah has not determined the terms of financing the LPP and, especially given the unexpected decrease in state income and reduced citizens' ability to pay resulting from the 2020 coronavirus pandemic, it seems unwise to saddle a community with debt service that requires a two-and-a-half percent growth rate, ***especially when the growth rates forecast for the county by the Gardiner Institute are less than two percent after 2035***. Indeed, the DEIS assumes population growth will continue after 2060, as noted in their projections through 2075 to justify the "reserve buffer." However, as shown in Figure 4, population growth is declining in the years prior, and approaching 1.5 percent by 2065, and there is no reason to think it would suddenly start increasing after that. Indeed, by 2045, the rate of growth is already approaching two percent.

3.9.3 State Bonding Capacity

Another weakness in the DEIS is its complete failure to assess the impacts on the rest of Utah's population when the state's bonding capacity has been used for the LPP and is no longer available for public projects such as roads, schools, or health facilities. If constructed, the LPP would be the largest project in the history of the state, consuming the state's ability to fund other, needed projects, such as schools, roads, healthcare facilities, etc.

3.9.4 Novel SARS/Coronavirus Pandemic

As mentioned above, 2020 has seen an unprecedented novel coronavirus pandemic, which began before the DEIS was released, but well after scoping and most of the analyses that were taken from the earlier FERC process. It is unclear at this juncture what the long-term economic effects will be, but all reliable sources indicate that it will be profound. Many businesses that were forced to close will never reopen. Personal incomes for many will not recover to pre-pandemic levels. Costs for healthcare, childcare, and other pandemic-related factors will increase, some permanently. The DEIS should attempt to assess how these costs might affect residents' ability to pay before any decision can be made.

4 Conclusions

The DEIS fails to provide sufficient justification for the LPP. The proponents—since Utah has not found a use for its allocation of 23% of Upper Colorado River Compact water—seem to be more focused on beginning a project—any project—to divert water from the Colorado River before some other Compact state lays claim to it. This seems a poor rationale for committing $2 billion of public funds toward a project that may never succeed.

The failures of this DEIS include:

- Arbitrary and new requirements for purpose and need, at least one of which, a "second source," is new to this analysis.
- No assessment of whether water will be realistically available from the Colorado River, given climate change-caused reduced flows, over-allocation of water between states, and over-allocation of water rights within Utah.
- Rejection out-of-hand of alternatives that rely only on local supplies and water conservation targets that other communities have already achieved.
- Insufficient analysis of environmental impacts, including:
    - Permanent impacts to visual resources and consequent impacts on a local tourist economy.
    - Danger posed to public and private water systems of aquatic invasive species, as well as health effects from mollusk waste products or chemicals used to eradicate them.
    - Cumulative effects on Mojave desert tortoise populations resulting from recent tragic fires in Red Cliffs Desert Preserve and elsewhere.
    - Questionable assumptions about economic impacts, especially during an unprecedented novel coronavirus pandemic.

BOR has a responsibility to help local public policy makers determine up-to-date impacts from a proposed LPP. It may not be able to do so on its original timeline; there is significant more work to be done on this EIS, especially concerning justifications for water demand, justification for a "second source," availability of additional water from the Virgin River Basin, lack of availability of water from the Colorado River and impacts on and by other Upper Basin states, environmental effects noted above, including costs for mitigation of quagga mussels, etc. In any case but there is clear evidence that the LPP would not be needed for decades, if ever, and making a near-term decision not yet ripe.

Appendix A. Abbreviations

AFY	Acre-feet per year
BOR	Bureau of Reclamation
CFS	Cubic feet per second
CRSP	Colorado River Storage Project
CSU	Conserve Southwest Utah
CUP	Central Utah Project
DEIS	Draft Environmental Impact Statement
DOI	Department of the Interior
EIS	Draft Environmental Impact Statement
EWFB	Utah Executive Water Finance Board
FERC	Federal Energy Regulatory Commission
GPCD	Gallons per capita per day
GRAMA	Government Records Access and Management Act
LPP	Lake Powell Pipeline project
LWA	Local Waters Alternative
M&I	Municipal and industrial
MAF	Million acre-feet
MAFY	Million acre-feet per year
NEPA	National Environmental Policy Act
RMP	Resource Management Plan
RO	Reverse osmosis
TDS	Total dissolved solids
THM	Trihalomethane
UBWR	Utah Board of Water Resources
UDWRe	Utah Division of Water Resources
UDWRi	Utah Division of Water Rights
WRA	Western Resource Advocates

Appendix B. Lynker Technologies Memorandum, July 28, 2020

MEMORANDUM

To: Conserve Southwest Utah

cc:

From: Ben Harding, Lynker Technologies, LLC

Subject: Lake Powell Pipeline, Draft Environmental Impact Statement

Date: July 28, 2020

Introduction and summary

This memorandum addresses water supply for the Lake Powell Pipeline Project and the adequacy of the Draft Environmental Impact Statement for the Project (DEIS).

The Lake Powell Pipeline Project (the Project) is proposed to deliver 86,249 acre-feet (af) of water annually from Lake Powell to Washington County, Utah. The DEIS infers that this full amount would be available every year, but in fact in many years the Project would almost certainly be limited to a lower or to no yield by curtailments under the Colorado River Compact and the Upper Colorado River Basin Compact arising from a flow shortfall on the Colorado River at Lee Ferry (Castle and Fleck, 2019; Harding, 2019). These curtailments would reduce the reliability of the project (and its average, long-term yield) and would consequently reduce the ability of the project to fulfill its declared purpose and need and would reduce its water supply benefits. What is generally unrecognized is that these curtailments are also mechanisms whereby operation of the Project can impair the operation of other more senior Colorado River water rights in Utah, and Colorado River water rights in the States of the Lower Division, impacts that have not been addressed in the DEIS.

The DEIS has also employed analytical methodological choices that overstate the performance of the project and understate its impact on other water rights, and it has not reported analytical results that directly quantify the expected reliability and impacts of the project. The results that are presented in the DEIS suggest that the Project would not be able to deliver its full yield, and possibly any yield, on average about every 4 to 7 years. In any year in which the Project is fully curtailed an impairment of other water rights would almost certainly occur.

The DEIS is deficient for the following reasons:

- It assumes that the Project will be 100% reliable, that is that it will supply its nominal yield of 86,249 af every year during its operational life. The available evidence and analyses suggest that the project yield will be reduced or eliminated in many years due to curtailments of water use in Utah under the Colorado River Compact and the Upper Colorado River Basin Compact;
- It does not evaluate and describe the degree to which curtailments caused by the Project would cause impairment of senior water rights within Utah;

- It does not evaluate and describe the degree to which depletions from Lake Powell by the Project could impair water rights in the Lower Basin;
- It does not evaluate and quantify the effect of climate change on the performance of the Project; it simply assumes that the Project will be able to deliver its nominal yield in every year during its operational life;
- The hydrology analyses on which the DEIS is based, and Reclamation's 2012 Basin Supply and Demand Study suggest that the project will be unable to deliver its full yield or any yield at all in many years in the future, but the results of these analyses are ignored in the DEIS;
- The hydrology analyses on which the DEIS is based and Reclamation's 2012 Basin Supply and Demand Study have methodological shortcomings that result in overstatement of the performance of the Project and understatement of its impacts.

These issues are addressed in detail in the rest of this memorandum.

1. Stated Purpose and Need for the Project

The project is to supply 86,249 af of water annually to new uses in Washington County. A full supply of water from the Project is proposed to be available by 2060 and presumably to continue indefinitely over the unspecified operational life of the Project.

The Project proponents intend for the project to meet these additional planning objectives:

1. Diversifying the regional water supply portfolio by providing a second source of water for Washington County;
2. Providing for system reliability by developing a secure source of water;
3. Providing for system redundancy in the event of system failure due to disasters or aging infrastructure;
4. Accounting for climate change scenarios; and
5. Accounting for long-term uncertainty when considering the summed effect of the vulnerability to the water supply.

Objectives 1-3 require that the Project supply water reliably. The Purpose and Need Report (Table 7.2-2; page 16) assumes that the project would supply its full yield of 86,249 af 100% of the time. The DEIS provides an estimate of benefit due to water supply reliability of $1.9 billion (Table 3.2-8; page 241). These benefits are all attributable to the Project; no water reliability benefits are attributed to the No Action Alternative. The DEIS provides no analysis of the reliability of the Project but the hydrologic modeling results found in various DEIS documents suggest that the Project would be substantially unreliable.

2. The mechanism and effects of compact curtailment of Utah water rights.

2.1. The law of the river (after Harding, 2019).

The Colorado River system is managed and operated in accordance with the "Law of the River", which consists of compacts, treaties, federal and state statutes, court decisions and decrees, contracts, and regulations. See MacDonnell, et al. (1995), Wilbur and Ely (1933), Wilbur and Ely (1948), Nathanson (1978) and Verburg (2010). A comprehensive and convenient compilation is at Weisheit (2010).

The Colorado River Compact (CRC; 1922) and the Upper Colorado River Basin Compact (UCRBC; 1948), the principal elements of the Law of the River, set constraints on consumptive use of water in the Upper Basin of the Colorado River. A water treaty with Mexico (1944) created a federal obligation to deliver water from the Colorado River system at the international border.

Article II of the Colorado River Compact defines the Colorado River System and divides it into the Upper Basin and the Lower Basin. Lee Ferry, a point on the Colorado River main stem one mile below the mouth of the Paria River, divides the two basins. Article II also partitioned the states into the States of the Upper Division (Upper Division: Colorado, New Mexico, Utah and Wyoming) and the States of the Lower Division (Lower Division: Arizona, California and Nevada)

Article III(a) of the Colorado River Compact apportions to each basin 7.5 million acre-feet (maf) per year of consumptive use of the waters of the River. Article III(b) grants an additional apportionment of 1 maf per year of consumptive use to the Lower Basin.

The Mexican Water Treaty of 1944 established a federal obligation to deliver 1.5 maf of water per year to Mexico. Article III(c) of the Colorado River Compact sets out terms by which that treaty obligation would be shared between the Upper Division and the Lower Division--some portion of that federal delivery obligation may be the responsibility of the Upper Division. Interpretation of these provisions is controversial (CRGI, 2010). The federal obligation is often assumed to be equally apportioned between the Upper and Lower Divisions, but under the most severe interpretation, the Upper Division may bear transit losses on its share of the delivery obligation and may thus owe more than 0.75 maf/year at Lee Ferry. A conventional interpretation of Article III(c) is that the Mexican Treaty delivery is an annual obligation.

Article III(d) of the Colorado River Compact sets out the terms of an obligation on the Upper Division not to cause the 10-year cumulative flow at Lee Ferry to be depleted below 75 maf. This flow obligation will likely be the principal limiting constraint on consumptive use in the Upper Basin. The framers of the Compact expected that annual natural flows at Lee Ferry would typically substantially exceed 16 maf, which would satisfy the apportionments in Article III(a) and (b), and the obligations in Articles III(c) and (d), and leave a surplus, but that expectation is now understood to have been optimistic (Kuhn and Fleck, 2019). The delivery obligation of the States of the Upper Division for a share of the Mexican Treaty under Article III(c), and the non-depletion flow obligation under Article III(d) constitute a "combined flow obligation".

Article VIII of the Colorado River Compact exempts Present Perfected Rights (PPRs) in the Upper Basin from the apportionment and obligations set out in Article III[1].

The Upper Colorado River Basin Compact (UCRBC) apportions water among the Upper Basin states and sets out principles for curtailment in the event of a flow shortfall in Article III of the Colorado River Compact. Note that the UCRBC refers to Article III of the CRC in its

[1] PPRs will not be curtailed even if the flow obligation at Lee Ferry or the federal delivery obligation to Mexico are unmet.

entirety, and thereby incorporates shortfalls to any delivery required to satisfy any obligation of the States of the Upper Division to meet the federal Mexico Treaty delivery obligation.

Article III of the UCRBC sets out the apportionment of water among the States of the Upper Division and Arizona. Arizona is apportioned a fixed 50,000 af; the apportionments among the States of the Upper Division are set out as percentages of, "…the total quantity of consumptive use per annum apportioned in perpetuity to and *available for use each year* by Upper Basin under the Colorado River Compact and remaining after the deduction of the use, not to exceed 50,000 acre-feet per annum, made in the State of Arizona" [emphasis added], which are: State of Colorado, 51.75%; state of New Mexico, 11.25%, state of Utah, 23.00%; and state of Wyoming, 14.00%. The term "available for use each year" in Article III recognizes that, under some hydrologic conditions, the amount of water available for consumptive use in the States of the Upper Division may be less than the amounts set out in Article III(a) of the CRC, due to operation of Articles III(c) (treaty obligation to Mexico) and III(d) (Upper Division obligation) of the CRC, however those might be interpreted.

