REPORT TO SAN DIEGO LAFCO

FALLBROOK PUD AND RAINBOW MWD WHOLESALER REORGANIZATION

Submitted by

Professor Michael Hanemann

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INTRODUCTION

I was engaged by the San Diego County Local Agency Formation Commission (LAFCO) to perform three tasks, as follows:

Topic One (Water Rate Impacts)

The Consultant shall prepare a written memorandum analyzing the potential water rate impacts to the San Diego County Water Authority, the Fallbrook Public Utility District, and the Rainbow Municipal Water District under three distinct scenarios: (i) Commission approval of both proposals; (ii) Commission approval of only the proposal filed by Fallbrook Public Utilities District; and (iii) Commission approval of only the Rainbow Municipal Water District. If the information on file and/or as augmented by the Commission Agreement Administrator is deemed insufficient, the memorandum should succinctly identify the missing, incomplete, incorrect, or otherwise unsubstantiated information needed to appropriately address this topic.

Topic Two (Water Supply Reliability)

The Consultant shall prepare a written memorandum analyzing whether any substantive differences exist with respect to the overall water supply reliability between the San Diego County Water Authority and Eastern Municipal Water District. The Consultant shall use their professional expertise in quantifying and/or qualifying "substantive" relative to addressing water supply reliability. If the information on file and/or as augmented by the Commission Agreement Administrator is deemed insufficient, the memorandum should succinctly identify the missing, incomplete, incorrect, or otherwise unsubstantiated information needed to address this topic.

Topic Three (Potential Departure Fees)

The Consultant shall prepare a written memorandum quantifying what - if any - departure fees (also referred to as exit charges) should be made conditions of approval if the Commission approves either or both proposals. This includes - and among other considerations the Consultant believes to be pertinent - addressing potential rate impacts to the Water Authority addressed in Topic One. If the information on file and/or as augmented by the Commission Agreement Administrator is deemed insufficient, the memorandum should succinctly identify the missing, incomplete, incorrect, or otherwise unsubstantiated information needed to address this topic.

I have discharged those tasks in this report.

I was engaged to address these topics as an economist. I was not engaged to conduct legal analysis or offer legal advice on the issues I addressed, and I do not offer any legal opinions.

The report is organized largely in a question-answer format. I chose this format because experience has shown that it is often the most effective way to convey detailed analysis to an audience. I selected and formulated the questions myself. No one assigned the questions for me to answer. Some questions occurred to me after hearing statements being made at meetings of the Ad Hoc Advisory Committee.

I wish to thank the members of the Ad Hoc Advisory Committee and, most especially, to Jack Bebee and his staff at Fallbrook Public Utility District, Tom Kennedy and his staff at Rainbow Municipal Water District, Sandy Kerl and Kelley Gage and their staff at the San Diego County Water Authority, and Nick Kanetis and his staff at Eastern Municipal Water District. Jack, Tom, Sandy, Kelley and Nick were exceptionally helpful and generous with their time in answering all manner of questions. I am extremely grateful to them. I also greatly appreciate the assistance provided to me throughout this project by Adam Wilson.

This report contains my opinions based on the information presently available to me. Any opinion that I may have stated previously but that is not repeated here is no longer my view. I alone am responsible for the opinions expressed here. Any errors remaining are my responsibility.

TABLE OF CONTENTS

TABLES

EXECUTIVE SUMMARY

REPORT ANALYSIS

FIGURES

EXECUTIVE SUMMARY

REPORT ANALYSIS

NO. 1 | HOW THE SAN DIEGO COUNTY WATER AUTHORITY SERVICE AREA GETS ITS WATER

The San Diego County Water Authority (SDCWA) service area has limited local supplies of surface water and groundwater, which are controlled by the SDCWA member agencies. Most of the water used in the SDCWA service area is provided by SDCWA to member agencies. From its formation in 1947 until 2003, SDCWA's sole source of water was water purchased from the Metropolitan Water District of Southern California (MWD), of which SDCWA is now the largest member agency – I refer to this water as *M-water*.

MWD was created in 1928 to import water to the Greater Los Angeles area from the Colorado River. In 1960 it contracted to receive water from the new California State Water Project (SWP). The SWP was originally planned to deliver 4.2 million acre-feet (MAF) a year to member agencies, and MWD was the single largest contractor with a 48% share of the supply. However, the SWP was not expanded as planned and it has a delivery capacity of only about 2.4 MAF. MWD's 48% share of contract entitlements allow it to receive 1.2 MAF of average year supplies and about 0.6 MAF or less in a dry year.

Until 1963, MWD had a firm allocation of 1.2 MAF a year of Colorado River water. Following the US Supreme Court's ruling in Arizona v California in 1963, this was reduced to 550,000 AF. MWD was still able to divert more than this amount until the Colorado River Quantification Settlement Agreement (QSA) took effect in October 2003. Including water purchased from Imperial Irrigation District (IID) in 1988, MWD now has a firm allocation of about 600,000 AF from the Colorado River.

The antecedent of the current issue is the severe drought in 1990 and 1991. For the first time ever, MWD mandated member agencies to reduce their water use culminating in March 1991 when it cut deliveries for Municipal and Industrial (M&I) use by 30% and for agricultural use by 90%. At the time, SDCWA depended on MWD for 95% of water used in its service area. That experience led SDCWA to seek to become less dependent on MWD for its water supply. In 1998 it signed an agreement with IID to purchase water that IID diverted under a senior water right from the Colorado River. That purchase agreement took effect in October 2003 as part of the larger QSA, which also includes Colorado River water obtained by SDCWA after paying to line the All-American and Coachella Canals.

SDCWA uses MWD's Colorado River Aqueduct (CRA) to move its QSA water to its service area under an Exchange Agreement negotiated with MWD. Under that agreement, MWD receives SDCWA's QSA water and is obligated to deliver a like amount of water to SDCWA. SDCWA pays a volumetric rate for the conveyance of this water. I refer to QSA water delivered by MWD to SDCWA as exchanged water or *E-water*. The delivery of E-water commenced in 2003 and ramped

up to the full amount of 277,700 AF in 2021. E-water has accounted for almost 64% of the water delivered by MWD to SDCWA in the last five years, and 80% in the last two years.

In addition, in 2016, SDCWA started to receive desalinated seawater from the Carlsbad Desalination Facility.

It has been suggested that, if Fallbrook Public Utility District (FPUD) and Rainbow Municipal Water District (RMWD) detach from SDCWA and instead become wholesale customers of Eastern Municipal Water District (EMWD), they will be receiving the same MWD water as before. That is incorrect. They will be receiving 100% M-water from EMWD rather than a mix of 80% E-water and 20% M-water from SDCWA. Regardless of whether molecules of E- and M-water are physically indistinguishable, they are legally different with regard to their underlying water right and reliability.

FPUD and RMWD are different from many other SDCWA member agencies in still having a high level of agricultural use. They are also the only member agencies located sufficiently far north in San Diego County that they receive some of their water from pipeline turnouts owned by MWD rather than SDCWA. This does not change ownership of the water – it is still owned by SDCWA – but it lowers the delivery charge levied by SDCWA.

NO. 2 | HOW EXPENSIVE IS SDCWA WATER, AND WHY?

Two conceptual economic distinctions come into play in answering these questions, that between *variable* versus *fixed costs* (and revenues); and that between *average* versus *marginal costs* (and revenues).

Variable costs *vary directly with the quantity of water delivered* and variable revenues vary directly with the quantity of water sold. Fixed costs *do not vary directly with the quantity of water delivered* (fixed revenue is revenue that does not vary with the quantity of water sold).

The average cost of water is defined as the total amount paid divided by the volume of water received; it is the cost per unit of water delivered. The marginal cost is defined as the change in total cost paid per unit change in the amount of water delivered. It measures the *incremental* cost per *incremental* unit of water.

Discussion on how much SDCWA charges focuses on the average cost of SDCWA water.

SDCWA imposes both variable and fixed charges for the delivery of its water, with separate variable charges for treated versus untreated water. The fixed costs can be converted to an equivalent volumetric charge by dividing them by the quantity of water delivered. The volumetric equivalent of the fixed costs counts towards the calculation of average cost. SDCWA's overall average cost of treated water in CY 2021, known as its *all-in cost*, was $1,769/AF, while its all-in cost for untreated water was $1,474/AF. Table ES1 compares these rates with MWD's all-in water rates. In CY 2021, SDCWA's rate for treated water is $367/AF higher (26% higher) than MWD's

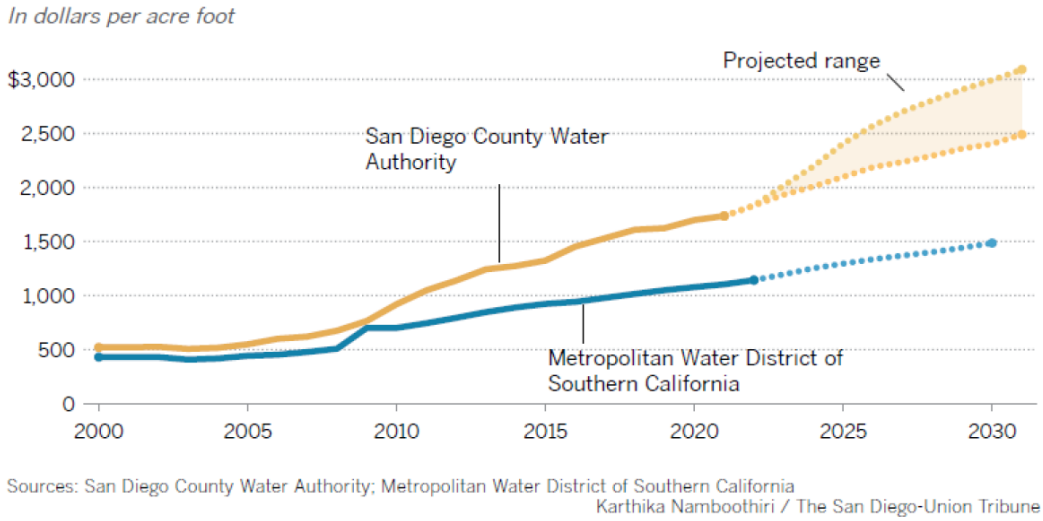
rate. SDCWA also offers a special rate for agricultural use that is $107/AF lower (7% lower) than MWD's standard rate; in exchange for this special rate, agricultural rate water users are subject to higher cutbacks in the event of supply shortage.

TABLE ES1 | All-In Water Rates Compared

	SDCWA	MWD
All-in untreated water rate	$1,474	$1,075
All-in treated water rate	$1,769	$1,402
Agricultural treated water rate (PSAWR)	$1,295	NA

It is not surprising that SDCWA charges more than MWD as a wholesale supplier of water since SDCWA buys water from MWD (both E-water and M-water) at a point near the northern boundary of San Diego County and then has the cost of maintaining and operating a separate water distribution system within the County. More significant, however, is that the differential between SDCWA's water rate and MWD's water rate widened starting around 2010. Figure ES1 depicts the growth in the rate differential, albeit somewhat inaccurately.[1]

FIGURE ES1 | Comparison of SDCWA All-In rates and MWD Full-Service Rate for Treated Water[2]



It has been suggested that this occurred because QSA E-water is more expensive for SDCWA than M-water from MWD. My analysis suggests otherwise. If QSA water was sometimes more

[1] This compares SDCWA's all-in rate, combining its fixed and variable charges, with MWD's variable charge alone, omitting MWD's fixed charges that amount to around $300/AF in 2020-2022.The graph thus overstates the rate differential.

[2]Joshua Smith "What Fallbrook and Rainbow's revolt says about San Diego's skyrocketing water rates" San Diego Union-Tribune December 18, 2021, retrieved on 12-28-2021 from https://www.sandiegouniontribune.com/news/environment/story/2021-12-18/fallbrook-rainbow-revolt-water-rates

expensive for SDCWA than M-water, that difference would not have been large, and it no longer exists. E-water costs SDCWA no more than M-water, or less, as shown in Table ES2, which describes SDCWA's supply sources in CY 2021 and their cost to SDCWA.

TABLE ES2 | SDCWA's Untreated Water Supply Cost

WATER SOURCE	Supply Share	Unit Cost ($/AF)		
QSA (E-water)	75.4%	$1,049		
Desal (Carlsbad)	13.0%	$2,725		
MWD (M-water)	11.6%	$1,075		
WEIGHTED AVERAGE		$1,271		

If SDCWA had not used any Carlsbad Desal water in CY 2021 and, instead, delivered a 75-25 mix of E- and M-water, its water cost would have been $1,056/AF instead of $1,271/AF, a savings of $215/AF. However, Carlsbad Desal water is more reliable than E- or M-water because it is not derived from streamflow that is being affected by climate change.

SDCWA only started using Carlsbad Desal water in 2016, so that does not explain why the SDCWA-MWD rate differential started to widen around 2010. Moreover, the $215/AF cost differential between Carlsbad and E/M-water accounts for only part of the $399/AF differential between SDCWA's and MWD's rates for untreated water. So, something else is at work. I believe that two other factors contributed to the rate differential:

1. SDCWA invested in some major water supply infrastructure projects just before and after 2010, a period when MWD was not making any unusually large investments. That would have caused the rate differential to widen.
2. Between 2010 and now, SDCWA experienced a 40% reduction in member agencies' demand for its water while MWD experienced only a 20% reduction. That difference would have caused the rate differential to widen, given that both agencies have very high fixed costs.

Contrary to what has sometimes been suggested, I have seen no evidence that SDCWA has charged member agencies unfairly, or that FPUD and/or RMWD were paying an excessively large share of the fixed charges levied by SDCWA, leading them to subsidize other member agencies.

NO. 3 | THE FINANCIAL IMPACT OF DETACHMENT

In the event of detachment by FPUD and/or RMWD, SDCWA would lose a variety of revenues including fixed and variable charges for water and also some charges borne by properties in the FPUD/RMWD service areas. It would also experience a reduction in its cost of operation. However, because almost 90% of SDCWA annual expenditures are fixed costs, the reduction in expenditures would fall far short of the reduction in revenues. Table ES3 below shows the impact on SDCWA's annual net operating revenue calculated for CY 2022.

TABLE ES3 | SDCWA Net Revenue Impact CY 2022

Item	FPUD	RMWD	FPUD + RMWD
REDUCTION IN REVENUE			
Without property tax loss	$8,590,141	$24,329,127	$32,919,268
With property tax loss	$8,750,141	$24,519,127	$33,269,268
REDUCTION IN EXPENDITURE			
Short-run	$4,686,300	$16,002,000	$20,688,300
Long-run	$5,047,100	$17,234,000	$22,281,100
CHANGE IN NET REVENUE			
SHORT-RUN			
Without property tax loss	$3,903,841	$8,327,127	$12,230,968
With property tax loss	$4,063,841	$8,517,127	$12,580,968
LONG-RUN			
Without property tax loss	$3,543,041	$7,095,127	$10,638,168
With property tax loss	$3,703,041	$7,285,127	$10,988,168

The exact reduction in revenue depends on whether SDCWA would continue to receive all, some, or none of the property tax revenue from the FPUD and RMWD service areas in the event of detachment, about which there seems to be some disagreement. Also, the reduction in expenditure will be different in the short run versus the long run. In the short run immediately after detachment, SDCWA will experience little reduction in the amount assessed against it by MWD for the Readiness to Serve (RTS) charge. Ten years later, MWD's RTS will be lowered based on the full reduction in M-water needed by SDCWA due to detachment.

The loss of annual net revenue is not a one-time event. It will occur for as long as SDCWA is paying the financial commitments that it has incurred to date. The exact amount of the annual impact will vary from year to year, depending on SDCWA's annual finances and rates.

The future financial impact will be lessened to the extent that SDCWA may find another buyer for the water that it would have delivered to FPUD and RMWD. But that will not fully offset the financial loss for two reasons: (1) The payment from the sale may not cover all the payments made annually to SDCWA by FPUD/RMWD as member agencies. (2) The water not delivered to FPUD/RMWD does not belong to FPUD and RMWD individually. Any financial benefit to SDCWA in the event that it sells the water that would have been delivered to FPUD/RMWD to some other party belongs collectively to SDCWA member agencies, and not to FPUD and RMWD individually.

Table ES4 presents my estimate of the cost-savings to FPUD and RMWD in CY 2022 if they switch from being served by SDCWA to being served by EMWD. Their financial gain would be somewhat smaller than SDCWA's financial loss.

TABLE ES4 | Savings In Water Cost When FPUD & RMWD Switch From SDCWA to EMWD

			EMWD			
			Unit Rate	FPUD	RMWD	FPUD + RMWD
	Source	Item	FPUD/RMWD	Expenditure		
			($/AF)	($)	($)	($)
a		WATER DELIVERY (AF)		4,100	14,000	
b	Table 16, row m	**SDCWA WHOLESALE WATER COST ($)**		$8,229,108	$23,034,412	$31,263,520
		EMWD WHOLESALE SUPPLIER				
c		MWD Full service Tier 1 treated	$1,143			
d	Estimated	MWD RTS charge	$122			
e	Estimated	MWD Capacity charge	$28			
f		EMWD Wholesaler "markup"	$11			
g	= c + d + e + f	**EMWD all-in treated rate**	**$1,304**			
h	= a * g	**EMWD WHOLESALE WATER COST ($)**		$5,346,400	$18,256,000	$23,602,400
i	= b - h	**COST SAVINGS ($)**		**$2,882,708**	**$4,778,412**	**$7,661,120**

NO. 4 | A DEPARTURE FEE

As I understand their positions, SDCWA argues that, if they detach, FPUD and RMWD should be liable for covering their shares of SDCWA's bonded and other indebtedness, which totals about $21 billion. Their share could amount to around $1 billion. In contrast, FPUD and RMWD argue that they should be able to detach without any further financial liability. In my judgment, as an economist experienced in the economics of water, neither position – a liability of about $1 billion nor a liability of zero – is reasonable.

However, the decision maker here is San Diego LAFCO, not me. The question confronting LAFCO is whether two SDCWA member agencies with a distinctive set of needs and situated at a distinctive location should be allowed to walk away scot-free, entirely unencumbered by any of the financial commitments that SDCWA has assumed on behalf of its member agencies.

The purpose of a departure fee is to assist SDCWA in covering its financial obligations that are fixed, ongoing and unavoidable for a limited period while it adjusts to the changed financial situation. It is not intended as payment for water being received; it is payment for obligations incurred when receiving water in the past, given that water supply is highly capital-intensive, requires long-term commitments, and is not operated on a PayGo basis.

If San Diego LAFCO were inclined to require a departure fee as a condition for approving detachment by FPUD or RMWD, it would need to decide what is the appropriate share to assign to FPUD or RMWD, of which SDCWA ongoing financial obligations, and for what length of time.

SDCWA is committed to making annual payments that run through 2047 (for IID Transfer water) and 2112 (for canal lining water). This year (CY 2021), the annual payments for QSA water amount to almost $285 million. LAFCO might use that amount as a starting point for thinking about what a fair and reasonable departure fee could be.

Table ES5 illustrates what an annual departure fee might be if it is framed as FPUD/RMWD's share of SDCWA's annual QSA payment commitment in CY 2021 ($284,524,900), using their three-year average share of either all deliveries or deliveries for M&I (non-PSAWR) use.

TABLE ES5 | Calculation of a Departure Fee

	Share	Annual payment
USING THE SHARE OF M&I DELIVERIES		
FPUD	1.9%	$5,295,156
RMWD	2.7%	$7,710,209
Total	**4.6%**	**$13,005,365**
USING THE SHARE OF ALL DELIVERIES		
FPUD	2.3%	$6,402,041
RMWD	4.3%	$12,107,975
Total	**6.5%**	**$18,510,016**

This calculation could be adjusted in many different ways and as LAFCO sees fit.

NO. 5 | WATER SUPPLY RELIABILITY

EMWD has both retail and wholesale customers. While about half of EMWD's supply is local supplies, it does not share those with its wholesale customers. Under the present arrangement, if FPUD and RMWD become members of EMWD this will not bring them access to any of EMWD's local supply. Through EMWD they will receive only M-water from MWD. With the Santa Margarita Conjunctive Use Project online, about half of FPUD's total consumption is now local supply, but RMWD has almost no local supply and will be essentially as dependent on MWD as SDCWA was in 1991. In contrast, SDCWA is now largely independent of M-water: that accounted for 24% of SDCWA's supply in CY 2020, about 12% in CY 2021, and is projected to decline even further over the next decade. The bulk of SDCWA's supply portfolio is: (i) QSA water from the Colorado River which comes under a higher priority water right than most of MWD's Colorado River M-water, and (ii) water from the Carlsbad Desal facility, which is fully protected against streamflow uncertainty.

The superior reliability of SDCWA's supply has benefitted FPUD and RMWD in the past. In the drought of 2009, SDCWA faced a 13% cut-back in the delivery of M-water. However, because of its access to QSA water, SDCWA was able to reduce deliveries to its member agencies by only 8%. In the 2015-2016 drought, the supply from the Carlsbad Desalination Facility was certified as drought-resilient, which lowered FPUD and RMWD's mandated water use reduction from 36% to 28%. In May 2016, the conservation mandate was replaced with a localized "stress test" under which a wholesale water agency could document its ability to meet demands for 2017-2019 should dry conditions continue. Based on the availability of SDCWA's drought resilient supply, the conservation requirement for FPUD, RMWD and other member agencies was reduced to 0%.

Both of MWD's sources of M-water – SWP water and Colorado River water -- have supply reliability issues.

There are supply reliability issues for SWP water with regard to: (i) the amount of water available for it to take from its source, the Feather River in the Sacramento Valley, and (ii) the ability to convey that water through the Sacramento/San Joaquin Delta to SWP member agencies south of the Delta.

- With regard to the availability of Feather River water, long-standing issues are that droughts are a fact of life in California and that SWP has relatively little carryover storage. A new factor is climate change and the growing recognition that droughts will become more frequent and more severe. Before 2013, there were only two years since SWP deliveries began in 1972 when it delivered a very low supply relative to its Table A commitment; but six of the nine years since then have seen a very low SWP supply. In addition, with soils becoming drier, with climate warming, northern California streamflow is becoming harder to predict using the standard hydrological models, rendering water supply less predictable.

- With regard to conveyance through the Delta, there are two issues: (i) environmental restrictions on releases have increased since the 2000s and (ii) there is a general recognition that the levee system used to convey SWP water is unreliable and will have to be replaced. The first proposal, launched in 2015 and known as WaterFix, involved two tunnels under the Delta, at an estimated cost of about $17 billion in 2017 dollars. MWD planned to acquire a 64.6% share in the supply at a projected cost of $10.8 billion. The proposal was withdrawn by Governor Newsom in 2019, and a one-tunnel project is being developed, known as the Delta Conveyance Project, with a preliminary cost estimate of $15.9 billion (in 2020 dollars). Exactly when the project will be completed, and at what cost, is unknown. It might not come into full operation for another 10 or 15 years. Without it, the ability to convey SWP (and CVP) water to users south of the Delta remains at risk.