Article IV of the UCRBC sets out the procedures and requirements for curtailment of use in the States of the Upper Division (no provision is made to curtail any overuse in Arizona). Several parts of that article are important. First it requires the immediate "repayment" of over-consumption (relative to its or their percentage apportionment) by a state or states prior to any additional curtailment of use in other states. Second, after repayment of overconsumption, apportionment of any necessary curtailment is based on actual water use during the water year immediately preceding rather than on the percentages set out in Article III(a)(2). Third, it defines Present Perfected Rights according to the date of adoption of the CRC by the negotiators on November 24, 1922.

The principal reservoir in the Upper Basin is Lake Powell, with a current active capacity of approximately 20 maf, impounded behind Glen Canyon Dam, about 18 miles above Lee Ferry. Construction of Glen Canyon Dam, closed in 1963, added another layer to the Law of the River in the form of operating rules (Reclamation, 1970) legislated as part of the Colorado River Basin Project Act (1968), as subsequently updated (Verburg, 2010).

What might be the future interpretation of each of the elements of the Law of the River, and how they may be implemented, is broadly contentious and their precise nature will only be resolved by negotiation or prolonged litigation, or both (Robison and Kenney, 2012).

2.2. Curtailment of consumptive use in the Upper Division under the Colorado River Compact

In general terms, if the flow at Lee Ferry falls below the combined flow obligations set out in Article III(c) and Article III(d)--however these may eventually be interpreted--consumptive use in the Upper Basin must be curtailed to the degree necessary to offset any flow shortfall, except that PPRs are not subject to curtailment, according to the principles set out above under Article IV of the UCRBC.

2.3. Curtailment of water use by Utah under the Upper Colorado River Basin Compact.

In the event of a flow shortfall at Lee Ferry and a consequent curtailment of consumptive use among the States of the Upper Division, if Utah has, over the previous ten years, consumptively used more than 23% of the water determined to have been available for consumptive use in the States of the Upper Division, it would immediately have to curtail use (or deliver stored water) until that amount has been offset. If, after repayment of all overconsumption, a shortfall still remains at Lee Ferry, Utah (along with the other States of the Upper Division) would have to curtail its use or deliver stored water in the proportion that its consumptive use in the previous year bears to the total consumptive use in the previous year among the States of the Upper Division.

2.4. Curtailment of use under water rights within Utah

Should curtailment of consumptive use in the State of Utah become necessary, the Utah Division of Water Resources would have the responsibility of curtailing use under Utah water law, according to priority of appropriation date, subject to preferences in the event of a declared temporary water shortage emergency (Utah Code Ann. § 73-3-21.1). Curtailment of consumptive use under water rights perfected prior to November 24, 1922 (Present Perfected Rights) would not be necessary.

2.5. Utah's apportionment of water will vary depending on hydrology

The quantity of water available for consumptive use in the Upper Basin in any year is a function of the hydrology over the period between the time when reservoir storage above Lee Ferry is full and the reservoir is spilling and the time of a shortfall in the combined flow obligation at Lee Ferry. In general terms, the amount of water available for consumptive use in the Upper Basin during a dry spell is the water stored in reservoirs above Lee Ferry (primarily Lake Powell) plus the cumulative natural flow of the river at Lee Ferry, less cumulative evaporative losses and less the cumulative combined flow obligation. The quantity of water available for consumptive use in Utah during this period is 23% of the total amount available to the Upper Basin (after subtracting the fixed 50,000 af/year apportioned to Arizona).

The amount of water available for consumptive use in the States of the Upper Division, and thus in Utah, can only be known exactly at the time of a flow shortfall (Harding, 2019). The time between a reservoir spill[2] and a flow shortfall can range over decades, and it is impossible to predict hydrology over more than a seasonal time frame with useful skill. If the exact amount of water available for consumptive use were known at the time a spill ends, then water rights could be administered in perfect priority to avoid a curtailment but perfect, or even useful foreknowledge is impossible. The event of a flow shortfall is evidence that water rights have not been administered perfectly, and administration of the payback of over-consumption, or of curtailment to maintain flow at Lee Ferry would cause undue harm to senior water rights (Harding, 2019).

3. The Project would not be 100% reliable at the nominal yield.

The Project would be susceptible to curtailment, and the available information suggests that it would be curtailed at a significant frequency, but the DEIS does not address this probability. Without an evaluation of the reliability of the Project, its ability to meet its proposed purpose cannot be evaluated. The DEIS must quantify the reliability of the project in the face of compact curtailments and operation of a drought contingency plan (DCP).

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[2] A "spill" as used herein means that the reservoir is full. The infrastructure at Glen Canyon Dam is such that water may be released down the spillways when the reservoir is not full, but in the terminology adopted herein those flows would be considered "releases".

As described above, the Project is susceptible to curtailment under the terms of the CRC and the UCRBC. Curtailment could reduce or even eliminate yield from the project for a year or more. As described below, evidence in the Project documents and the Colorado River Basin Supply and Demand Study (Reclamation, 2012) cited in the DEIS and its supporting documents, suggests that the Project could be curtailed at a significant frequency.

A DCP includes both a Demand Management Storage Agreement (DMSA), allowing for use of unfilled space in federal reservoirs, and demand management programs (DMP) for the Upper and Lower Basins. No Upper Basin DMP currently exists—its feasibility and potential scope is currently the subject of study by at least some states of the Upper Division. Reclamation (2019) contains a conceptual statement of purpose for an Upper Basin DMP.

> "The purpose of an Upper Basin Demand Management Program will be to temporarily reduce Consumptive Uses in the Upper Basin or augment supplies with Imported Water, if needed in times of drought, to help assure continued compliance with Article III of the Colorado River Compact without impairing the right to exercise existing Upper Basin water rights in the future." (Reclamation, 2019)

Augmentation of supplies would be extraordinarily expensive and politically complex and is unlikely to occur. Accordingly, without augmentation the Upper Basin DMP is solely a mechanism for prospective administration of consumptive use, so as to reduce the probability of a shortfall to the combined flow obligation at Lee Ferry. As such, operation of an Upper Basin DMP can be thought of as a pre-emptive curtailment, and diversions by the Project would likely be reduced when the DMP is in operation.

4. In the event of a curtailment, the Project would likely impair senior Utah water rights

As described above, and in Harding (2019), except in extraordinary circumstances, a curtailment will result in impairment of senior rights due to the accumulation of depletions by more junior rights. Because years or decades may pass between curtailments, the effect of excess consumptive use by junior rights accumulates in Lake Powell. If the cumulative over-consumption under a junior right is more than its annual consumptive use, curtailment would extend to senior rights, thus impairing those rights (Harding, 2019).

For illustration, assume that the Project operates at its full annual capacity for ten years, and that it is the most junior water Colorado River water right operating in Utah. Over that time it will deplete about 860,000 af from the Colorado River, and those annual depletions will accumulate in Lake Powell with the result that the reservoir will be 860,000 af lower than if the Project had not been operating. If, at the end of that period Lake Powell is empty, and a shortfall in the combined flow obligation in the amount of 500,000 af results, that shortfall will be entirely due to operation of the Project over that ten-year period; absent the effect of the project, the reservoir would have been able to release 500,000 af, so no shortfall would have occurred, and still have contents of 360,000 af. But the Project, even if shut down completely, would make up only 86,000 af of that shortfall in one year; the remainder would have to be made up by curtailing other, senior water rights.

Even prospective administration, such as against "triggers" as contemplated by DMPs would likely impair senior rights. Only an after-the-fact settlement may be able to make senior rights whole (Harding, 2019).

5. The Project could cause impacts to Lower Basin water rights

A curtailment is intended to maintain flow at Lee Ferry sufficient to meet the combined flow obligation there. This may not be possible in in very severe conditions, particularly because consumptive use under Present Perfected Rights cannot be curtailed even if that means that the flow at Lee Ferry will drop below the combined flow obligation. In the event that the combined flow obligation at Lee Ferry is not fully met, the amount of water available for storage or use in the Lower Basin would be reduced, potentially impairing water rights there. Shortfalls to the combined flow obligation are possible based on analysis of prehistoric flow reconstructions (Harding, 2019) and will increase in frequency if climate change or megadroughts reduce flows of the Colorado River further.

6. DEIS ignores the effect of climate change on Project yield.

The DEIS adopts projections of hydrologic conditions under five future climate scenarios to show that Washington County Water Conservancy District (WCWCD) would experience 2060 supply deficits ranging from approximately 54,000 af to approximately 113,000 af, or more. These projected deficits are used to establish the need for the project. The project purpose is to supply water to the WCWCD to eliminate or reduce these deficits.

However, the DEIS applies inconsistent analytical approaches for the assessment of need and purpose. In assessing need, the DEIS quantifies the effect of climate change on water supply shortfalls to WCWCD, as noted above, but it ignores the effect of climate change when assessing the ability of the Project to deliver water, and assumes that the nominal annual yield claimed for the Project, 86,249 af, would be available in every year. The very research cited in support of the assessment of need offers a dire picture of future water supply on the Colorado River and suggests that the yield of the project is highly uncertain. Further, the hydrology studies incorporated into the DEIS documents suggest that the yield of the Project would not be reliable.

The DEIS cites recent published research by Udall and Overpeck (2017) and Milly and Dunne (2020) to support projections of lower flows on the Virgin River, and thus larger WCWCD supply shortfalls. However, the results in both Udall and Overpeck and Milly and Dunne encompass the entire Upper Colorado River Basin, and can be directly applied to natural flow at Lee Ferry. Both papers offer estimates of projected change in runoff (directly comparable to change in natural flow at Lee Ferry) due to projected changes in temperature. The expected value of flow changes at 2050 ranged from -7% to -27% for Udall and Overpeck and -14% to -31% for Milly and Dunne. Very roughly speaking, these projections translate to reductions in water available to Utah of 240 thousand af (kaf) to 1 maf[3]. Both groups of authors state that it is possible that these reductions could be moderated by increases in precipitation, but that it is unlikely that those increases could fully counter the temperature-induced reductions.

Note that these projections are for changes to average flow. Multi-decadal-scale droughts are amply represented in the historical record, and more severe and sustained droughts are contained in the prehistoric record. Drought would compound the flow reductions due to

[3] Based on a long-term average flow at Lee Ferry of 15 maf. A 7% reduction of 15 maf is 1.05 maf, which would be borne by the Upper Division states. Utah is apportioned 23% of the water available to the Upper Division states; its share of the 7% reduction is thus about 240,000 af.

projected changes average temperature. For example, Udall and Overpeck note a 16% reduction in flow during a 25-year drought in the prehistoric record.

7. The DEIS hydrology analyses are not based on sound science and sound assumptions

The DEIS reports results of hydrology modeling on the Colorado River. Two hydrology scenarios are used to generate this result, a historical scenario and a climate change scenario. However, these analyses are unrealistic, as they assume that a substantial part of the expected increase in basinwide consumptive use will not occur. In Appendix C-10 (Reclamation, 2020), Reclamation writes:

> In this modeling, Colorado Basin future total annual depletions are significantly lower than those modeled in the 2012 Basin Study and the 2007 Final EIS of the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead (Interim Guidelines EIS; Reclamation 2007a). This is because for the purposes of this analysis all depletions except the Southern and Highway Alternatives and those identified as reasonably foreseeable held at 2060 levels were held constant at 2020 depletion levels.

Elsewhere in Appendix C-10 and in the DEIS, Reclamation characterizes this modeling decision as providing "the maximum impact", but this is simply wrong. Each one of the seven Colorado River states plans to utilize fully all water that is physically and legally available to it. No justification is provided for this assumption of reduced basin-wide depletions, but even if one could be offered the assumption is scientifically incorrect and completely implausible, and renders useless the hydrology results on which the DEIS is based.

Reclamation did include a "sensitivity analysis" wherein full basinwide projected demands were used to simulate the Project, but only against the historical inflow scenario. Using the full basinwide projected demands is the correct demand assumption, but that assumption should be used in the main analysis. (The use of the direct natural flows to represent "historical" conditions overstates the performance of the Project, as is described more fully below.)

In the DEIS and in Appendix C-10, it is not clear exactly what depletions from the Colorado River were simulated in modeling the No Action Alternative. See the specific language below.

8. The DEIS does not provide a direct assessment of the reliability of the Project

As described above, the Project will be susceptible to curtailment by operation of the Colorado River Compact and the Upper Colorado River Basin Compact. The DEIS does not report, as part of its hydrology analyses, results that allow a direct assessment of the reliability of the Project. What is necessary are estimates of the frequency and severity of curtailments. A presentation of results that would provide this information would be a set of curves of the magnitude of 10-year cumulative flows at Lee Ferry, for the 10th, 5th and 2nd percentile (corresponding to return intervals of 10, 20 and 50 years)[4].