The Colorado River was MWD's original source of water and remained its larger source until the QSA took effect in 2003, reducing MWD's firm supply of Colorado River water. Starting in 2003, SWP made up the majority of MWD's water. The recent difficulties with SWP deliveries are causing a return to Colorado River water. However, there has been a twenty-year drought on the Colorado River, and the impacts are now beginning to be felt. Lake Mead and Lake Powell, the country's two largest reservoirs, are now at their lowest levels ever. In September, for the first time in history, a Tier 1 shortage was declared on the river. Tier 1 reduces diversions by Arizona and Nevada but not California. California loses about 5% of its diversion under Tier 2b, and about 8% under Tier 3. Current projections are that there is a 25% chance of a Tier 3 declaration in 2023, a 44% chance in 2024, and a 59% chance in 2025. In the event of a California reduction, the brunt would be borne by MWD, not SDCWA, because of the seniority of the water right to which SDCWA has access. Looking to the future, Tier 3 will not be enough to manage the Colorado River under the "new normal" conditions now being anticipated; sharper cutbacks will probably be required for all three lower basin states.

In anticipation of possible shortage, MWD has built up substantial dry-year reserves stored in groundwater banks in the San Joaquin Valley and Coachella Valley and in Lake Mead. This will enable it to withstand two or three critical shortage years in a row. However, projected climate change scenarios indicate the possibility of significantly longer droughts in the future. It is not clear that MWD yet has the practical capacity to sustain more severe and prolonged drought, especially on the Colorado River.

In switching from being wholesale customers of SDCWA to EMWD, FPUD and especially RMWD may face some challenges. Riverside County is the fastest growing county in California. While EMWD has significant local supplies, it does not share those with its wholesale customers – it provides only MWD water to them. Most of EMWD's wholesale customers themselves have substantial local supplies. The City of Perris and RMWD will be the only EMWD wholesale customers who are solely dependent on MWD water.

EMWD presented an analysis showing that it would be able in a drought to withstand a 30% reduction in MWD deliveries, sparing any wholesale customer (including FPUD and RMWD) from being short of supply. However, that analysis rests on certain assumptions which I find unrealistic.

In summary, while I believe that FPUD and RMWD are taking something of a gamble on supply reliability if they switch from SDCWA to EMWD, the gamble ultimately is not one of running out of water but, rather, paying a higher price than they had anticipated to get by in a drought.

NO. 6 | WHAT IS THE PROBLEM?

The problem generally is not that SDCWA is using water that is too expensive. My analysis indicates that QSA water is not more expensive than M-water from MWD. Desal water from Carlsbad is expensive, but it also has real economic value as insurance against disruption of supplies derived from streamflow, and it proved its value during the 2015-2016 drought. It would be even more valuable if this reliability could be shared across a wider set of Southern California water users.

Increased use of recycled water is also not a solution to the high cost of water supply. While recycling brings important environmental benefits and also has a significant economic benefit as the solution to overcapacity in wastewater collection, treatment and disposal systems, it is generally an expensive source of water supply.

The larger problems underlying the present detachment issues are problems with SDCWA's fiscal model and, to some degree, its governance model.

There is a severe structural imbalance in SDCWA's finances, arising from a mismatch between the share of its revenues that are variable versus fixed and the share of its expenditures that are variable versus fixed. That creates significant financial vulnerability when the volume of water

delivered to member agencies declines. When it delivers less water, while it saves on some expenditure, its revenue declines even more, causing a net loss. This vulnerability is not unique to SDCWA – it is shared with MWD and many other water agencies. Table ES6 below shows the mismatch between its variable revenue share and its variable expenditure share for SDCWA in comparison with MWD.

TABLE ES6 | Financial Exposure to Variation in Water Sales

	SDCWA	MWD
PERCENT OF EXPENDITURE THAT VARIES WITH AF DELIVERED	15%	16%
PERCENT OF REVENUE THAT VARIES WITH AF DELIVERED	72%	88%

These figures are based on SDCWA's current rate structure and could change if the rates changed. They also indicate that MWD is even more vulnerable to a reduction in deliveries than SDCWA. Still, SDCWA's situation is quite serious. As a rough example, I estimate that for every 1,000 AF less that SDCWA delivers to member agencies, on average its annual *net* revenue falls by almost $1M. This is a significant concern given that, over the coming decade, SDCWA is projected to experience a 60,000 AF reduction in deliveries as member agencies substitute increased use of local recycled water for SDCWA water.

The problem with SDCWA's governance is also shared with many other water agencies, including MWD. The problem is that the Board of Directors makes major investment decisions without any upfront commitment by member agencies to take and pay for the water that will be generated. This strategy commits current resources without guaranteeing the future revenues to pay for new investments. This is a problem that was noted for MWD in a Blue Ribbon Task Force Report to which I contributed in 1993-1994, and it still has not been fixed by MWD.

Member agencies need flexibility to change their supply portfolio in the future without being tied down by long-term purchase commitments. But water supply infrastructure is massively capital intensive and very long-lived. It cannot be funded on a PayGo basis; it needs a long-term financial commitment. The problem was less severe in the past when property tax revenues provided the main repayment source for water infrastructure investments. That source of revenue stability is now lacking.

It has been suggested elsewhere that water transfers and exchanges can contribute to solving the financial dilemmas of urban water supply. Whether that is true depends, in part, on the nature and form of the transfer activity. Up to now, SDCWA and MWD have been the principal actors in water transfers in Southern California, initiating and implementing transfers through the networks that they control. However, the need for transfers now arises increasingly at the local level of individual member agencies with varying needs for reliability in water and varying willingness to pay for water. To take advantage of the variety in individual member needs and to

overcome the financial challenges confronting Southern California's water at a time of climate change, it will be important that local member agencies step up, take more responsibility for the water they obtain through regional wholesalers, commit financially on a long- rather than short-term basis, and become leading actors in shaping their individual supply portfolios through water transfers and exchanges as needed. In that scenario, SDCWA and MWD will to some degree become facilitators and providers of assistance rather than the principals. For this to work, it will also be essential to have a strong degree of cooperation and collaboration between SDCWA and MWD as Southern California's two premier water supply agencies.

CHAPTER TWO | REPORT ANALYSIS

2.1 HOW THE SAN DIEGO COUNTY WATER AUTHORITY SERVICE AREA GETS ITS WATER

Q. If I am served by a member agency of the San Diego County Water Authority (SDCWA), where does my water come from?

A. Your water comes from one of two sources: (1) *local supplies* -- water your member agency obtains from local sources that it controls, and (2) water supplied to your member agency by SDCWA.

Q. What are local supplies?

A. Historically, local sources were groundwater and surface water within the local area of the urban water agency. Before 1947, the San Diego region relied entirely on local surface water runoff and groundwater pumped from local aquifers.

Over time, local sources have expanded to include the use of treated wastewater from local wastewater plants, the use of desalinated local groundwater and, also, desalinated seawater (some of the seawater at the Carlsbad Facility is contracted for by SDCWA member agencies Carlsbad MWD and Vallecitos WD and counts as part of their local supplies).

However, as the region's population and economy grew, local supplies became insufficient to meet the region's water needs.

Q. How did San Diego County's local supplies come to be augmented?

A. In 1928, the Metropolitan Water District of Southern California (MWD) was formed to develop, store and distribute supplemental water in Southern California, with the specific intention of importing water to the region from the Colorado River. MWD built the Colorado River Aqueduct (CRA) during the 1930s to convey this water, with the aqueduct coming into operation in 1941. The founding members were Los Angeles and its neighboring cities in Los Angeles County.

World War II caused a great increase in water consumption in San Diego and threatened to deplete the region's available local water supply. The solution was to connect the region to the Los Angeles area CRA and import Colorado River water from MWD. In 1943, engineering studies were completed for an aqueduct that would connect with the CRA at what is now called Lake Mathews and convey water south across Riverside County and into San Diego County. The San Diego County Water Authority was organized with nine original members in June 1944 under an enabling act of the California State Legislature known as the County Water Act.[3] The primary purpose was to contract with MWD as a member agency and supply imported MWD water to

[3] SDCWA now has 24 member agencies.

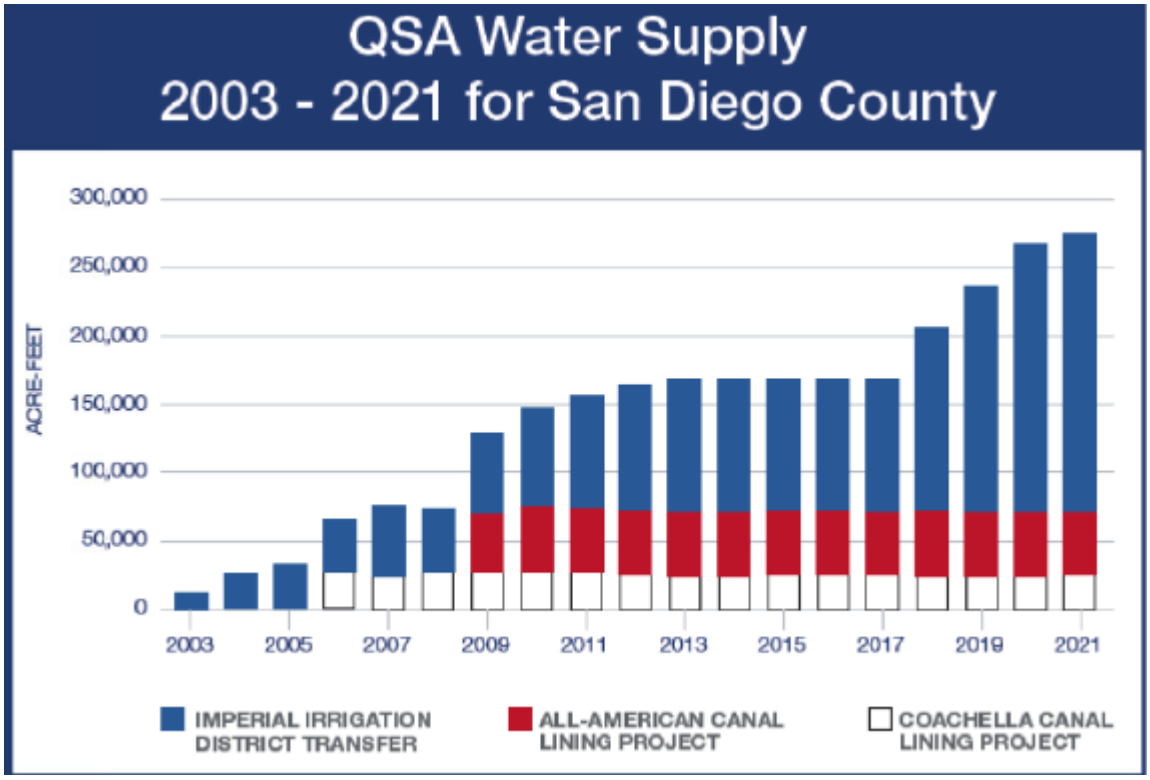
the region. The San Diego Aqueduct was completed and placed in operation in December 1947. Between the 1950s and the 1980s, SDCWA constructed four additional aqueducts that are all connected to MWD's distribution system and import water to the County.

SDCWA supplies from 75% to 95% of the region's water consumption, depending on hydrologic conditions and yield from local supplies.

Q. Where does SDCWA get its water from?

A. For almost sixty years, from 1947 to 2003, MWD was the sole provider of imported water to SDCWA. This changed in 2003; starting that year, SDCWA began to receive water purchased in a transfer agreement with Imperial Irrigation District (IID). In 2007, SDCWA started to receive an amount of water from projects that lined portions of the All-American Canal (AAC) and the Coachella Canal (CC) in order to conserve water that infiltrated into the ground before the canals were lined. The ramp-up in the delivery of this water from the Colorado River is depicted in the graph below:[4]

FIGURE 1 | Build-up of QSA Water Delivery to SDCWA



I will refer to the water obtained by SDCWA from IID and from the canal lining as *QSA water*. It is conveyed from the Colorado River to the SDCWA service area by MWD using the CRA under a 2003 agreement known as the Exchange Agreement.

[4] Source: Presentation to SDCWA Board, 1-25-2018, slide 65.

In addition, in 2016, SDCWA started to receive desalinated seawater from the Carlsbad Desalination Facility.

Q. Why did SDCWA decide to broaden its source of water beyond water from MWD?

A. SDCWA decided it needed to expand the sources from which it received water in the light of its experience with MWD during the drought in 1991.

Q. What happened to SDCWA during the drought in 1991?

A. The period from 1987 to 1992 saw one of the major droughts in California's history.

This was by no means California's first drought. There had been multi-year droughts in California in 1918-1920, 1928-1934, 1947-1950, 1976-1977 and, subsequently, there were droughts in 2007-2009 and 2012-2016. But, the droughts prior to 1976-1977 occurred when California's population was much smaller and before major reservoirs had been constructed.

What made the droughts of 1976-1977, 1987-1992, 2007-2009 and 2012-2016 so significant was the combination of very low precipitation, low runoff, and severely depleted reservoir storage.

1976-1977 was the single most severe drought in terms of precipitation and runoff, but it was just a two-year drought, and the water supply impact was not as severe as in the subsequent longer droughts starting with 1987-1992.

The drought of 1987-1992 came as a major shock to Southern California's water system. In April 1990, MWD's Board had approved a first-ever drought management plan, calling on agricultural and municipal water users within its service area to voluntarily reduce their usage of water. Adopting a tougher approach, in December 1990 MWD mandated cutbacks in water use by agricultural and municipal users. In January 1991 it mandated sharper cutbacks. It increased the mandated cutbacks in February 1991 and again in March 1991, when it ended up cutting deliveries of water for agricultural use by 90% and deliveries for municipal use by 30%. MWD came within a few weeks of an even more severe cutback – it had given notice of an upcoming cutback of 50% in the County's water supply. This was avoided when heavy rains fell during the March Miracle of 1991.

The 30/90% cutbacks that were implemented were still devasting to SDCWA. SDCWA was almost entirely dependent on delivered water from MWD – MWD deliveries accounted for 95% of the water supply in its service area that year, with local supplies making up only 5%. By contrast, the City of Los Angeles relied on MWD for about 60% of its water, having its own supplies for the remainder. A 30% cut back on 60% of Los Angeles' municipal water supply equated to an 18% cut overall, while a 30% cut back on 95% of San Diego County's water supply equated to a 28.5% cut overall. MWD's cutback of deliveries for agricultural users was even more draconian since, in 1991, SDCWA accounted for 63% of MWD's total agricultural water sales.

The SDCWA Board decided to meld MWD's water supply cutbacks and impose a uniform 31% cut on all member agencies, regardless of whether those were agricultural or municipal uses of water.

Q. What were the consequences of the 1991 drought experience?

A. The experience during the drought in 1991 had important consequences both for SDCWA and for MWD.

For SDCWA, the consequence was a desire for less dependence on MWD and "a unified regional resolve to use visionary planning and smart investments to ensure San Diego's water supplies would be more resilient to shortage."[5] This led to the 1998 agreement between SDCWA and IID under which SDCWA would purchase water from IID, and also to the negotiations between SDCWA and Poseidon Resources, initiated in 2002 and finally consummated in 2012, for the construction of the Carlsbad Desalination Facility.

For MWD, too, the consequence was a desire for greater resilience in its water supply, including more water marketing transactions and the acquisition of more water storage capacity outside MWD's service area.[6]

Q. Where does MWD get its water from?

A. MWD has two core sources of water. The first source, as noted above, was water from the Colorado River, for which MWD was established in 1928, and which it started to deliver in 1941. The second is water from the State Water Project (SWP), which is owned by the State of California.

The SWP stretches more than 600 miles from Lake Oroville on the Feather River in Butte County down to Lake Perris in Riverside County. MWD contracted with California's Department of Water Resources (CDWR) in 1960 when the project was planned. MWD is one of 29 water agencies that have long-term contracts with the SWP. SWP was initially planned to deliver about 4.2 million acre-feet (MAF) of water, and MWD contracted for about 2 MAF, or about 48% of the total. MWD received its first deliveries of SWP water in 1972.

An important feature of the SWP contracts is that the full amount of water was not anticipated to be needed for at least the first 20-30 years. Facilities needed to transport the full 4.2 MAF were expected to be constructed over time as demands on the system increased. However, in a famous ballot in 1982, California voters rejected what was known as the Peripheral Canal Act that would have authorized building a canal around the periphery of the Sacramento-San Joaquin River Delta to move additional SWP water down to Central and Southern California. That left the SWP

[5] Pete Wilson, Foreword on *To Quench a Thirst: A Brief History of Water in the San Diego Region* as quoted in SDCWA Combined Response, 9-18-2020, p. 18.

[6] MWD's planning for the Eastside Reservoir (Diamond Valley Lake) had begun in 1987, and so predated the 1991 drought.

delivery capacity at about 2.7 MAF on average, and only about 1.2 MAF in a dry year. The most recent estimate of average SWP Table A deliveries is 2.4 MAF.[7] Following amendments to the SWP contracts under the 1994 Monterey Agreement, all SWP supplies are allocated to contractors in proportion to their original contractual entitlements. Thus, MWD's 48% share of total SWP contract entitlements allows it to receive about 1.2 MAF of average year SWP supplies, and about 0.6 MAF or less in a dry year depending on the severity of the drought.

In addition to a reduced supply of SWP water, MWD has also had to deal with a reduced supply of Colorado River water. Until 1963, MWD had a firm allocation of 1.2 MAF of Colorado River water through contracts with the U.S. department of Interior, which was enough to keep the CRA full. However, as the result of the U.S. Supreme Court's 1963 ruling in Arizona v. California, California's supply of Colorado River water was reduced to a total of 4.4 MAF and MWD's supply was reduced to 550,000 AF.

That ruling had little effect at first because Arizona and Nevada did not make use of the full apportionment of Colorado River water awarded to them by the U.S. Supreme court. In the interim, California water users, including MWD, took advantage of the situation to divert more Colorado River water than their allocation.

By the 1990s, the situation was different. By then, Las Vegas had grown into a large metropolitan area, and the Central Arizona Project, authorized by Congress in 1968 to deliver Arizona's apportionment of Colorado River water, had been completed. Arizona and Nevada were ready to take their full allocation of Colorado River water (2.8 MAF and 0.3 MAF, respectively). However, California water agencies, notably IID and MWD continued their high rates of diversion. On average during the 1990s, MWD was able to fill the CRA and California overall took 5.1 MAF of Colorado River water.[8] At this point the Secretary of the Interior stepped into the situation and moved to enforce the limits on California's use of Colorado River water.

The new arrangement on the Colorado River took effect when the Quantification Settlement Agreement (QSA) was signed in October 2003. This enforced the limits on California's use of Colorado River water, including MWD's limit of 550,000 AF.[9]

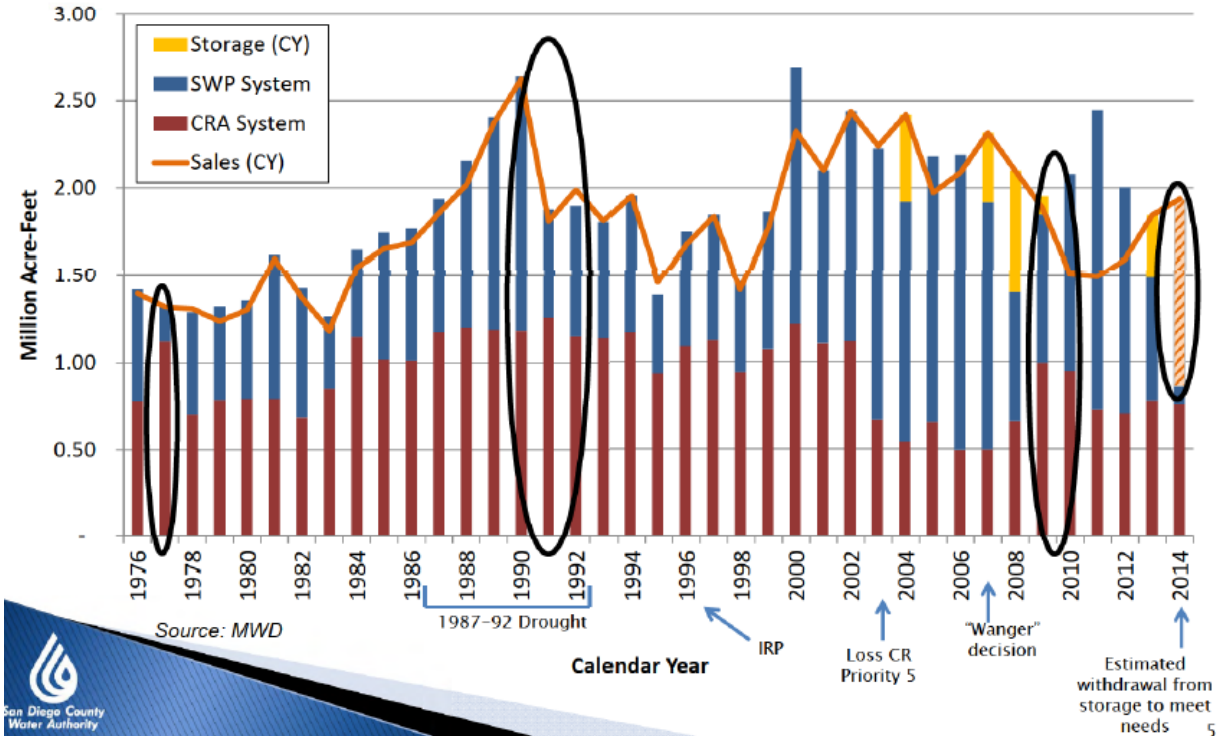
In addition to its contractual rights to SWP water and Colorado River water, MWD has augmented its water supply through water leasing and transfer arrangements with other parties outside its service area, including other holders of Colorado River water rights, other SWP contractors and other California water agencies. To store this water, MWD developed additional storage, both the Eastside Reservoir (which was completed in 2000) and additional storage outside its service

[7] California DWR, *The Final State Water Project Delivery Capability Report 2019*, August 2020, Figure 5.2.
[8] The years 1996-2000 were relatively wet in the Colorado River watershed and the Secretary of the Interior was able to declare that surplus water was available, which benefited California's water users and gave them some time to prepare for the coming change.
[9] In addition, MWD had completed a water transfer agreement with IID in 1988 to obtain about 106,000 AF out of IID's right to Colorado River water. Under certain conditions, however, MWD must provide 50,000 AF to the Coachella Valley Water District. Therefore, MWD's firm supply from the Colorado River is about 600,000 AF.

area, including storage in groundwater banks and storage in Lake Meade through the Colorado River 's Intentionally Created Surplus program.

Figure 2 summarizes MWD's changing mix of supply sources over time.[10] After MWD first received SWP water in 1972, it reduced the amount of water it took from the Colorado River (labelled CRA water in the figure). The chart depicts the steep reduction in delivery of SWP water delivery in the 1991 drought; the reduction in MWD diversions of Colorado River water following MWD's loss of surplus supplies (662,000 AF) in 2003; the initiation of MWD's program to build up out-of-district storage supplies starting in 2004; the reduction in SWP deliveries following increasing environmental restrictions on Delta export pumping; and the severe drought emergency in 2014 leading to a drastic reduction in SWP deliveries which continued into 2015.