9. What other DEIS hydrology analyses suggest about Project reliability

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[4] This would be similar to Figure 2.3-9 of Appendix C-10, Hydrology, but for the ten-year cumulative flow and for at least the three percentiles noted.

Three analyses of the water supply for the Project from the Colorado River are available: the presumably final analysis in Appendix C-10; Final Study Report 18, Surface Water Resources, dated April 2016; and Draft Study Report 18, Surface Water Resources, dated November, 2015. Each provides information beyond what is contained in the DEIS itself.

9.1. Appendix C-10: Hydrology

This analysis is the source of three charts presented in the DEIS showing model results for Lake Powell water surface elevation (WSE) in December. Very important modeling results were provided in Appendix C-10 but not included or even mentioned in the DEIS. In addition to the December WSE results, Appendix C-10 provides results for the probability that Lake Powell would fall below minimum power pool, and water-year release volume from Glen Canyon Dam. In addition, Appendix C-10 presents results for another scenario using a conventional assumption of full development in the Upper Basin[5] and the climate change hydrology. Results for that scenario are shown in the following figures.

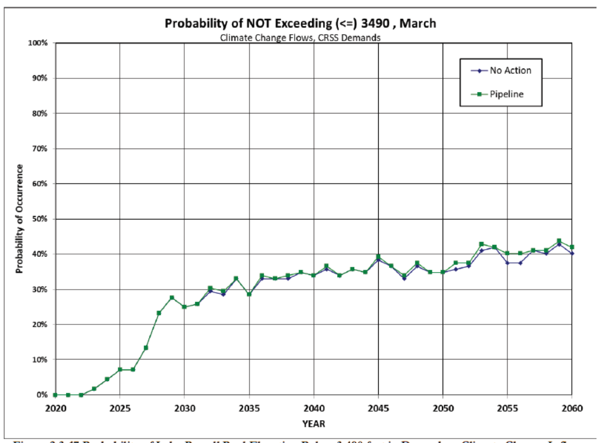

Figure 2.3-17 Probability of Lake Powell Pool Elevation Below 3,490 feet in December. Climate Change Inflows, 86kaf Lake Powell Pipeline Maximum Depletion.

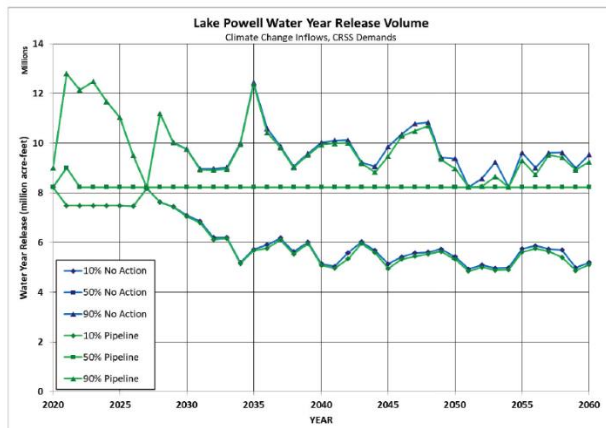

Figure 2.3-18 Lake Powell Water Year Release. Climate Change Inflows, 86kaf Lake Powell Pipeline Maximum Depletion.

Figure 2.3-17 (left) shows the probability of not exceeding the WSE of minimum power pool in Lake Powell (3,490 ft). Minimum power pool is the elevation at which generation at the hydroelectric plant at Glen Canyon Dam must cease, causing severe operational and financial impacts. A primary objective of an eventual Upper Basin DMP would be to maintain Lake Powell at or above minimum power pool. Figure 2.3-17 shows that the probability that Lake Powell would be at or below minimum power pool increases with time, and reaches 40% at 2060. Demand management practices (e.g. fallowing) act slowly, over a year or more, so this result suggests that an Upper Basin DMP would have to be active at all times, so the yield of the Project would likely be substantially reduced.[6]

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[5] Virtually every previous study of water availability in the Colorado River has included evaluation of what is termed "full development" in the Upper Basin. See, for example, Reclamation, 2007 and Reclamation, 2012.

[6] The agreement about Colorado River drought contingency management, Reclamation, 2019, sets a target level of 3,525 ft as the elevation when actions will be contemplated to protect against excessively low levels in Lake Powell. While this is an operational target, it illustrates that action will be contemplated well before the Reservoir approaches minimum power pool. This provides a perspective on the degree of conservatism that can reasonably be expected in an Upper Basin DMP.

Figure 2.3-18 (right) shows the distribution of releases from Lake Powell during the study period. Of interest is the lower set of lines—releases from Lake Powell (through Glen Canyon Dam) were simulated to be at or below the levels shown in those lines ten percent of the time. (For example, in 2043, the simulation shows that in both the No Action and Pipeline cases the annual release would be less than or equal to 6 maf.) Under normal operations, an annual release of 8.23 maf from Glen Canyon Dam is considered sufficient to meet the combined flow obligation at Lee Ferry[7] and this is the usual operation. Releases below this level will lead to a flow shortfall to the combined flow obligation at Lee Ferry, which would precipitate a curtailment. Even a single year of low flow could cause a curtailment if the release over the previous nine years has been at the nominal level of 8.23 maf. Figure 2.3-18 shows that after about 2032 there would be a 10% probability that releases would be at or below 5 to 6 maf. These results suggest that the Project could be susceptible to curtailment one out of every ten years, on average.

Appendix C-10 adopted the same assumption about future basinwide depletions as the DEIS:

> Those depletions that cannot be defined as reasonably foreseeable remained constant at the 2020 depletion levels associated with the Basin Study Current Projected demand scenario. Those depletions assumed reasonably foreseeable are held constant at 2060 levels, and include the Central Utah Project, Animas-La Plata, Dolores Project, Navajo-Gallup, Ute Indian Compact, and Navajo Indian Irrigation Project.

Appendix C-10 describes the No Action Alternative this way:

> Under the No Action Alternative, the LPP would not be built and no other planned projects described in the No Action Alternative in Chapter 2 of this DEIS would affect the Colorado River. Therefore, there would be no effect to the Colorado River under this alternative.

Without a detailed report of the modeled depletions the disposition of the Colorado River supply for Project in the No Action Alternative is uncertain. A comparison of DEIS Figure 3.8.1, Appendix C-10 Figure 2.3-1 and Final Study Report 18 Figure 1 show similar differences between the Action and No Action alternatives, which implies that Appendix C-10 and the DEIS assumed that the water supply for the Project would not be developed elsewhere by Utah under the No Action alternative. The relatively small, and increasing magnitude of the differences between the Action and No Action alternatives in this modeling is attributable to the transient nature of the analysis and its arbitrary stopping point in 2060. This is only an inference, however—this imprecision in the DEIS prevents an assessment of the impacts of the Project.

[7] The combined flow obligation at Lee Ferry is assumed to be met if the flow at Lee Ferry is 8.25 maf annually, as this will provide 75 maf over a ten year period to meet the CRC Article III(d) obligation and 0.75 maf annually to meet the assumed Upper Division share of the federal obligation to Mexico. The Paria River joins the Colorado River between Glen Canyon Dam and Lee Ferry and contributes an annual average of 20,000 af (0.02 maf). Thus, the usual operation at Glen Canyon Dam is an annual release of 8.23 maf. Higher or lower releases are made under specific conditions.

9.2. Final Study Report 18, Surface Water Resources

Final Study Report 18 (UBWR, 2016) is based on hydrologic modeling conducted by Reclamation (Reclamation, 2015) included therein as Attachment 2, DRAFT Lake Powell Pipeline Hydrologic Modeling. The approach and results in Reclamation, 2015 are consistent with but not identical to results in Appendix C-10 and the DEIS. One difference in approach is that depletions that are not considered "reasonably foreseeable" are held at 2015 levels.

Reclamation, 2015 is explicit about whether water contemplated for diversion by the Project is assumed to be used elsewhere in Utah. It describes the No Action alternative this way.

> The No Action alternative assumes that if the Lake Powell Pipeline is not developed, Utah's unallocated water would not be developed somewhere else in the state. This analysis isolates the effect of adding a new project (Lake Powell Pipeline) to the mix of existing and reasonably foreseeable depletions in the Colorado River system.

9.3. Draft Study Report 18, Surface Water Resources

Draft Study Report 18 (UBWR, 2015) is based on hydrologic modeling conducted by Reclamation (Reclamation, 2010) included therein as Attachment 2, DRAFT Lake Powell Pipeline Hydrologic Modeling. Reclamation, 2010 differs in substantial ways from the subsequent reports described above.

It adopted two scenarios of future basinwide depletions, each with different assumptions about the No Action alternative:

- Final Planning Analysis: Assumes that future water development in the Upper Colorado River Basin would occur according to projections provided by the Upper Basin States. In this analysis the No Action alternative assumes that if Utah does not develop the Lake Powell Pipeline, that water *would* be developed somewhere else in the state.
- No Additional Depletion Analysis: Assumes water use in the Colorado River basin would remain constant at current levels, except for reasonably foreseeable future projects, which are held constant at 2009 depletion levels. In this analysis, the No Action alternative assumes that if the Lake Powell Pipeline is not developed, that water *would not* be developed somewhere else in the state.

As explained below, the No Additional Depletion scenario is not plausible and is not considered further here.

Reclamation, 2010 adopted two scenarios of future hydrology:

- Direct Natural Flow, Index Sequential Method (ISM): The future hydrology used as input to the model in this scenario consisted of samples taken from the historic record of natural flow in the river system over the 101-year period from 1906 through 2006.
- Nonparametric Paleo-conditioned (NPC) inflows: This inflow hydrology scenario uses paleo-hydrologic state information (i.e., wet or dry) to conditionally sample from the historic natural flow record. The paleo-hydrologic state information was derived from annual streamflow reconstructions from tree-ring chronologies of the years 762 to 2005 on the Colorado River at Lees Ferry (Meko *et al.*, 2007).

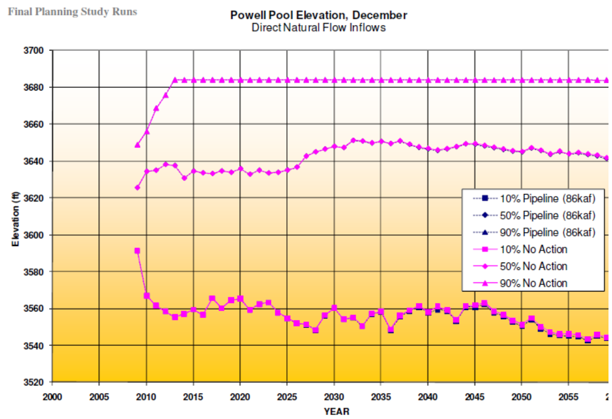
See Reclamation (2007) for details of the Index Sequential Method (Chapter 4) and the Non-Parametric Paleo-conditioned method (Appendix N).

The most notable result from Reclamation 2010 is the substantial difference in simulated Project performance between model runs using the ISM and the NPC hydrology, as shown in the following figures ("Selected results…"). The first row shows Figure 1 (left, based on direct natural flows, DNF/ISM) and Figure 7 (right, based on NPC) from Reclamation, 2010. These two figures show estimates of the future probability of Lake Powell WSE. Note that the two figures have very different vertical axes.

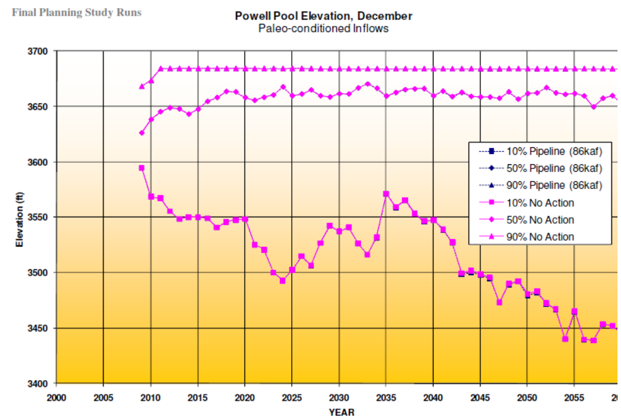
Selected results from Reclamation, 2010 (Draft Study Report 18, Surface Water Resources, Attachment 2)

Results based on Direct Natural Flows (ISM)

Results based on paleo-conditioned flows (NPC)



Lake Powell Pool Elevation, December. Direct natural flow inflows, 86kaf Lake Powell Pipeline maximum depletion.



Lake Powell Pool Elevation, December. Paleo-conditioned inflows, 86kaf Lake Powell Pipeline max depletion.

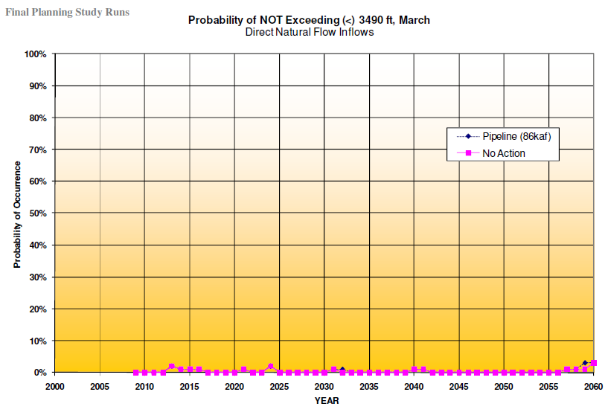


Figure 2. Probability of Lake Powell pool elevation being below 3490 ft in March. Direct natural flow inflows, 86kaf Lake Powell Pipeline maximum depletion.

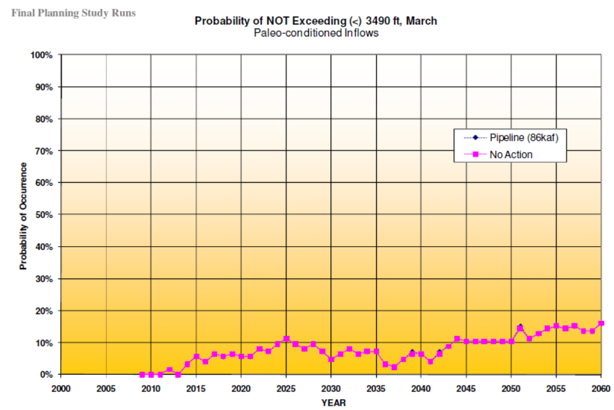
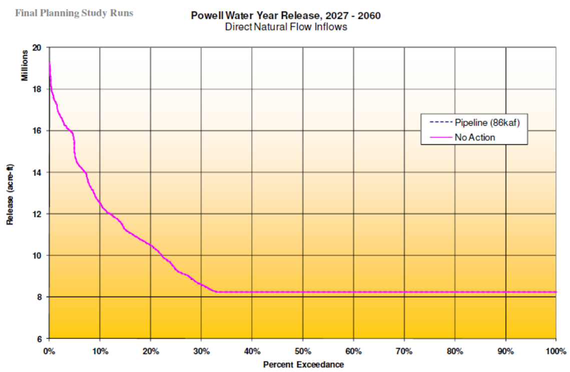
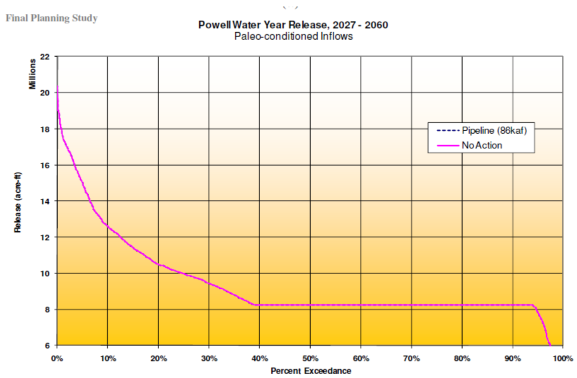


Figure 8. Probability of Lake Powell pool elevation being below 3490 ft in March. Paleo-conditioned inflows, 86kaf Lake Powell Pipeline max depletion.



(b)

Figure 4. Lake Powell water year release, flow duration curve throughout time during the Interim Guidelines period (a) and during the post-Interim Guidelines period (b). Direct natural flow inflows, 86kaf Lake Powell Pipeline maximum depletion.



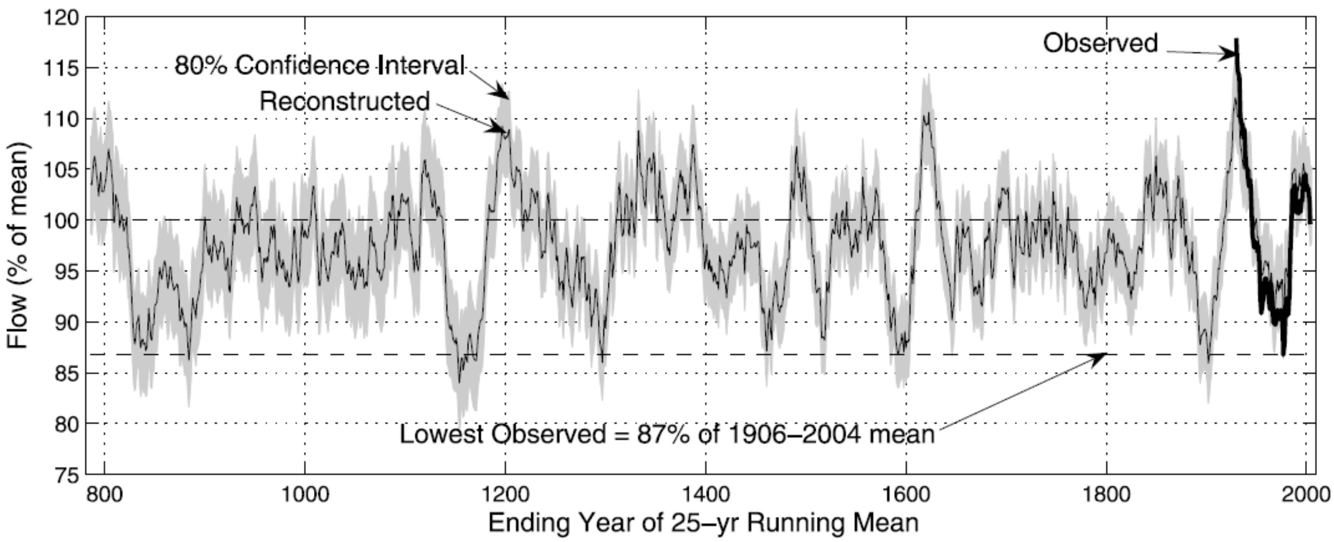
(b)

Figure 10. Lake Powell water year release, flow duration curve throughout time during the Interim Guidelines period (a) and during the post-Interim Guidelines period (b). Paleo-conditioned inflows, 86kaf Lake Powell Pipeline maximum depletion.

The 10th percentile WSE for the NPC scenario decreases dramatically after 2035, falls below minimum power pool in about 2050, and is decreasing when the analysis ends in 2060. The second row shows the probability that Lake Powell WSE would fall to or below minimum power pool. Figure 8 (right, NPC) shows the probability that Lake Powell WSE would fall to or below minimum power pool to be about 10% by 2045 (one out of every ten years) and 15% by 2060 (approximately one out of every seven years; the corresponding probability in Figure 2 (left, DNF/ISM) is virtually zero. The third row shows the cumulative distribution of annual water-year releases from Glen Canyon Dam. Figure 10 (right, NPC) shows the probability that Glen Canyon water-year releases would fall below 8.23 MAF to be about 5% (approximately 1 in every 20 years); the corresponding probability in Figure 4 (left, DNF/ISM) is zero (flows are at or above 8.23 MAF 100% of the time). Note that lowest value shown on the vertical axis of Figure 4 is 6 MAF and flows reach that level, or below, three percent of the time.

The results from the NPC analysis suggest that the Project would be vulnerable to reductions or elimination of yield due to operation of DCP/DMP or due to curtailment. The tenth percentile of Lake Powell WSE (first row, right) drops steadily after 2035 and drops below minimum power pool around 2050. The tenth percentile value is the elevation at which the reservoir will be *at or below* one year out of ten, on average. That the tenth percentile WSE is dropping in 2060 is an indication that the system is not sustainable and that the study period must be extended to adequately characterize the long-term performance and reliability of the Project. The probability of not exceeding minimum power pool (WSE of 3490 ft; second row, right) rises above 10% before 2045, reaches about 15% in 2055 and is still increasing in 2060. This result is consistent with Figure 7. The frequency distribution of water year releases from Glen Canyon Dam (third row, right) drops below the normal annual release of 8.23 maf about 5% of the time. This is equivalent to a flow shortfall in one out of every 20 years.

The differences between the results from the DNF and NPC scenarios are due to the peculiar nature of the historical record. The natural flow record on the Colorado River begins in 1906 and from that time until the 1920's the river enjoyed a sustained wet period. The ISM method steps through the historical hydrology record (101 years long, at the time of these analyses), first starting a simulation in 1906 that runs until 2006, then starting a second simulation that runs from 1907 through 2006 and then wraps around and includes 1906, and so on. This produces 101 separate simulations, the last one starting in 2006 and then wrapping around to pick up 1906 through 2005. However, each of the 101 simulations includes the wet period in the first part of the 20th Century, but that wet period was a very rare event—it is singular in the reconstructed period reaching back to year 762. Figure 2 from Meko *et al.*, 2007 illustrates this.



The Meko *et al.,* 2007 reconstructed record indicates that the early 20th Century wet period is wettest period in more than 1,200 years. Assuming only for illustration that the climate over the next 1,200 years would remain the same as it was in the last 1,200 years, then we could expect to see one wet period equivalent to that of the early 20th Century over that 1,000-year period. But, *each* of the 101 simulations from the DNF/ISM hydrology contains that wet period as one or two wet spells. This introduces a non-conservative bias into the evaluation of the performance and impacts of the Project. On the other hand, the NPC hydrology preserves the mean flow from the historical record within a few percent but generates many unique synthetic flow sequences that are consistent with the variability shown in the Meko *et al.,* 2007 reconstruction. Because it was a very rare event, the NPC flow sequences do not contain a wet spell comparable to the early 20th Century. For this reason, the NPC method is the scientifically sound approach to evaluate the performance and impacts of the project under the current climate.[8]

9.4. The DEIS hydrology studies adopted assumptions and methods that overestimate reliability of the Project

9.4.1. Understating basin-wide depletions

The DEIS bases its assessment of the benefits and impacts of the Project on an analysis that does not reflect full development of all basin states. It offers a “sensitivity analysis” that does reflect full development as an ancillary analysis but that is actually the more appropriate analysis. The assumption in the DEIS that full development would not take place is simply not plausible, and constitutes an egregious error in the analysis of the performance and impacts of the Project. This assumption evaluates the Project in the context of a system where there is less

[8] The NPC does not reflect the future impact of climate change on the flows of the Colorado River. Rather, it provides a less-biased representation of the past long-term variability of the flow of the Colorado River.

competition for water than is plausible, so the Project will appear to be more reliable and to have less impact than would likely be the true case.

Beyond that bias, the DEIS does not quantify the degree to which basin-wide depletions have been underestimated. The hydrology studies do provide a list of the model "nodes"[9] that have been included in the analysis, but to quantify the degree to which the decision to exclude other expected depletions has understated future basin-wide development would require a high degree of expertise and access to the Reclamation models and datasets. While this is surely possible, the DEIS is deficient because it conceals this important information from the general public.

The DEIS rationalizes its assumption of less-than-full development on a narrow technical interpretation of what projects are "reasonably foreseeable". Even though the development of an individual project may be uncertain, and therefore it is judged not to be "reasonably foreseeable", full development by each Upper Division state of its available water supply is inevitable. Because the impact of any individual project on the water balance above Lee Ferry depends primarily on its consumptive use of water, and not on its location or other details, generic "placeholder" projects should be used to provide a realistic context for evaluation of the Project.

9.4.2. Use of DNF/ISM method

As noted above, the ISM method used to construct the flow sequences used as input in modeling of the Direct Natural Flow scenario always includes the anomalous wet period from the early 20th Century (Meko *et al*, 2007) so it overstates the reliability of the project because Lake Powell fills completely at least once in every trace. The NPC hydrology provides a better foundation for evaluating the performance of the project under an assumption of climate stationarity (i.e. an assumption that the future climate will be similar to that of the past 1,200 years).

9.4.3. Using transient climate-change analysis through 2060 overstates reliability of project

Reclamation consistently uses direct simulation of projected future natural flows based on future climate conditions projected by global climate models (GCMs; also called general circulation models) that are converted into natural inflows using a hydrology model; see Reclamation, 2012. This methodological choice overstates the performance (reliability) of the project for two reasons.

The first reason is related to the short study period used in the DEIS hydrology analyses, all of which end in 2060. The development plan for the Project does not have it begin diversions until 2027 and then depletions start at low levels and increase only gradually and do not reach full yield until 2049, so the Project's full impact is only simulated for eleven years. Projected changes in natural flow develop progressively throughout this century, with conditions at mid-century being substantially less severe than conditions at the end of the century (see, e.g., Harding *et al.*, 2012). Thus, the performance of the Project is being evaluated over a very short period that is not representative of the conditions that are projected to occur during the substantial majority of its service life. A proper evaluation of the reliability and impacts of the

[9] These are locations where depletions are simulated to occur in the Colorado Rivers Simulation System (CRSS) Model used by Reclamation.