FIGURE 2 | MWD's Changing Reliance on Sources of Supply



Q. Where does Fallbrook Public Utility District (FPUD) get its water from?

A. FPUD obtains its water from (i) some small local supplies and (ii) mainly from SDCWA.

Local supplies: according to FPUD's 2020 Urban water Management Plan, in Calendar Year (CY) 2020 FPUD obtained 100 AF from local groundwater and 517 AF of recycled water from its Fallbrook Water Reclamation Plant, for a total local supply of 617 AF.

SDCWA: In addition, FPUD obtained 8,303 AF from SDCWA in CY 2020.

[10] Taken from Presentation to SDCWA Board on 6-26-2014, slide 146.

Q, Will FPUD's local supplies increase in the future?

A. Yes: there are three projects that will increase FPUD's local supplies.

FPUD recently completed a rehabilitation of its Fallbrook Water Reclamation Plant which will allow it to increase the use of recycled water from 517 AF to 830 AF.

FPUD has been developing a major new local supply project, the Santa Margarita Conjunctive-Use Project, in collaboration with Camp Pendleton. The project involves capturing high surface water flows along the Santa Margarita, a short intermittent river that runs through Camp Pendleton, and storing the surplus flow in an aquifer on Camp Pendleton. Facilities to pump raw water from the aquifer near the Pendleton/FPUD boundary have been completed, and FPUD is currently constructing an advanced water treatment plant to desalinate the brackish groundwater extracted from the aquifer. The project came online during 2021. The amount of water yielded is expected to vary with hydrological conditions; it has been assessed conservatively at an average annual yield of 4,200 AF.

FPUD is also working on a project to obtain 300 AF of surface water by relocating a water right it held to the Santa Margarita but could not utilize to a diversion point on a tributary of the river outside its service area, upstream of Lake Skinner in Riverside County. Lake Skinner is MWD's reservoir that feeds MWD's Skinner Drinking Water Treatment Plant which provides drinking water to MWD's member agencies in Riverside and San Diego Counties. FPUD will store the water it diverts from the tributary in Lake Skinner, and MWD will wheel (convey) the water to FPUD via the SDCWA pipeline that connects SDCWA and MWD in return for a treatment charge plus a wheeling charge to be levied by MWD. When this comes into operation, it is conservatively expected to provide a yield of 300 AF for FPUD.

Q. Where does Rainbow Municipal Water District (RMWD) get its water from?

A. RMWD, like FPUD, is a member agency of SDCWA. It currently has no local supply and relies on SDCWA for the entirety of its water supply, which amounted to 14,297 AF in CY 2020.

Q. Will RMWD develop some local supply in the future?

A. RMWD is investigating the feasibility of developing local San Luis Rey River basin groundwater resources as a local supply of water. This would require the construction of a desalting plant or some other appropriate form of treatment facility for the groundwater extracted. In its 2020 Urban Water Management Plan, RMWD anticipates that this groundwater project might provide a local supply of 2,000 AF by 2030.

Q. Is FPUD served by MWD as its wholesaler?

A. No.

So far in its history, PFUD has had no supply relationship with MWD. FPUD is not a member agency of MWD, and MWD does not sell water to non-member agencies. FPUD is a member agency of SDCWA, and SDCWA is its sole wholesale supplier.

If FPUD starts to receive a surface water diversion from upstream of Lake Skinner, wheeled to it by MWD, then it will have a relationship with MWD. But MWD will then be serving in the roles of a treater of the water and a (partial) conveyor of the water, not as a supplier of that water.

MWD's water distribution line that comes down from Riverside County and connects to SDCWA's distribution system is owned by MWD for some of its length and by SDCA for the rest.[11] Although the county line demarcates the boundary of SDCWA's service area, the county line did not serve as the demarcation point between the portion of the pipeline controlled by MWD and the portion controlled by SDCWA. Instead, the control demarcation points for Aqueducts 1, 2, 3 and 4 are located at varying distances into San Diego County.

In consequence, FPUD and RMWD are each served by some turnouts owned by MWD and some owned by SDCWA. The details are presented in the following table:[12]

[11] This was motivated by how the pipeline's construction cost was split between MWD and SDCWA.
[12] Provided to me by SDCWA in an email dated 8-31-2021.

TABLE 1 | Metered Deliveries to FPUD and RMWD (AF)

(FY 2017 - FY 2021)

Meter Description	Pipeline Turnout Structure Owner	Flow Control Facility (FCF) Owner	Meter Deliveries (AF) FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Fallbrook Public Utility District							
DeLuz 1 FCF	MWD	MWD	2,180	2,264	1,541	1,426	1,579
Fallbrook 3 FCF	MWD	SDCWA	1,739	1,485	1,340	2,393	2,635
Fallbrook 4 FCF	SDCWA	SDCWA	1,132	1,499	1,197	292	0
Fallbrook 5 FCF	MWD	SDCWA	Not in Service				
Fallbrook 6 FCF	MWD	MWD	3,667	5,102	3,808	3,763	4,799
		Total	**8,718**	**10,350**	**7,886**	**7,874**	**9,013**
Rainbow Municipal Water District							
Rainbow 1 FCF	MWD	SDCWA	2,151	2,892	2,584	2,940	3,149
Rainbow 3 FCF	SDCWA	SDCWA	3,560	4,335	3,534	2,293	3,564
Rainbow 4 FCF	MWD	SDCWA	Not in Service				
Rainbow 5 FCF	SDCWA	SDCWA	Not in Service				
Rainbow 6 FCF	SDCWA	SDCWA	2,403	2,393	1,962	1,866	2,799
Rainbow 7 FCF	SDCWA	SDCWA	3,110	3,119	2,601	1,191	383
Rainbow 8 FCF	MWD	MWD	2,238	2,647	1,425	3,585	3,747
Rainbow 9 FCF	MWD	MWD	1,617	1,842	1,496	1,197	1,456
Rainbow 10 FCF	MWD	SDCWA	955	1,060	548	462	634
Rainbow 11 FCF	SDCWA	SDCWA	1,167	922	506	946	1,239
Rainbow 12 FCF	SDCWA	SDCWA	Not in Service				
		Total	**17,202**	**19,211**	**14,654**	**14,479**	**16,972**

[1] Represents water delivered to FPUD and RMWD. No adjustment for small volumes of interagency exchanges.

As shown, FPUD was served by three pipeline turnouts owned by MWD and one owned by SDCWA. FPUD took delivery of water from the turnout owned by SDCWA for the last time in November 2019 (within FY 2020).

RMUD is currently being served by four pipeline turnouts owned by MWD and by four owned by SDCWA.

Q. Are there any other SDCWA member agencies that have turnouts on a portion of the pipeline from Lake Skinner owned by MWD?

A. No. FPUD and RMWD are the only SDCWA member agencies located sufficiently far north in San Diego County that they receive water from turnouts owned by MWD rather than SDCWA.

Q. Does the fact that MWD owns a turnout from which FPUD or RMWD receives water make MWD a wholesale supplier to FPUD or RMWD?

A. No. The fact that MWD owns a turnout from which a SDCWA member agency receives water does not make that member agency a wholesale customer – or any other form of customer – of MWD. The member agency is solely a customer of SDCWA.

This is so for several reasons:

SDCWA is the entity that acquired the water from MWD.

SDCWA is the entity billed by MWD for the water.

SDCWA owns the water it obtains from MWD.

Q. Does the fact that SDCWA waives its Transportation Charge for water received by FPUD and RMWD from a turnout owned by MWD make that not SDCWA water?

A. No. The fact that SDCWA has decided to waive its Transportation Charge for water received by FPUD and RMWD does not make this something other than SDCWA water, for the reasons stated above.

Q. Is it the case that, if FPUD and RMWD exit from SDCWA, they still would end up receiving the same MWD water from the same turnouts on the same pipes? Nothing would really change?

A. No – that is not the case.

FPUD and RMWD would not receive water from turnouts owned by SDCWA.

More importantly, FPUD and RMWD would NOT be receiving the same water as they receive as member agencies of SDCWA.

Q. Why will it not be the same water?

A. It will be water belonging to MWD and supplied by MWD, rather than water belonging to SDCWA and supplied to FPUD and RMWD by SDCWA.

Q. How is water supplied by MWD different from water supplied by SDCWA?

A. It is different in source, it is different in supply reliability, and it is different in pricing.

Q. How is MWD water physically delivered by MWD to FPUD and RMWD different in source from SDCWA water physically delivered by MWD to FPUD and RMWD?

A. SDCWA, as an MWD member agency, purchases water from MWD. But this is supplemental water. SDCWA's base water supply – water that it owns directly – consists of QSA water from the Colorado River (canal lining water and IID Transfer water) and desalinated water from the Carlsbad Facility.

MWD base supply – water that it owns directly – consists of water obtained under its right to Colorado River and water purchased from IID, totaling approximately 600,000 AF, plus water obtained by MWD through its 48% share of the SWP supply.

Q. Isn't it true that MWD currently delivers to SDCWA some water from the SWP?

A. It is more complicated than that. MWD delivers molecules of SWP water to SDCWA in *two distinct capacities*.

MWD delivers SWP water to SDCWA as a *supplier* of water. MWD also delivers water as a conveyor of water through an exchange agreement with SDCWA.

Q. What is the difference between MWD's role as a supplier of water versus its role as a conveyor of water under an exchange agreement with SDCWA?

A. As a supplier of water, MWD is both selling the water and transporting the water to SDCWA. MWD owns the water supplied and it owns the conveyance facility. It charges for both the water supplied and for the conveyance.

Under the exchange agreement with SDCWA, MWD is providing water to SDCWA in exchange for water owned by SDCWA and received by it from SDCWA – it is charging just for conveyance of the exchanged water.

Q. Is MWD's exchange agreement the same as wheeling water?

A. No.

A dictionary definition of wheeling water is the following:

"The conveying of water through the unused capacity in a pipeline or aqueduct by someone other than the owner."

There is an important distinction between wheeling water and what MWD does for SDCWA under the 2003 Exchange Agreement between those two parties. Typically, wheeling occurs only if there is available capacity in the pipeline.

Under the exchange agreement, however, MWD is obligated to making capacity available. SDCWA pays MWD a volumetric rate to cover MWD's expenses in exchange for the conveyance of water. "Unlike the wheeling context, the Exchange Agreement does not literally call for the conveyance of water but instead for the *exchange* of water."[13]

[13] Karnow, August 28, 2015, p.27.

Q. Is MWD selling the water it delivers to SDCWA under the Exchange Agreement?

A. This question was resolved in the course of rate litigation between SDCWA and MWD.

MWD had argued that the Exchange Agreement involved a purchase of water by SDCWA because, under the agreement, SDCWA gives money and water to MWD (namely, QSA water) and obtains from MWD different water – some blend of Colorado River water and SWP water.

The trial judge in San Francisco Superior court ruled against MWD and in favor of SDCWA. He held that "San Diego is not purchasing water from Met. San Diego is exchanging water with Met to make use of its own independent supplies. The parties agreed to exchange an equal amount of water; the only water quality requirement was for Met to provide San Diego with water of at least the same quality as the water Met received from San Diego. These facts underscore that the Exchange Agreement was not an agreement pursuant to which San Diego obtained water from Met, but instead an agreement pursuant to which Met in effect conveyed water on behalf of San Diego. That the Exchange Agreement differs in some respects from a wheeling contract does not mean that the Exchange Agreement was not in substance an agreement to convey, rather than purchase water."[14]

The trial judge's ruling was relitigated before the California Court of Appeals in 2017. The Court of Appeals upheld the trial court on this point. It stated:

"The trial court found 'the Exchange Agreement was not an agreement pursuant to which [the Water Authority] obtained water from [Metropolitan], but instead an agreement pursuant to which [Metropolitan] in effect conveyed water on behalf of [the Water Authority].' … We agree with this conclusion."[15]

The Appeals Court further stated: "The purpose, structure and terms of the [exchange] contract make it clear that the Water Authority is not purchasing water from Metropolitan but from Imperial. As the trial court rightly discerned, the Water Authority is exchanging water with Metropolitan 'to make use of its own independent supplies.' … In agreeing to pay rates equal to the Metropolitan-supplied water rates, the Water Authority did not agree it was purchasing Metropolitan water. There was no purchase of Metropolitan water…"[16]

Q. Is water delivered by MWD to SDCWA as a member agency the "same water" as water provided by MWD to SDCWA under the exchange agreement?