Project would use a "period-change" approach (Brekke, 2011) with a simulation period extending for at least the expected service life of the project after full development. The period change approach adjusts historical stream flows to reflect the projected average conditions at some future time. The period change approach has been used in numerous studies, including the Colorado River Water Availability Study (CWCB, 2012) and several studies by Reclamation: the St. Mary-Milk Basin Study (Reclamation 2010a), a yield study of selected reservoirs in Oklahoma (Reclamation 2010b), and the Northwest Area Water Supply Project, in North Dakota (Reclamation 2012a). The use of the period change approach has precedence in the DEIS as it was used in the Virgin River Climate Change Analysis as part of the "period composite delta" method (Reclamation, 2014; UBWR, 2016a). An appropriate future time frame for this analysis would be, at a minimum, at the mid-point of the expected service life of the project, but a more conservative choice would be at the end of its expected service life.

The second reason is that the current climate models understate decadal to multi-decadal (D2M) variability in precipitation in historical simulations of the climate of the Western United States, and elsewhere (Ault *et al.*, 2012). It is precisely D2M variability that is most critical for the performance of Lake Powell in the Upper Colorado River Basin. Paleo studies (such as the Meko, *et al.*, 2007 reconstruction) indicate that estimates of D2M prominence based only on the 20th century record may themselves understate the long-term condition. Thus, a future expectation of more severe and sustained drought overlaid on top of changes in mean hydrology is supported by research. The DEIS analysis does not adequately incorporate the current, accepted science about this issue.

10. Reclamation 2012 Supply & Demand Study suggests the Project would have poor reliability

The DEIS refers to Reclamation's 2012 Supply and Demand Basin Study (2012 Basin Study; Reclamation, 2012) to support the statement of need for the Project. Specifically, the DEIS cites to Reclamation, 2012 to rationalize the argument that in the face of climate change WCWCD should have a second source of water. However, the DEIS notably ignores the large body of results in Reclamation, 2012 that quantify the likely effect of climate change to reduce water availability from the Colorado River.

10.1. Reported curtailment frequency, volume

The 2012 Basin Study offers quantitative estimates of the frequency and severity of flow shortfalls at Lee Ferry. (Reclamation, 2012, Figure G-5.) Such flow shortfalls trigger curtailments of consumptive use in the States of the Upper Division. These results suggest that the reliability of the Project would be significantly less than 100%: After about 2040, the frequency of years with flow shortfalls in climate change scenarios range from about 17% to about 25% (roughly, on average, every fifth year) depending on the development scenario. The NPC scenario results in between 2% and 8% (roughly, on average, every 50th to every 12th year) depending on the development scenario. The distribution of the severity of curtailments is generally not influenced by the supply or development scenario: If there is a deficit, 10% of the time it wouldn't exceed 500,000 AF, 50% of the time it wouldn't exceed 2 MAF and 90% of the time it would not exceed 3.5 MAF. Conversely, 10% of the time the magnitude of the curtailment will exceed 3.5 maf. Any deficit would require repayment of overdrafts or curtailment of like amounts of consumptive use in the Upper Division. Multiply the basin-wide deficit by 23% (Utah's share under the UCRBC) to get a rough magnitude for Utah's share of a curtailment. As described below, the flow shortfalls at Lee Ferry, and therefore the volume of projected curtailments, from Reclamation, 2012, are understated due to omission of the Upper Division obligation to supply a share of the federal Mexico Treaty obligation.

10.2. Methodological shortcomings in the 2012 Supply & Demand Study

The 2012 Basin Study adopted methodological choices that understate the frequency, duration and magnitude of flow shortfalls and thus curtailments. Like the hydrology analyses for the DEIS, the 2012 Basin Study also uses a transient analysis framework and direct simulation of hydrology time series based on GCM outputs. As noted above (Section 8.4.3), these choices reduce the apparent hydrological stress on Lake Powell and therefore understate the frequency, severity and duration of flow shortfalls.

A more significant shortcoming is that the 2012 Basin Study uses a non-depletion flow obligation at Lee Ferry of 75 MAF over ten years. The conventional assumption used in most analyses by Reclamation, and that is incorporated into the operating rules for Lake Powell, is that under most conditions the minimum release from Glen Canyon dam will be 8.23 maf, which is sufficient to provide an annual flow at Lee Ferry of 8.25 maf, which in turn is sufficient to meet the non-depletion obligation in CRC Article III(d) (75 maf over ten years) and an assumed equal share of the federal obligation to Mexico (0.75 maf, annually). See Section 2.1, above for context. The assumption of a ten-year flow obligation of 75 maf at Lee Ferry in Reclamation, 2012 ignores the obligation of the Upper Division to contribute some share to the federal Mexico Treaty delivery obligation (Reclamation, 2012c, Chapter 5). How that share will be quantified is in dispute, but there is no plausible argument that it will be zero; the conventional assumption is that the Upper Division will be required to deliver 0.75 maf (one-half of the federal Mexico Treaty obligation) each year at Lee Ferry. Thus, the modeling conducted in Reclamation, 2012, understates the amount of water that must be released from Lake Powell by 7.5 maf over every ten-year period. This results in a low bias in estimates of both frequency and severity of curtailments.

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Appendix C. Water DM Analysis of Water Demand, September 4, 2020

September 4, 2020

Conserve Southwest Utah

321 North Mall Drive, B202

St George, UT 84790

Expert opinion and analysis regarding water demands and statement of need for the Lake Powell Pipeline Project DEIS

To Whom It May Concern:

At the request of Conserve Southwest Utah, I have prepared this expert letter report regarding water demands pertaining to the Lake Powell Pipeline (LPP) Project Draft Environmental Impact Statement (DEIS) and statement of Purpose and Need (Appendix B).

In summary, this letter report concludes that the future water demand forecast for Washington County is grossly inflated. The forecast is inflated through several mechanisms including:

- A population forecast that increases by 293%.
- An excessive level of per capita water use that would make Washington County water users among the highest in the US.
- Improper inclusion and inflation of raw secondary irrigation water in the forecast.
- A 15.4% water loss factor that never improves and thus wastes approximately $300 million in value of the $2 billion-dollar project.

A statement of need and water demand forecast for a project of this size and scope must be based on sound data, reasonable assumptions, and conservative resource principles to ensure the water will not be wasted. Water customers across the Western United States have successfully implemented effective water efficiency strategies that today have reduced per capita use far below levels shown the DEIS forecast for 2020 and 2075. The forecast in the DEIS provides for an excessive level of per capita water use over the next 55 years with efficiency improvements that simply end at year 2045 with no further improvement in efficiency achieved over the next 30 years. This is neither realistic nor reasonable.

The DEIS forecasts a future population of more than 500,000 people, which is equivalent to a city the size of Tucson, Arizona. With this level of development, current housing patterns will change and fewer people are likely to live in large sprawling single-family homes with a supply of secondary water for irrigation as is common today. Under this high growth scenario, water use will necessarily change and become more efficient. The DEIS forecast should reflect realistic, efficient levels of future use, not wasteful and excessive levels as currently presented.

Arguments that Washington County is somehow different or exceptional from other communities in the West because it has second homes, resorts, pools, golf courses, and such and is thus immune to national trends towards higher efficient water use are nonsense. Water is a precious and expensive commodity and least cost planning principles must be applied when considering expensive infrastructure projects such as the Lake Powell Pipeline.

Water in Washington County will be expensive in the future, regardless of the source, and economics alone will press down demand. New technology for remotely managing irrigation and for detecting both utility and customer water leaks will reduce demands and losses in the future, something ignored in the DEIS forecast. Communities across the Western US, including Aspen, Las Vegas, and Tucson - with many second homes and traditionally high irrigation demand - have successfully reduced both indoor and outdoor water use to levels today that are far below what is forecast in the DEIS for year 2075.

For the past 30 years water demand forecasts prepared by utilities have grossly over-estimated water demands because they ignore the impacts of water efficiency and conservation. The demand forecast in the DEIS makes the same mistake and is inflated and unrealistic. The DEIS forecast ignores obvious trends in usage and future technological improvements as well as economic pressures that have reduced demand and will continue to do so, because water is such a precious commodity.

This report provides a detailed review and analysis of each component of the DEIS demand forecast and shows how it compares with current water use in other communities across the Western US. The analysis in this report shows that the DEIS forecast is highly inflated and likely unrealistic. Even if this exceptional (and highly unlikely) level of population growth were to occur in the southern Utah desert, the water demands required to serve these people have been improperly inflated though several mechanisms. The proposed future level of per capita water use and water loss are excessive and ignore today’s best practices regarding the ongoing impact of water efficiency.

Summary of Qualifications

I am the Principal of Water Demand Management, LLC (WaterDM), based in Boulder, Colorado. WaterDM is a water consulting firm providing expertise and services in the following areas:

- Municipal and industrial water use, research, and analysis
- Water conservation and demand management planning and implementation

- Integrated water resources planning
- Water loss control
- Analysis of municipal water rates and rate structures
- Drought preparedness and response
- Demand forecasting
- Evaluation of changes in demand
- Statistical analysis of water demand and modeling
- Meter technology implementation
- Meter and service line sizing

I have a Master of Science in Engineering (1995) from the University of Colorado, Boulder and a Bachelor of Arts (1986) from Oberlin College. I am a registered and licensed Professional Engineer in Colorado.

I am a civil engineer and the focus of my career for over 25 years has been on urban water systems and demand management including conservation planning and implementation, rate analysis, water demand research, demand forecasting, drought preparation, utility metering, and water loss control. Since 1995, I have served as a consultant and researcher to urban water providers, US EPA, the Water Research Foundation, the Alliance for Water Efficiency, state governments, and municipal and industrial water users in the US and Canada.

Over my 25 -year engineering and consulting career, I have worked with and advised hundreds of water providers and organizations such as the California Department of Water Resources; Salt Lake City Public Utilities; Marina Coast Water District; Tucson Water; New York City Water Board; the Colorado Water Conservation Board; Hilton Head, SC; Denver, CO; Scottsdale, AZ; San Antonio, TX; Metropolitan Water District of Southern California; US EPA; the US Department of Justice; the Alliance for Water Efficiency and many others. I have served as the principal investigator and lead or co-author of numerous national and state-level water demand research studies including: Residential End Uses of Water (2016, 1999); Assessing Water Demand Patterns to Improve Sizing of Water Meters and Service Lines (2020); Peak Demand Management (2018); Colorado Water Plan and Update (2010, 2018); National Submetering and Allocation Billing Program Study (2004); Water Budgets and Rate Structures (2008); Commercial and Institutional End Uses of Water (2000); and many others.

I Chair of the subcommittee and am lead author of the American Water Works Association (AWWA) M22 Sizing Water Service Lines and Meters 3rd. ed. (2014) and 4th ed. (pending). I am co-author of the AWWA G480 Water Conservation Standard (2013 and 2020) and co-author of the Colorado Best Practices Guidebook for Municipal Water Conservation (2010). I served as Trustee of the AWWA Water Conservation Division from 2001-2007 during which time I worked with EPA to create the WaterSense™ program and helped establish the Alliance for Water Efficiency. I have been a Senior Technical Advisor to the Alliance for Water Efficiency since 2007. I am a member of the American Water Works Association, the Alliance for Water

Efficiency, the American Water Resources Association, the American Society of Civil Engineers (ASCE), the Colorado Water Congress, and the Colorado River Water Users Association.

In 2016, I testified as an expert witness on municipal and industrial water use at the US Supreme Court (FL v. GA, 142 Original) on behalf of the State of Georgia.

A copy of my curriculum vitae is available at www.waterdm.com.

Lake Powell Pipeline DEIS Water Demand Forecast

The Lake Powell Pipeline Project is proposed to deliver 86,249 acre-feet (af) of water annually from Lake Powell to Washington County, Utah to supplement approximately 100,000 af of local surface water supplies to meet a forecast water demand in 2075 of 184,593 af (reproduced below).[1]

This volume of water is ostensibly required to meet a forecast 2075 population in Washington County of 594,660 people, a 293% increase over 60 years. As part of this forecast, per capita water use (inclusive of all uses except system losses) starts at 302 gallons per capita per day (gpcd) in 2015 and is reduced by 20% to 240 gpcd by 2045. After year 2045 there are no additional efficiency improvements and gpcd is forecast to remain at 240 gpcd through 2075. System water losses start at 15.4% in 2015 and continue unchanged through 2075.

Table 1: Future Water Requirements for Washington County WCD produced from Table 6.2-1 from the DEIS.

Table 6.2-1 Future Water Requirements for Washington County Water Conservancy District

Year	WCWCD Service Area Population - Baseline Projection (calculated using the Gardner estimate multiplied by UDWRe system ratio)	GPCD per Applied Analysis that includes 20% conservation	System loss from Applied Analysis model	Demand (acre-feet) with System Loss
2015	151,360	302	0.154	59,038
2020	182,689	296	0.154	69,791
2025	214,408	283	0.154	78,483
2030	246,338	271	0.154	86,370
2035	280,731	260	0.154	94,289
2040	314,199	250	0.154	101,326
2045	348,064	240	0.154	107,999
2050	383,226	240	0.154	118,909
2055	420,257	240	0.154	130,399
2060	458,960	240	0.154	142,408
2065	500,349	240	0.154	155,250
2070	545,470	240	0.154	169,251
2075	594,660	240	0.154	184,513

Key:
GPCD = gallons per capita per day
UDWRe = Utah Division of Water Resources
WCWCD = Washington County Water Conservancy District

The 2015 demand data that forms the basis for the future water requirements for Washington County are published by the Utah Division of Water Resources (Table A-5 County 2015

[1] Reclamation. 2020. Lake Powell Pipeline Project, Draft Environmental Impact, Statement, Coconino and Mohave Counties, Arizona, Kane and Washington Counties, Utah. U.S. Department of the Interior, Bureau of Reclamation. June 2020. Table 6.2-2 Future Water Requirements of the Washington County Water Conservancy District.

Community Water use[2]). These data show an average of 302 gpcd in Washington County made of up 231 gpcd of potable water and 71 gpcd of secondary water.[3] In addition to this, the 15.4% water loss added on top in the DEIS, further increasing demand. Figure 6 shows the breakdown of potable use into relevant categories along with secondary water use and water loss calculated at 15.4% to match the DEIS. Secondary use accounts for 20% of the total demand in Figure 6 of 59,038 AF and which matches the DEIS forecast shown in Table 1.

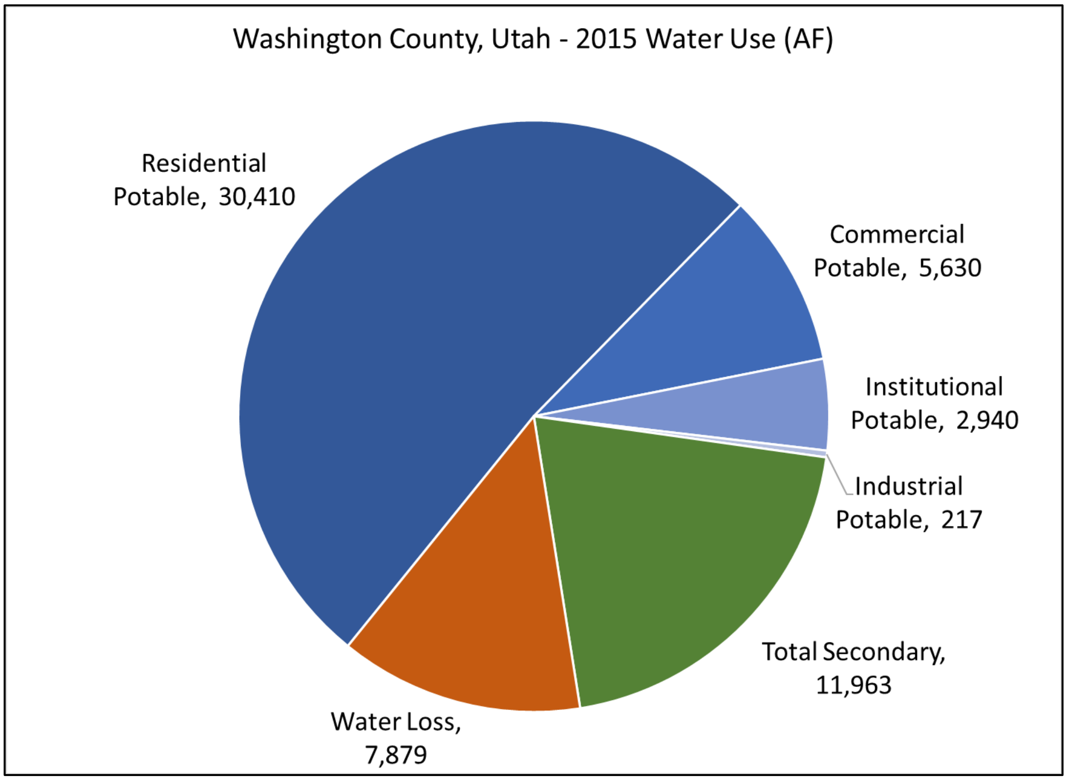

Figure 6: 2015 potable and secondary water use, Washington County, Utah.

Using the data in Table 1, WaterDM prepared Figure 7, which shows the DEIS forecast from 2015 – 2075. A 20% conservation factor is applied through 2045, but once the 20% conservation factor ends, demand in Washington County is forecast to increase steeply and unabated for another 30 years. Under this forecast Washington County, which increases demand in each sector proportionally over time, is predicted to have annual water losses of more than 24,000 AF by year 2075, which is more than the potable demands of the commercial and industrial sectors combined.

[2] 2015 Municipal and Industrial Water Use Data. 2020 version 3. Utah Division of Water Resources. Salt Lake City, Utah.

[3] Secondary water is defined as "non-potable or untreated water that does not meet EPA Safe Drinking Water requirements. Generally, irrigation and canal companies deliver secondary water through open ditch systems or pressurized pipelines for irrigation of lawns, gardens, landscape, parks, cemeteries, golf courses, and other open areas." (p. 5 2015 Municipal and Industrial Water Use Data. 2020 version 3).

Figure 7 shows a tripling of water demand in Washington County and assumes that more than 500,000 future residents will only increase efficiency modestly over the next 25 years and that beyond that, no additional efficiency will occur, in spite of high water rates necessitated by expensive infrastructure like the Lake Powell Pipeline, a dry desert climate, and codes and standards that have reduced demand and will continue to reduce demand across the United States. The forecast also includes a staggering 293% population increase over the forecast period.

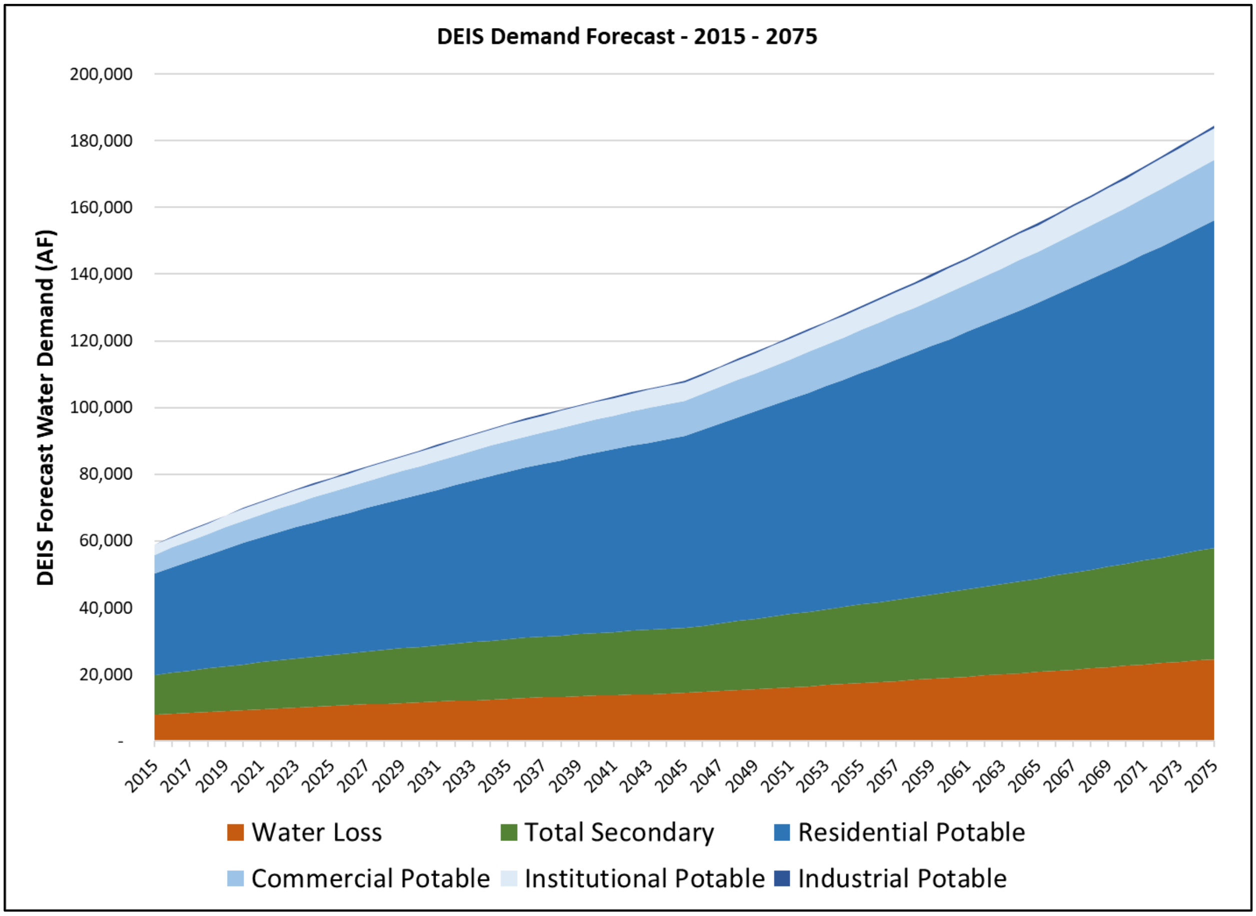

Figure 7: DEIS water demand forecast for Washington County, Utah (2015 – 2075).

WaterDM reviewed each component of the DEIS water demand forecast shown in Table 1 for reasonableness and accuracy as is required to justify construction of a $2 billion infrastructure project.

Per Capita Use Forecast

As part of the DEIS forecast, per capita water use (inclusive of all uses except system losses) starts at 302 gpcd in 2015 and is reduced by 20% to 240 gpcd by 2045. After year 2045 there are no additional efficiency improvements and gpcd is forecast to remain at 240 gpcd through 2075. The reasonableness of this forecast must be considered in the context of changes in water demands that occurred over the past 25 years and comparisons with other water providers in the Western US.

System Per Capita

Annual system per capita use is calculated by taking the total volume of water produced in a year for a water system and dividing that volume by the population and the number of days. Water production volumes are usually measured at water treatment plants before water is put into the distribution system and thus system per capita use typically includes system water losses that occur as water is transported to customers. The per capita use values presented in the DEIS are inclusive of all water use (residential, commercial, irrigation, etc.) with the notable exception of system water losses which the DEIS separates into a separate category.

Per Capita Use Has Declined Nationally

The US Geologic Survey publishes national water use data every five years and Figure 8 shows the public supply withdrawals in the US and population for 1950 through 2015, the most recent year for which data are available. Public supply withdrawals peaked in 2005 and declined in 2010 and 2015.

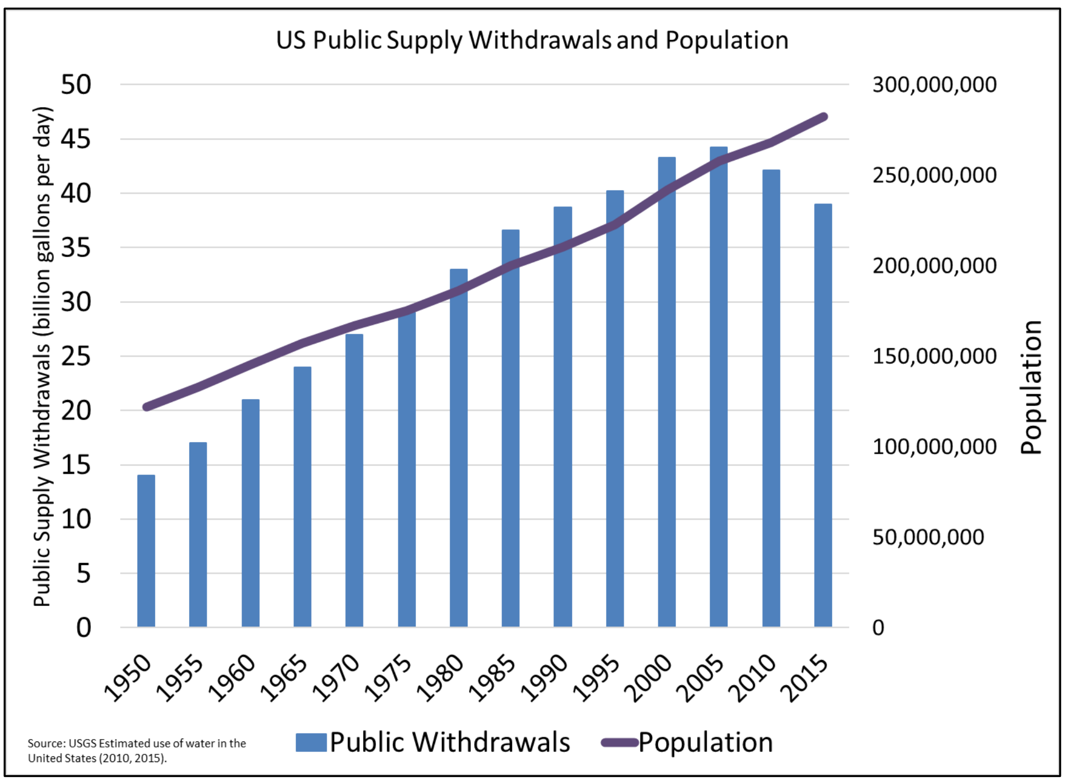

Figure 8: US Public Supply Withdrawals and Population, 1950 – 2015

Figure 9 shows the same US public supply withdrawals along with the average annual gallons per capita per day. Nationally, per capita use peaked in 1985 at about 184 gpcd and by 2015 had declined to less than 140 gpcd. **The DEIS forecasts the 2075 gpcd in Washington County to be 71% higher than the national average in 2015.**