A. No.

The molecules of water may be the physically and chemically indistinguishable, but they are different legally, with regard to both their underlying water right and their reliability.

[14] Karnow, August 28, 2015, pp. 28-29.
[15] Court of Appeals, June 21, 2017, 372.
[16] Op cit., 373.

With what I will call *M-water*, water that MWD delivers to SDCWA in its capacity as a MWD member agency, this is water owned by MWD under its right to Colorado River water or under its contract with the SWP.

With what I will call *E-water*, water supplied to QSA under the 2003 Exchange Contract, this is water that MWD is exchanging with SDCWA in return for water that is owned by SDCWA under SDCWA's agreements with IID for QSA water, which in turn reflect IID's right to Colorado River water.

As explained further below, IID's right to Colorado River water is senior to MWD's right to Colorado River water and is therefore more reliable.

MWD's obligation to deliver E-water to SDCWA is different from its obligation to deliver M-water to SDCWA.

MWD has the same obligation to deliver M-water to SDCWA as it has to deliver that water to other MWD member agencies. MWD's obligation to deliver E-water to SDCWA is unique to SDCWA.

If MWD experiences a shortfall in its supply of water from the SWP or in its diversion of water from the Colorado River, it can declare a reduced allocation to MWD member agencies, including SDCWA in its capacity as a member agency. Regardless of that, if SDCWA delivers to MWD the volume of water specified under the Exchange Agreement, my understanding is that MWD is not free to deliver a reduced amount of water to SDCWA under that agreement: it is obligated to deliver the amount specified in the Exchange Agreement.[17]

Q. Is most of the water delivered by MWD to SDCWA M-water?

A. That used to be true, but it is no longer true– see Table 2 below.[18]

[17] The terms of the exchange are that (1) SDCWA makes the water that it purchases from IID and that it obtains from the lining of canals available to MWD at Lake Havasu, and (2) MWD delivers a like amount of water from any source to SDCWA in equal 1/12th monthly deliveries, regardless of when in the year SDCWA makes the IID and canal lining water available to MWD (SDCWA Exhibit 28, p. 6).

[18] This uses data provided to me by SDCWA in an email dated 9-2-2021.

TABLE 2 | Breakdown of Water Delivered by MWD to SDCWA

Fiscal Year	QSA Water	MWD Water	Total	QSA Share
2012	156,604	282,948	439,552	35.6%
2013	183,500	296,472	479,971	38.2%
2014	180,256	325,729	505,985	35.6%
2015	180,123	305,039	485,162	37.1%
2016	179,347	187,057	366,404	48.9%
2017	178,278	189,919	368,197	48.4%
2018	194,326	163,639	357,965	54.3%
2019	192,241	132,831	325,072	59.1%
2020	230,430	82,843	313,273	73.6%
2021	274,702	42,322	317,024	86.7%
2012-2021	1,949,807	2,008,798	3,958,604	49.3%
2012-2013	340,104	579,420	919,523	37.0%
2017-2021	1,069,977	611,554	1,681,531	63.6%
2020-2021	505,132	125,165	630,297	80.1%

As Table 2 shows, in the past decade overall, the water delivered by MWD to SDCWA broke down almost evenly between M-water and E-water, but the share of E-water has grown steadily from 37% in 2012 and 2013 to almost 64% in the last five years, to 80% in the most recent two years.

A clear implication is that the bulk of the water received by FPUD and RMWD, whether through turnouts owned by MWD or by SDCWA, is now E-water, not M-water.

Q. Are FPUD and RMWD different from other SDCWA member agencies?

A. Two features stand out as points of some difference between FPUD and RMWD versus other SDCWA member agencies.

First, as noted above, FPUD and RMWD are the only member agencies located sufficiently far north in San Diego County that they receive water from turnouts owned by MWD rather than by SDCWA.

Second, FPUD and RMWD are heavily agricultural users of water. Agricultural water uses in SDCWA's service area overall amounted to about 37,050 AF, or 8% of total water use in the service area in 2020.[19] However, in RMWD agricultural use amounted to 8,876 AF out of a total use of 14,297 AF in 2020, or 62%. [20] FPUD had about 2,676 AF of agricultural use, or about 30% of total water use.[21]

[19] SDCWA 2020 Urban Water Management Plan p. ES-1.
[20] RMWD 20202 Urban Water Management Plan, Table 4-1, p. 4-1.
[21] FPUD 2020 Urban Water Management Plan p. 12.

Other SDCWA member agencies with significant levels of agricultural use include Valley Center MWD, Ramona MWD, Yuima MWD and the City of Escondido, all located in the northern parts of the County.

The primary crops grown by SDCWA's agricultural water users include avocado, citrus, cut-flowers, vegetables, vine crops and nursery products. These are generally high value agricultural crops. Nevertheless, a high price for water is an issue for many agricultural producers, even of high value crops. As shown below, SDCWA's charges for water have risen significantly since 2000. The consequent rise in the retail price of water has been a factor in the reduction of crop production and agricultural water use in the FPUD and RMWD service areas since 2000. In the case of RMWD, its total annual water use has declined by about 50% from around 30,000 AF in 2000 to 14,297 AF in 2020.

2.2 HOW EXPENSIVE IS SDCWA WATER, AND WHY?

Q. What does SDCWA charge for water?

A. SDCWA obtains revenue from its member agencies as their wholesale supplier through a mix of charges. The charges for CY 2021 and CY 2022 are itemized in Table 3, below.

TABLE 3 | SDCWA Rates and Charges

		ITEM	CY 2021	CY 2022
	CHARGED TO MEMBER AGENCIES			
a		M&I water supply rate ($ /AF)	$940	$1,009
b		Agricultural water supply ($/AF)	$777	$799
c		Transportation rate ($/AF)	$150	$173
d		Treatment rate ($/AF)	$295	$310
e		Customer Service charge - Total, all member agencies ($)	$25.6M	$25.6M
f		Storage Charge - Total, all member agencies ($)	$60.0M	$60.0M
g		Supply Reliability charge - Total, all member agencies	$38.84M	$39.3M
h		Infrastructure Access charge ($/meter equivalent)	$4.24	$4.24
i	e + f + g + h	Fixed charges equivalent ($/AF)	$384	$341
j	a + c + i	All-in Untreated ($/AF)	$1,474	$1,523
k	d + j	All-in Treated ($/AF)	$1,769	$1,833
	CHARGED TO PROPERTIES IN SERVICE AREA			
l		Water Availability Standby charge (per property)	$10	$10
m		Ad valorem Property Tax	VARIES	VARIES
n		System Capacity Charge per new meter less than 1" ($)*	$5,312	$5,328
o		Treatment Capacity Charge per new meter less than 1" ($)*	$147	$149
		* varies by meter size		

Some of the items are charged to member agencies (items a-h), and others are charged to properties in the SDCWA service area (l-o).

Depending on the item, charges to member agencies vary by acre-feet of water supplied each month (items a-d), or by the individual agency's proportional share of a three-year or five-year rolling average of the total quantity supplied to all member agencies, or by the number of individual meter equivalents served by the agency in the previous year (h).[22]

Items a-d are volumetric charges. Economists classify these as *variable costs* for member agencies since they vary directly with the quantity of water delivered that year to the member agency. The other charges listed in Table 3 are fixed charges; these are what economists call *fixed costs* for member agencies because they do not vary directly with the quantity of water delivered that year to the member agency.[23] Items e-f-g do vary *indirectly* with the quantity of water delivered, in that they apportion to each member agency a portion of a quantum of fixed cost ($25.6M, in the case of item e) based on the member agency's share of the total quantity delivered to all member agencies over a span of three or five years. A change in the quantity of water delivered to a member agency in 2021, say, will have the potential to change the agency's allotted share of a cost item e, f, or g three or five years hence.

SDCWA offers a separate rate for water delivered to member agencies for agricultural use known as the Permanent Special Agricultural Water Rate (PSAWR). The PSAWR rate applies item b in place of a.[24] It includes the transportation rate, c, the treatment rate, d, and the customer service charge, e, but it excludes the storage charge, f, and the supply reliability charge, g. In exchange for this special agricultural rate water users are subject to higher cutbacks compared to M&I users in the event of a supply limit imposed by MWD ("an allocation") or other water shortages faced by SDCWA.[25] PSAWR users do not receive the benefit from the supply reliability or storage programs since they do not pay the charges for those programs.[26]

For planning purposes, a common practice is to convert the fixed charges e-f-g-h into equivalent volumetric charges ($/AF) by dividing them with the total (projected) quantity of water delivered to member agencies. For CY 2021, SDCWA estimates that its *all-in untreated water cost* [27]amounts to $1,474/AF, while its *all-in treated water rate* amounts to $1,769/AF.[28]

These all-in rates are averages across all SDCWA member agencies. For any individual member agency, its actual all-in rate for SDCWA water will vary with the quantity of water it buys that year from SDCWA, as well as with its mix of M&I water versus PSAWR water. The member agency allocations of fixed charges are based on the agencies' past shares of total water deliveries and

[22] Customer service charge is applied to a three-year rolling average of all SDCWA deliveries; Storage charge is applied to a three-year rolling average of M&I (non-PSAWR deliveries); and Supply reliability charge applies to a five-year rolling average of M&I (non-PSAWR) deliveries.

[23] This does not imply that fixed charges cannot be lowered: it means that they cannot be lowered *just by delivering less water*.

[24] By design, SDCWA's agricultural water supply rate, item b, is kept the same as MWD's full volumetric rate for its Tier 1 water supply (items a plus c plus d in Table 4).

[25] If MWD imposed a reduction in its delivery of M-water (as opposed to E-water), deliveries to PSAWR users would be cut in the proportion used by MWD regardless of the availability of QSA water or Carlsbad water.

[26] Less than half of FPUD and RMWD's agricultural customers avail themselves of the PSAWR rate.

[27] The all-in cost is the unit cost or average cost of water.