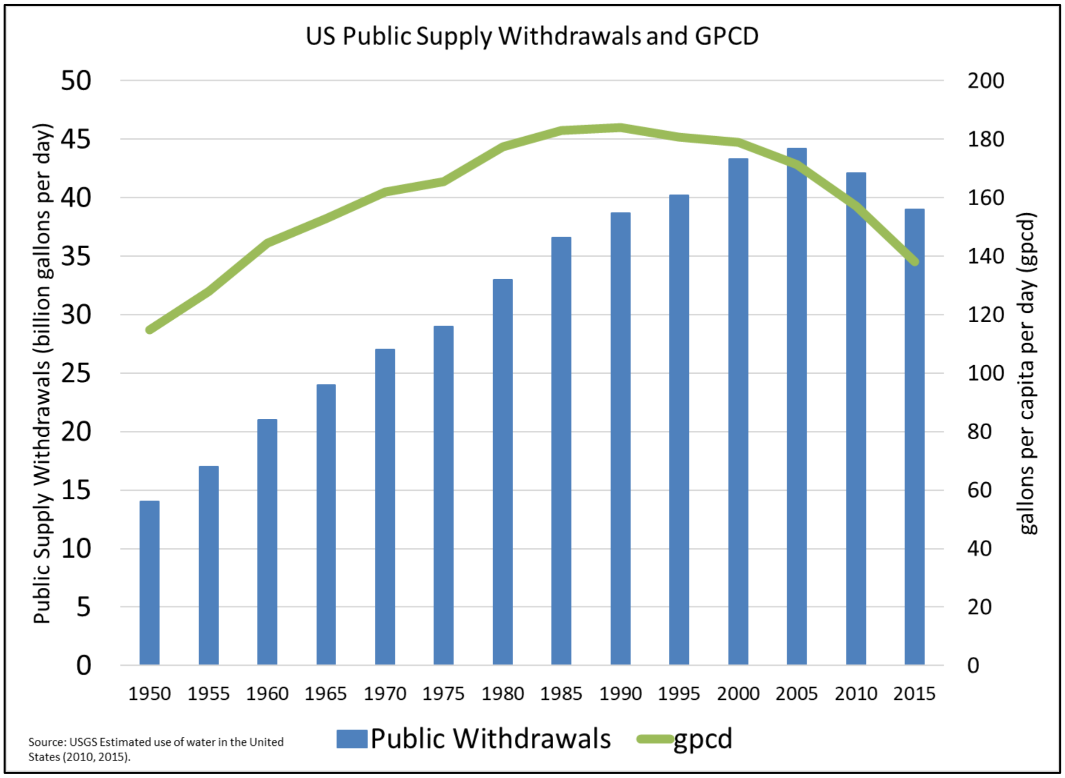

Figure 9: US Public Supply Withdrawals and GPCD, 1950 – 2015.

Residential water use in Utah remains among the highest in the US according to the USGS as shown in Figure 10, which was prepared by the City of Tucson to understand how water use around the western US compares. This suggests that Utah, as a state, and Washington County as the highest water using region in the state, have ample room for increased efficiency in the future. Downstream users on the Colorado River like California, Arizona and Nevada are paying attention. Water efficiency is the norm up and down the Colorado River basin as supplies have dwindled as a result of drought and climate change.

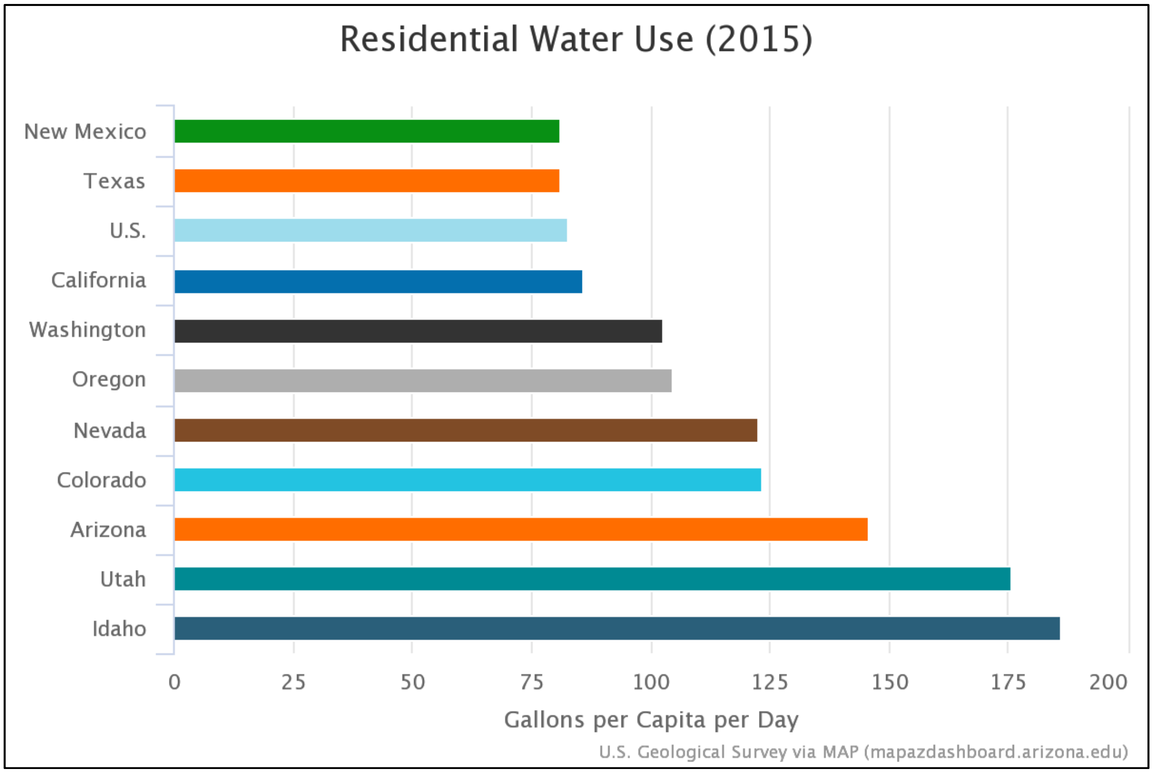

Figure 10: Comparison of per capita residential water use in the US, 2015.[4]

Per Capita Comparisons Show High Usage in Washington County

To better understand the scale of the forecast gpcd values in the DEIS, these data were compared against per capita use from cities that participated in the 2016 Residential End Uses of Water Study.[5] Per capita use was calculated for this study using the same approach as the DEIS with water losses explicitly excluded, but all other uses (residential, commercial, irrigation, etc.) included. The most "apples to apples" comparison of gpcd is to compared potable gpcd and this and other comparisons are presented in Table 2: Per Capita Comparisons. In 2015, even potable water use by itself in Washington County averaged 231 gpcd, placing it among the highest levels of per capita use of comparable western cities as shown in Table 2.

It should be noted that most western cities have concluded that such high levels of per capita water use are unsustainable (not to mention expensive) in arid environments and they have all implemented metering, conservation pricing and various other water efficiency programs to reduce demand and extend existing supplies. The DEIS in recognition of this, applies a steady reduction factor until a 20% reduction is achieved in 2045.

Even with the conservation factor applied, DEIS forecast total per capita use for Washington County in year 2075 is higher than any utility that participated in the 2016 Residential End Uses

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[4] https://mapazdashboard.arizona.edu/infrastructure/residential-water-use

[5] DeOreo, W.B., P. Mayer, J. Kiefer, and B. Dziegielewski. 2016. Residential End Uses of Water, Version 2. Water Research Foundation. Denver, CO

Study, including Scottsdale Arizona, which in addition to having high water use also has a well-funded and staffed utility-sponsored water efficiency program.[6]

Table 2: Per Capita Comparisons

Agency	Population	GPCD
Washington County WCD - 2015 potable + secondary + water loss	**151,360**	**348.2**
Washington County WCD - 2015 potable + secondary	**151,360**	**302.0**
Washington County WCD - 2075 potable + secondary + water loss forecast	**594,660**	**277.0**
Scottsdale, AZ – 2010 potable	217,385	273.1
Henderson, NV – 2010 potable	277,502	256.9
Washington County WCD - 2075 potable + secondary forecast	**594,660**	**240.0**
Washington County WCD - 2015 potable	**151,360**	**231.0**
Colorado Springs, CO – 2010 potable	441,000	212.3
Washington County WCD - 2075 potable forecast	**594,660**	**190.0**
Fort Collins, CO – 2010 potable	129,000	157.9
Denver, CO – 2010 potable	1,174,000	156.7
Tacoma, WA – 2010 potable	317,450	150.0
Otay, CA – 2010 potable	198,616	149.9
Tucson, AZ – 2010 potable	545,975	144.0
Mountain View, CA – 2010 potable	72,800	132.6
Aurora, CO – 2010 potable	325,078	126.6
Austin, TX – 2010 potable	886,768	121.9
San Diego, CA – 2010 potable	1,312,000	118.2
Santa Barbara, CA – 2010 potable	91,416	115.0

[6] https://www.scottsdaleaz.gov/water/rebates

San Antonio, TX – 2010 potable	1,360,000	105.7
Philadelphia, PA – 2010 potable	1,500,000	104.5
Chicago, IL – 2010 potable	5,300,000	98.4
Sacramento, CA – 2010 potable	430,437	91.4
Portland, OR – 2010 potable	915,800	61.0

Sources: Table 6.2-2 Future Water Requirements of the Washington County Water Conservancy District., DeOreo, W.B., P. Mayer, J. Kiefer, and B. Dziegielewski. 2016. Residential End Uses of Water, Version 2. Water Research Foundation. Denver, CO

Water Efficiency Impacts Not Considered After 2045

The forecast for Washington County in year 2075 would place its water use among the very highest water using communities in the western US today and in the future. With the Lake Powell Pipeline, Washington County must necessarily also have high water rates. A strong price signal through rates is proven effective at reducing consumption, even in communities with second homes and significant volumes of irrigation. Yet the DEIS shows no efficiency improvements or demand reductions in Washington County for a 30-year period.

It is unclear why efficiency improvements are stopped in 2045. This is neither reasonable, nor realistic, particularly given the anticipated impacts of climate change, which will drive up the cost of providing water and will reduce supplies. All of the new demand in Washington County will come from new residents and new buildings that will be constructed in compliance with modern plumbing codes and standards. These national codes and standards, such as the 1992 Energy Policy Act require that all toilets sold in the US use 1.6 gallons or less per flush. Stores like Home Depot only offer EPA WaterSense certified toilets use that 1.28 gallons per flush or less. New buildings will necessarily be more water efficient than old buildings. Assuming future water use in 2075 will be the same as it was in 2045 without efficiency improvement is not reasonable and not a sound basis for least-cost infrastructure planning.

Recent failures of demand forecasting (discussed below) have exposed demand forecasting methods that fail to include long term efficiency improvements and, thus, water efficiency and efficiency improvement are now standard consideration for most demand forecasts. These forecasting failures have been largely due to inflated future per capita demands and inflated population forecasts – two problems clearly evident in the DEIS.

The changes and efficiency improvements that have been made in indoor residential water use are documented in research conducted by the Water Research Foundation and the American Water Works Association. A summary is presented in Table 3. These data show that modern, water efficient homes in the US will use about 40 gpcd indoors. In the future they could use even less.

Table 3: Summary of per capita use from Residential End Uses of Water Studies (REUWS).

	1999 REUWS (indoor gpcd)	2016 REUWS (indoor gpcd)	WaterSense New Home (indoor gpcd)
Toilet	18.5	14.2	7.7
Clothes Washer	15	9.6	4.4
Faucet	10.9	11.1	8.1
Shower	11.6	11.1	11.0
Dishwasher	1.0	0.7	0.5
Leak	9.5	7.9	5.0
Bath	1.2	1.5	1.5
Other	1.6	2.5	1.6
Indoor Total	**69.3**	**58.6**	**39.8**

Sources: Mayer, P.W., W.B. DeOreo, et. al. 1999. Residential End Uses of Water. American Water Works Association Research Foundation, Denver, CO.; DeOreo, W.B., P. Mayer, J. Kiefer, and B. Dziegielewski. 2016. Residential End Uses of Water, Version 2. Water Research Foundation. Denver, CO; W.B. DeOreo, A. Dieteman, T. Skeel, P. Mayer, et. al. 2001. Retrofit Realities. Journal American Water Works Association, March 2001.

A major emerging trend in water utilities is the use of advanced metering infrastructure (AMI) to detect customer leaks and alert customers about abnormal usage. Recent research has shown that these programs are capable of reducing customer-side leakage by about 50%.[7] As the cost of water increases over the next 50 years, outdoor use will become more and more expensive and landscaping will be adapted accordingly.

Secondary Water Use Improperly Forecast

Baked into the DEIS demand forecast is a substantial component of secondary water use. As shown in Figure 6, secondary water use accounts for about 20% of 2015 demand once water losses are included.

Figure 6: 2015 potable and secondary water use, Washington County, UtahSecondary water is defined as “non-potable or untreated water that does not meet EPA Safe Drinking Water requirements. Generally, irrigation and canal companies deliver secondary water through open ditch systems or pressurized pipelines for irrigation of lawns, gardens, landscape, parks, cemeteries, golf courses, and other open areas.”[8]

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[7] https://sfwater.org/index.aspx?page=947

[8] 2015 Municipal and Industrial Water Use Data. 2020 version 3. Utah Division of Water Resources, p. 5.

Because secondary water use is imbedded into the 2015 water demand of 302 gpcd (71 gpcd is secondary water), secondary water demand is automatically increased throughout the 60-year forecast. In Washington County today, most of the secondary water is supplied by irrigation companies with limited water rights. These supplies cannot possibly grow proportionally with population into the future as shown in Figure 7, yet they have been improperly imbedded into the 2015 baseline demand.

Even with the 20% conservation factor applied through 2045, secondary water use, which is imbedded into the forecast, must necessarily increase through the demand forecast and after 2045 because of the forecasting methodology. This is not reasonable. The Lake Powell Pipeline should not be constructed to provide secondary water use for irrigation companies, rather the project is only properly considered as a primary potable supply. Water from the Lake Powell Pipeline will be too expensive and high valued to sell as secondary water for irrigation. Use of secondary water is seasonal, thus including it as part of the annual gpcd is misleading from the perspective of supply timing as well.

Secondary water is a separate supply and thus demand for secondary water should be determined distinctly from the potable demand into the future. Lumping them together, as has been done in the DEIS, is improper from multiple planning and forecasting perspectives because demand for secondary water should be considered and forecast separately. This should be corrected. WaterDM estimates that including secondary water in the demand forecast has improperly inflated per capita demands in the DEIS by at least 20%.

The DEIS should be corrected and the Bureau of Reclamation must clarify to what extent secondary water for irrigation companies will be carried in the Lake Powell Pipeline, if at all. The cost of secondary water is generally much lower than for potable water and it is not clear how the economics of the $2 billion Lake Powell Pipeline work if 20% of the supply is sold at secondary water rates not to mention being subject to 15.4% of the supply lost to leakage.

Future Per Capita Use Improperly Inflated

If more than 500,000 people live in Washington County Utah in 2075 and use an average of 277 gpcd (including water losses) it will be one of the most water-inefficient communities in America in that year or any year. It is not reasonable to plan for such inefficiency and profligate water use.

The future per capita use presented in the DEIS has been improperly inflated given that 30 years of potential efficiency gains are ignored, secondary water use is incorrectly included and allowed to increase, and water loss is never addressed.

System Loss Forecast

In the DEIS, a 15.4% water loss factor is applied each year to account for real losses in the system. The 15.4% water loss factor, presumably based on current water loss rates*, does not change over the 60-year period of the forecast* and is applied to both potable and secondary water use. As shown in Figure 7, **the DEIS predicts real annual water losses (e.g., the physical**

loss of water from the system) of more than 24,000 AF by year 2075, which is an astonishingly high volume and more than the potable demands of the commercial and industrial sectors combined.

The Lake Powell Pipeline is a $2 billion dollar project and the DEIS forecast states that 15.4% of the product or value delivered through this LPP will be lost each year. This implies that approximately $300 million in value of the initial $2 billion dollar project will be wasted along with additional value of the operation, maintenance, and the repair costs wasted over the life of the project. This is an outrageous, wasteful, unreasonable, and expensive assumption that is being used to justify an unnecessary project which will have real impacts for water rate payers in Utah. The economic consequences of $300 million in water losses are simply too large to ignore. State and national policies are increasing accountability for water loss and requiring utilities to reduce real loss to the extent it is economically reasonable. In 2020, Utah passed HB 40, which will improve water loss accounting across the state.[9] This increased scrutiny of water losses will apply to Washington County.

The starting point for water loss in Washington County, 15.4%, is an extremely high level of real losses for a system to endure. For many years an industry rule of thumb was that anything above 10% “unaccounted for water” constituted a real problem. Over the past 20 years water loss accounting has improved and advanced, which has improved understanding of typical water loss rates, though they vary tremendously depending upon the age of a water system. Properly designed and installed new distribution systems have lower levels of loss than older water systems and managing system pressure has a significant impact.

It is unreasonable that water loss levels for Washington County do not improve over time in the DEIS forecast. This implies that this high level of waste and loss is tolerable, acceptable, and affordable, none of which is true. More properly, the DEIS forecast should show a decreasing level of water loss over time until a level below 10% is achieved. A level of 6% - 8% would not be an unreasonable target for a well-managed system with many new components, based upon my experience. Maintaining a loss level of 15.4% unreasonably and unnecessarily inflates the final demand forecast by at least 5.4% - 9.4%.

Population Forecast

The single most significant aspect driving future demand in the DEIS forecast is anticipated population growth in Washington County. The DEIS population forecast is based on state forecasts developed by the Kem C. Gardner Policy Institute,[10] but extends the Gardner forecasts another 10 years to 2075. This DEIS forecasts that population of Washington County in 2075 to be 594,660 people, a 293% increase over 60 years. The Gardner forecasts show Washington County to be the fastest growing county in Utah over the next sixty years. If realized, Washington County will be the most populated stretch of I-15 from Las Vegas to Provo.

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[9] https://le.utah.gov/~2020/bills/static/HB0040.html

[10] Utah's Long-Term Demographic and Economic Projections Summary. July 2017. Principal Researchers: Pamela S. Perlich, Mike Hollingshaus, Emily R. Harris, Juliette Tennert & Michael T. Hogue

The rate of population growth starts at a rip-roaring 3.4% per year and reduces by about 50% finishing the 60-year forecast in 2075 at a still remarkably high growth rate of 1.7% per year. It is interesting to note that the DEIS population forecast extends 10-years beyond the 2017 published Gardner Institute forecasts, adding more than 94,000 people during from 2065 – 2075.

I have reviewed numerous population forecasts over my 25-year career, but I have seldom encountered a growth forecast as aggressive as the one presented in the Lake Powell Pipeline DEIS. The level of growth projected would create a community the size of Tucson, Arizona, Fresno, California, or Albuquerque, New Mexico, in Washington County by 2075. Even spread out across the county, this would represent a tremendous level of growth across what is now a largely rural area. What is the expected economic driver for this exceptional level of growth?

It is rare in the US for an isolated region to experience a 293% growth surge without a corresponding economic driver. For example, Gilbert, Arizona, one of the fastest growing communities in the US over the past 30 years saw growth driven by technology companies and large businesses that chose to locate nearby. What will drive a similarly high level of growth to Washington County? Tourism to Zion National Park and other attractions in the region may be part of the answer, but certainly not all so it remains unclear what will drive the 293% growth projected for 65 years in Washington County. It seems likely that the population forecast has also been inflated.

An inflated future population results in an inflated future demand forecast. It seems quite possible that the population forecast presented for Washington County is unrealistic and the future population will more likely be much lower. Data and information supporting a 293% population growth has not been offered to my knowledge. Support for a population forecast with an escalating growth rate has not been offered and the DEIS population forecast extends ten years beyond forecasts published by the Gardner Institute.

Inflated Demand Forecasts, Costly Decisions

The factors that combine to create a greatly inflated demand forecast in the DEIS are not unique. Water utilities have struggled with making accurate demand forecasts since the mid-1980s when federal plumbing codes and energy standards began reducing the water used for toilets, showers, faucets, clothes washers, dishwashers, and more.

An August 2020 Pacific Institute report found that California water providers consistently inflated forecasts of future demand even as they tried to incorporate the impacts of efficiency. On average, the report found water suppliers projected that per capita demand would decline by less than one percent per year; but actual per capita demand declined twice as fast.[11] The report states:

[11] An Assessment of Urban Water Demand Forecasts in California. August 2020. Pacific Institute. Oakland, CA.

> *" Urban water suppliers routinely overestimated future water demand, projecting increases in water demand even as actual demand declined. The is largely due to inflated estimates of future per capita demand, although overestimates of population are also a contributing factor." (p.8)*

The consequences of an unrealistic and inflated demand forecast can be significant and can impact a community for years to come. The report states:

> *"Overestimates of future water demands have important implications for local communities and the state. Specifically, they can result in unneeded water supply and treatment infrastructure, higher costs to ratepayers, and unnecessary adverse environmental impacts." (p.8)*

The consequences of the inflated water demand in the DEIS include all of the problems noted by the Pacific Institute such as over-sized expensive infrastructure, higher costs to rate payers, and unnecessary environmental impacts. Even if the Lake Powell Pipeline is constructed and the full population forecast appears, future per capita use is likely to be substantially lower than forecast in the DEIS. An unrealistic population forecast, and unreasonably high levels of water loss compound the problem and further inflate demands to unrealistic levels compared with communities across the western US.

Conclusions

The analysis in this report clearly illustrates how the DEIS water demand forecast for Washington County has been grossly inflated. The forecast is inflated through multiple mechanisms including:

- A population forecast that increases by 293%.
- An excessive level of per capita water use that would make Washington County water users among the highest in the US, even after more than 50 years of available efficiency improvements.
- Improper inclusion and inflation of raw secondary irrigation water in the forecast.
- A 15.4% water loss factor that never improves and thus wastes approximately $300 million in value of the $2 billion dollar project.

A statement of need and water demand forecast for a project of this size and scope must be based on sound data, reasonable assumptions, and conservative resource principles to ensure the water will not be wasted. Water customers across the Western United States have successfully implemented effective water efficiency that today reduced per capita use far below levels shown the DEIS forecast for 2020 and 2075. The forecast in the DEIS provides for an excessive level of per capita water use over the next 55 years with efficiency improvements that simply end at year 2045 with no further improvement in efficiency achieved over the next 30 years. This is neither realistic nor reasonable.

The DEIS forecasts a future population of more than 500,000 people, which is equivalent to a city the size of Tucson, Arizona, or Albuquerque, New Mexico. With this level of development, even spread across Washington County with its rural setting, current housing patterns will necessarily change and fewer people are likely to live in large sprawling single-family homes with a supply of secondary water for irrigation, as is common today. Under this high growth scenario coupled with escalating costs for water, demand will necessarily change and become more efficient. The DEIS forecast should reflect realistic efficient levels of future use, not wasteful and excessive levels as currently presented.

Arguments that Washington County is somehow different or exceptional from other communities in the West because it has second homes, resorts, pools, golf courses, and such and is thus immune to national trends towards higher efficiency are nonsense. Water is a precious and expensive commodity and least cost planning principles must be applied when considering expensive infrastructure projects such as the Lake Powell Pipeline.

Water in Washington County will be expensive in the future, regardless of the source, and economics alone will press down demand. New technology for remotely managing irrigation and for detecting both utility and customer leakage will reduce demands and losses in the future, something ignored in the DEIS forecast. Communities across the Western US, including Aspen, Las Vegas, and Tucson — with many second homes and traditionally high irrigation demand — have successfully reduced both indoor and outdoor water use to levels today that are far below what is forecast in the DEIS for year 2075.

For the past 30 years water demand forecasts prepared by utilities have grossly over-estimated water demands because they ignored the impacts of water efficiency and conservation. The demand forecast in the DEIS makes the same mistake and is inflated and unrealistic. The DEIS forecast ignores obvious trends in usage and future technological improvements as well as economic pressures that have reduced demand, and will continue to do so, because water is such a precious commodity.

This report reviews and analyzes each component of the DEIS demand forecast and shows how it compares with current water use in other communities across the Western US. The analysis in this report shows that the DEIS forecast is highly inflated and likely unrealistic. Even if this exceptional (and highly unlikely) level of population growth were to occur in the southern Utah desert, the water demand forecast for this population has been improperly inflated though several mechanisms. The proposed future level of per capita water use and water loss are excessive and ignore todays best practices and the ongoing impact of water efficiency.

Sincerely,

Peter Mayer

Peter Mayer, P.E.
Principal

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