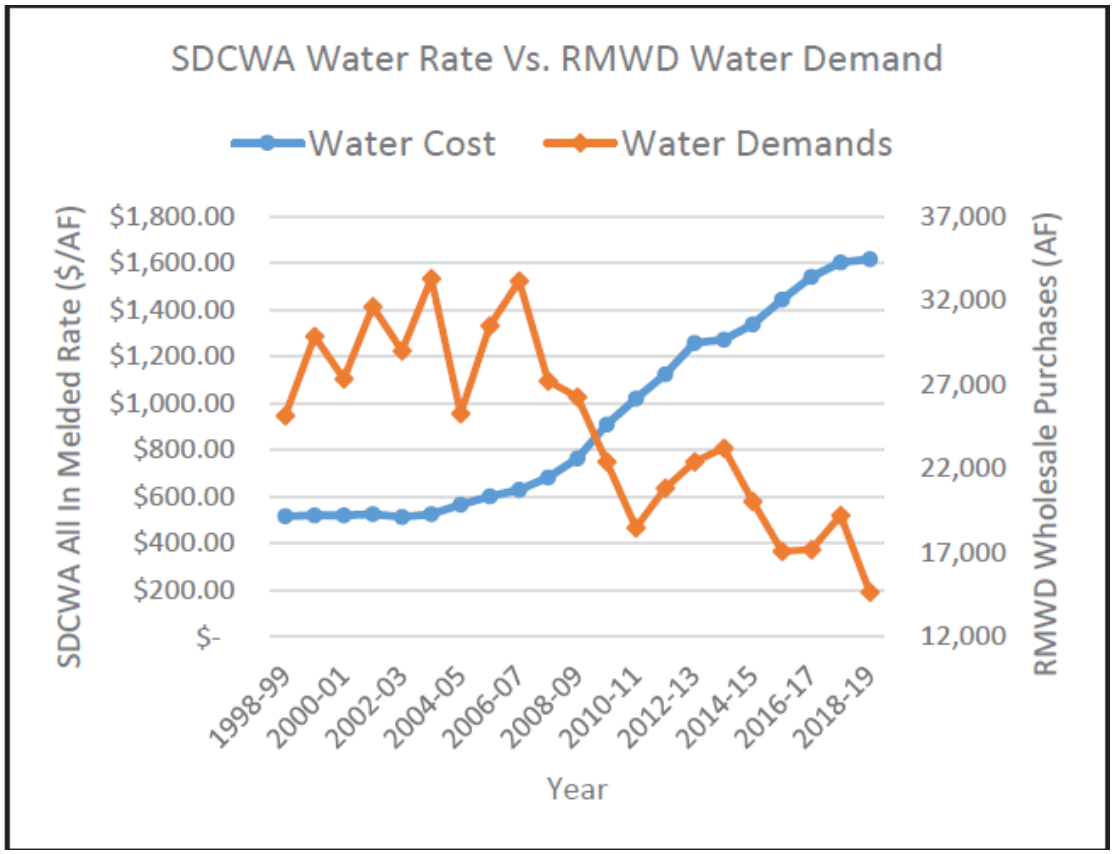
[28] The all-in treated water agricultural water rate amounts to $1,295/AF in CY 2021 and $1,355 in CY 2022.

total M&I deliveries; if an agency takes less SDCWA water this year than it had in the past (which is especially true of FPUD in 2021 and 2022), it will raise its all-in SDCWA water rate.

Q. How has the cost of SDCWA water changed over time?

A. Figure 3, plots SDCWA's all-in treated water rate over the period FY 1999 through FY 2019.[29]

Figure 3 | SDCWA All-In Treated Water Rate 1998-1999 to 2018-2019



The all-in treated water rate was $516/AF in FY 1999, and it stayed around that level through FY 2003. It started to rise in FY 2004, and it grew at a faster rate after FY 2009. FPUD and RMWD have cited the increasing trend in SDCWA's all-in treated water rate as their reason for wanting to depart from SDCWA.

[29] This figure was prepared by RMWD and presented to the RMWD Board of Directors on December 3, 2019. See Memorandum Subject: Consider Adoption of a Resolution of Application Authorizing the General Manager to Prepare and Submit an Application to the San Diego LAFCO to detach from SDCWA and Annex to EMWD." Page 46 of 238.

Q. What does MWD charge for water?

Table 4 below shows how MWD currently charges its member agencies for water this year.[30]

MWD's Tier 1 water supply rate applies to a member agency's water purchases that are within the agency's set Tier 1 maximum. In addition, MWD applies its System Access rate and its System Power rate to cover MWD's cost of transporting water delivered to member agencies. Up to CY 2020, MWD also applied its Water Stewardship Rate. Thus, the MWD Full-Service Tier 1 untreated rate, the sum of items a, c, d and f, amounted to $755/AF for CY 2020, $777/AF for CY 2021, and $799/AF for CY 2022.

The Full-Service Tier 1 treated water rate (row k) adds in the treatment surcharge (item e), for a total of $1,078/AF in CY 2020, $1,104/AF in CY 2021, and $1,143/AF in CY 2022.

Items a-f are all variable (volumetric) charges in the sense defined above. Items g and i are fixed charges, although they vary indirectly with the quantity of water delivered by MWD. Item g (the Readiness to Serve Charge, RTS) allocates to each member agency a portion of a fixed quantum ($130M, in CY 2021) identified by MWD as recovering the cost of providing capacity, including emergency storage capacity, to meet outages and hydrologic variability. This cost is allocated to member agencies based on each agency's proportional share of a ten-year rolling average of all M-water deliveries.[31] It is a fixed charge in the short run; it is a variable charge in the long-run as the ten-year rolling average adjusts.

Item i (the Capacity Charge) is charged on each member agency's individual peak (maximum) summer day delivery of water from MWD measured, in cfs, over a three-calendar year period. This varies, therefore, with changes in peak daily delivery, but not with total annual delivery.

For planning purposes, SDCWA converts g and i into equivalent volumetric charges ($/AF) by dividing them by the quantity of water it expects to purchase from MWD as a member agency (i.e., the quantity of M-water).[32] The table includes those equivalent per-acre foot charges (rows h and j) for CY 2020, 2021 and 2022, as presented to the SDCWA Board on 2-25-2021. What SDCWA refers to as MWD's all-in rate adds the per-acre foot equivalent MWD RTS and Capacity charges (rows h and j) to MWD's other charges (rows a+c+d+e+f) shown in Table 4.

[30] The charge structure was different in the past. MWD used to have a special agricultural rate which was discontinued.
[31] Member agencies may choose to have a portion of their total RTS obligation offset by standby charge collections levied by MWD on their behalf, and SDCWA chooses to do this.
[32] This is a delicate calculation. In the case of row g, the per-acre-foot estimate varies depending on whether one uses the average annual delivery over the previous ten years, on which the RTS is based, the projected delivery to SCWA this year (used by SDCWA here), or the actual realized CY delivery.

TABLE 4 | MWD Water Rates and Charges

	ITEM	CY 2020	CY 2021	CY 2022
	CHARGED TO MEMBER AGENCIES			
a	Tier 1 Water supply rate ($/AF)	$208	$243	$243
b	Tier 2 Water supply rate ($/AF)	$295	$285	$285
c	System Access rate ($/AF)	$346	$373	$389
d	System Power rate ($/AF)	$136	$161	$167
e	Treatment surcharge ($/AF)	$323	$327	$344
f	Water Stewardship rate ($/AF)	$65	-	-
g	Readiness to Serve (RTS) charge ($M)	$136	$130	$140
h	Readiness to Serve charge ($/AF)*	$179	$161	$174
i	Capacity charge ($/cfs)	$8,800	$10,700	$12,200
j	Capacity charge ($/AF)*	$103	$137	$156
k	Full-service Tier 1 treated ($/AF)	$1,078	$1,104	$1,143
l = h+j+k	All-in Tier 1 treated charge ($/AF)	$1,360	$1,402	$1,473
	CHARGED TO PROPERTIES IN SERVICE AREA			
m	Ad Valorem Property Tax	VARIES	VARIES	VARIES
n	Standby charge per parcel	VARIES	VARIES	VARIES
	*Equivalent charge per acre foot for SDCWA.			

Q. How does what SDCWA charges for water compare with what MWD charges?

A. Comparisons of what MWD charges for water versus what SDCWA charges are typically framed in terms of the all-in rates for water discussed above.[33] Table 5 presents the comparison of SDCWA versus MWD all-in water rates in CY 2021.

TABLE 5 | All-in Rates Compared ($/AF) CY 2021

	SDCWA	MWD
All-in untreated water rate	$1,474	$1,075
All-in treated water rate	$1,769	$1,402
Agricultural treated water rate (PSAWR)	$1,295	NA

The all-in SDCWA treated water rate is about 26% higher than the all-in MWD treated water rate ($1,769 vs $1,402). This is due primarily to the difference in the charge for untreated water, where the SDCWA rate is about $400/AF higher than the MWD rate, which amounts to a price differential of 37% ($1,474 vs $1,075). SDCWA's treatment cost is about 10% lower than MWD's treatment cost ($295 vs $327).[34]

Q. Is it surprising that SDCWA charges more for water than MWD?

A. No.

In addition to having its own source of water (E-water), SDCWA obtains water from an outside wholesale supplier, namely M-water from MWD. Every water agency that is supplied with water by an outside wholesaler supplies water to its own customers at a higher cost than what its wholesale supplier charges. This is because the water agency is both paying towards the costs of the wholesale supplier's infrastructure and also covering the cost of its own supply infrastructure for its own service area.

Thus, there definitely should be a difference between what MWD charges and what SDCWA charges. SDCWA obtains water through the MWD pipeline at the north end of San Diego County and then maintains, operates and manages a distribution system serving the entire western portion of the county. It is obvious that there has to be some mark-up over MWD's wholesale rate to cover the cost of maintaining, operating and managing water distribution in the county.

[33] I expand on that cost analysis below.

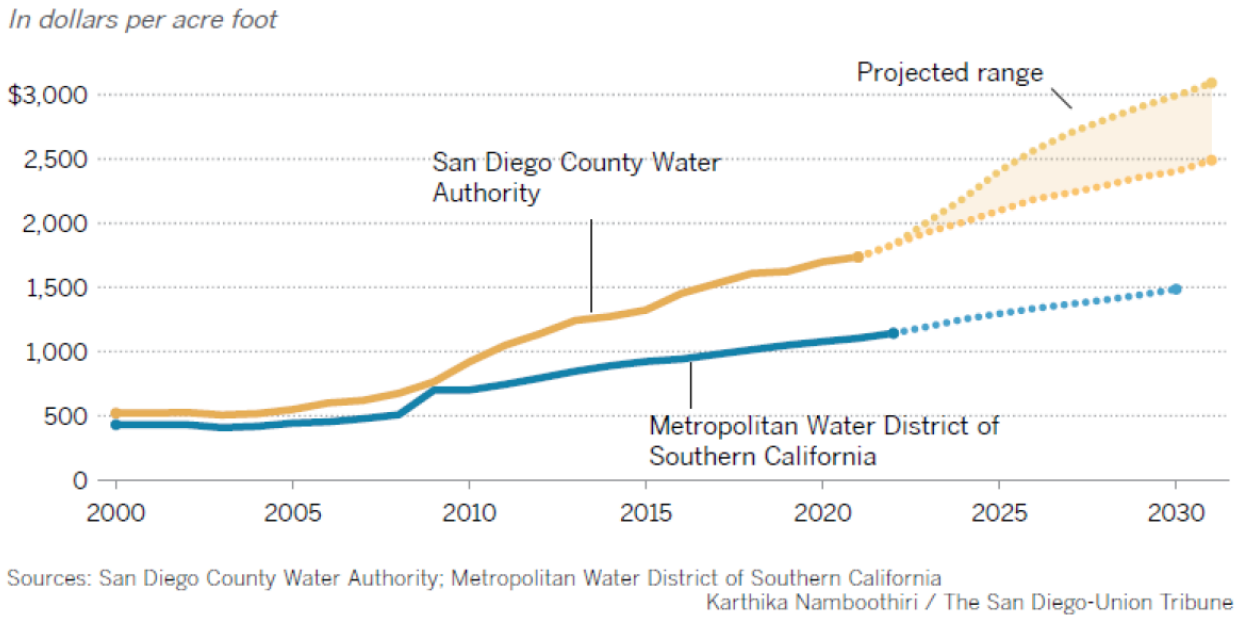
[34] Some commentaries have compared the MWD all-in untreated rate of $1,075/AF with the SDCWA all-in treated rate of $1,769/AF, but that is comparing apples with oranges. Others have compared SDCWA's all-in treated water rate with MWD's Full-service Tier 1 treated rate, rather than MWD's all-in treated rate – see Figure 4 below.

It also should be noted that, just as SDCWA's wholesale water rate has increased substantially over the past two decades, so has MWD's wholesale rate.

I do not have the data to consistently compare SDCWA's and MWD's water rates over time. What I have is shown in Figure 4. This compares SDCWA's *all-in* treated water rate not with MWD's all-in rate (Table 4, row l) but, rather, with MWD's *Full-service* Tier 1 treated water rate (row k). This omits the Readiness to Serve and Capacity charges imposed by MWD – rows h, j -- which amount to $282/AF in CY 2020, $298/AF in CY 2021, and $330/AF in CY 2022. Figure 4 thus has the effect of overstating the rate differential between SDCWA and MWD. Nevertheless, it is probably correct in pinpointing when the differential began to widen.

From 2000 to 2005, the differential between SDCWA's rate and MWD's rate as depicted in Figure 4 was around $100/AF; from 2006 to 2009, it was around $150/AF. In 2010 it rose to about $220/AF, in 2011 it became about $300/AF, and it continued to rise thereafter. Thus 2010 seems to have been the turning point when SDCWA's wholesale water rate began to rise significantly faster than MWD's rate.

FIGURE 4 | Comparison of SDCWA All-In Rates and MWD Full-Service Rate for Treated Water [35]



Q. Is it significant that the differential between SDCWA rates and MWD rates widened starting around 2010?

A. Yes.

[35] Joshua Smith "What Fallbrook and Rainbow's revolt says about San Diego's skyrocketing water rates" San Diego Union-Tribune December 18, 2021, retrieved on 12-28-2021 from https://www.sandiegouniontribune.com/news/environment/story/2021-12-18/fallbrook-rainbow-revolt-water-rates

That widening differential between SDCWA rates and MWD rates has been an important factor underlying FPUD and RMWD's wish to detach from SDCWA.

Q. Why did the differential between SDCWA rates and MWD rates widen starting around 2010?

A. Below, I investigate four possible explanations:

(1) QSA water (E-water) is more expensive for SDCWA than M-water from MWD.
(2) The Carlsbad desalination water is more expensive for SDCWA then M-water from MWD.
(3) SDCWA made major infrastructure investments soon before and after 2010; this was a time when MWD happened not to be making major infrastructure investments.
(4) SDCWA was hit harder than MWD by a sharp reduction in demand for its water from its member agencies.

Q. Is QSA water (E-water) more expensive for SDCWA than M-water from MWD?

A. It depends on what is being referred to: more expensive in terms *average* cost or *marginal* cost? Also, more expensive in terms of *short-run* marginal cost or *long-run* marginal cost?

I compare here the average cost of QSA water for SDCWA versus the average cost of M-water, and also the marginal cost of E-water versus the long- and short-run marginal costs of M-water.

The average cost of water is defined as the total amount paid divided by the volume of water received; it is the cost per unit of water delivered (E-water or M-water). If this cost per unit is multiplied by the number of units of water delivered, this yields the total amount paid that year, inclusive of all charges, for E-water or M-water.

The marginal cost is defined as the change in total cost paid per unit change in the amount of water delivered. It measures the *incremental* cost per *incremental* unit of water.

The marginal cost is relevant when contemplating changes in the amount of water delivered. If a change in the amount of water delivered to SDCWA is contemplated, multiplying the marginal cost by the change in the delivered amount yields the change in total cost paid by SDCWA. Using the short-run marginal cost yields the savings in cost paid if this is a one-time reduction in water delivery that year. Using the long-run marginal cost yields savings in cost paid if the reduction in quantity delivered is sustained over a multi-year period.

While both variable and fixed costs count towards the calculation of average cost, only variable costs (volumetric charges) count towards the calculation of marginal cost. Thus, the all-in costs reported in the text preceding Table 5, and in Table 5 itself, are average costs, not marginal costs. Table 6A and 6B assess the cost of QSA water to SDCWA versus the cost of M-water in FY 2021 (as opposed to CY 2021), breaking cost down into its components and separately identifying average cost versus short-run marginal cost versus long-run marginal cost.

TABLE 6a | AVERAGE/MARGINAL COST QSA E-WATER

			CY 2021		
	ITEM	FORMULA	Rate ($/AF)	Supply (AF)	Cost ($M)
			(a)	(b)	(c)
1	IID transfer	1(c) = 1(a)*1(b)	$688	200,000	$137.6
2	IID early transfer	2(c) = 2(a)*2(b)	$214	5,000	$1.1
3	IID Socioeconomic reimbursement	3(a) = 3(c)/3(b)	($2)	205,000	($0.3)
4	Canal Lining OM&R	4(c) = 4(a)*4(b)	$17	77,700	$1.3
5	Canal Lining Debt Service	5(a) = 5(c)/5(b)	$76	77,700	$6.0
6	Total QSA charge (fixed cost)	6(c) = 1(c) + … + 5(c)			$145.7
7	**Melded QSA Supply rate (average cost)**	7(a) = 6(c)/7(b)	**$515**	282,700	
8	MWD System Access rate (marginal/average cost)	From Table 4	$373		
9	MWD System Power rate (marginal/average cost)	From Table 4	$161		
10	**MWD Exchange rate (marginal/average cost)**	12(a) = 8(a) + 9(a)	**$534**		
11	**Combined cost QSA supply (average cost)**	11(a) = 7(a) + 10(a)	**$1,049**		
12	**Combined cost QSA supply (marginal cost)**	12(a) = 10(a)	**$534**		

Table 6A deals with the QSA water, which came to SDCWA in FY 2021 in three separate varieties: (i) regular transfer water whose amount had built up on a schedule specified in the 2003 Revised Fourth Amendment Transfer Agreement between SDCWA and IID; (ii) early transfer water which provided for the additional transfer of small quantities of IID water to SDCWA in 2020, 2021 and 2022 at a special, low price; and (iii) canal lining water which became available to SDCWA from the Coachella Canal in 2007 and from the All-American Canal between 2008 and 2010. IID transfer water came with a specified scheduled of annual prices that grew over time. The price rose by roughly 10% a year between 2007 and 2015; from 2016 through 2034 it follows a price index which, so far, has been rising at less than 2% a year. For canal lining water, there is no charge for the water per se, but SDCWA pays an annual debt service on its financing of the canal lining, amounting to roughly $76/AF per year, plus a small annual amount to cover the cost of operations, maintenance and replacement, which amounted to $17/AF in 2021. In summary, of the two main supply items, canal lining water provides SDCWA with 77,700 AF/year at a current unit cost of $93/AF which will increase by only a couple of dollars a year, and IID transfer water provides 200,000 AF/year at a purchase cost in FY 2021 of $688, which, currently, is rising at less than 2% per year. The weighted average of the costs of these two forms of QSA water amounted, in FY 2021, to $515/AF.

The key feature of these QSA costs is that, in economic terms, they are all fixed costs, stemming from commitments that SDCWA has made. SDCWA has committed to pay for the specified annual amounts of IID transfer water at the specified annual prices, and it borrowed money to co-fund the lining of the canals. Therefore, SDCWA's QSA expenditure would not be reduced if, for whatever reason, it decided to take less than 200,000AF/year from IID, or less than

77,700AF/year from the canal lining. These are long term commitments: the canal lining contract runs through 2113; the IID transfer contract runs through 2047 and can be extended to 2077 upon mutual consent.

To transport the QSA water from the Colorado River to the San Diego County service area, SDCWA signed the Exchange Agreement with MWD, which runs through 2047. Under this agreement, MWD charges a rate per acre-foot exchanged. In CY 2021, the exchange rate amounted to $534/AF (row 10).

Prior to CY 2021, MWD's Exchange Rate for QSA water had also included the Water Stewardship charge levied by MWD (amounting to $65/AF in CY 2020). In June 2010, SDCWA sued MWD challenging the Exchange Rate which MWD had adopted for CY 2011 and 2012 on the grounds that (i) MWD was misallocating certain SWP costs included in the System Access charge and System Power rate and wrongfully applying them towards the QSA water Exchange Rate, and (ii) the Stewardship rate was really a cost of MWD water supply and should not be included in the Exchange Rate.[36] The San Francisco Superior Court issued a ruling in April in 2015, which was then appealed. The California Court of Appeal issued its ruling in June 2017. My understanding is that the Superior Court essentially upheld both of SDCWA's claims, (i) and (ii); the Appeals Court reversed this judgment on (i) while upholding it on (ii). There is still ongoing litigation on these and other issues related to the Exchange Rate in more recent years.[37] However, MWD's Board of Directors decided to suspend the Stewardship rate for CY 2021 and 2022, thus removing it from both M-water and E-water.

If, for whatever reason, SDCWA had decided to take less than the contracted amounts of QSA water in CY 2021, it would have avoided paying the MWD Exchange Rate cost ($534/AF) per acre-foot not taken, but it would still have had to pay the contracted total of $145.7M shown in row 6 of Table 6A. Thus, the average (unit) cost of QSA water for SDCWA in CY 2021 was $1,049/AF (= $515 + 534), while the marginal cost saved by taking a smaller amount of QSA water than was contracted for would have been $534/AF.

[36] MWD used the Stewardship rate to fund member agency investments in local resources including recycled water, conservation and demand management.

[37] According to a press release issued by SDCWA on 10-28-2021, the two parties are now seeking to resolve the remaining issues outside of court. Also, MWD recently refunded to SDCWA some excess payment of the Stewardship rate plus interest.

TABLE 6b | Average/Marginal Cost of MWD M-Water

	ITEM	FORMULA	CY 2021 Rate ($/AF)
1	**MWD Tier 1 untreated rate (marginal/average cost)**	From Table 4	**$243**
2	MWD System Access rate (marginal/average cost)	From Table 4	$373
3	MWD System Power rate (marginal/average cost)	From Table 4	$161
4	**Tier 1 full service untreated**	4 = 1 + 2 + 3	**$777**
5	Treatment surcharge		**$327**
6	**Tier 1 full service treated**	6 = 4 + 5	**$1,104**
7	Readiness to Serve (long-run marginal cost)	Total amount of RTS/Projected total MWD delivery	$88
8	Readiness to Serve (average cost)	= SDCWA RTS/actual SDCWA delivery	$161
9	Capacity Charge (average cost)	= SDCWA Capacity charge/actual SDCWA delivery	$137
10	**All-in MWD Tier 1 untreated (average cost)**	10 = 4 + 8 + 9	**$1,075**
11	**All-in MWD Tier 1 treated (average cost)**	11 = 6 + 8 + 9	**$1,402**
12	**All-in MWD Tier 1 untreated (long-run marginal cost)**	12 = 4 + 7	**$865**
13	**All-in MWD Tier 1 untreated (short-run marginal cost)**	13 = 4	**$777**

Table 6B shows the costs to SDCWA of M-water from MWD. As with QSA water, there are two main charges: a cost for the water itself and a cost to transport it through MWD's system to the SDCWA service area. In addition, there are some other MWD charges that do not vary directly with the quantity of M-water supplied that year.

The cost for the water itself is the Tier 1 untreated rate (row 1), which in CY 2021 amounted to $243/AF. The variable costs are the MWD System Access charge and the System Power Rate (rows 2, 3), which together total $534/AF.

The other charges for untreated M-water are the Capacity charge and the Readiness to Serve (RTS) charge (rows 8, 9). The Capacity charge depends on the peak (maximum) daily delivery of water by MWD to a member agency. If the annual delivery of water to a member agency changes but the peak daily delivery does *not* change, then the Capacity charge would be effectively a fixed cost, not a variable cost, and it would not count towards the marginal cost of M-water.[38] The RTS charge does count towards the marginal cost of M-water, but it counts differently in the long-run and the short-run.

Converting these charges to a per-acre-foot equivalent is non-trivial, and it produces varying estimates depending on whether the quantity of water being divided into these charges is the projected water use looking forward over the coming year or the historical water use that actually materialized, looking backward. Also, in the case of the RTS, it makes a difference whether one uses an agency's proportional share of a ten-year rolling average of total M-water deliveries or

[38] The flow of M-water to SDCWA drives the capacity charge paid to MWD by SDCWA. Since E-water is delivered in equal monthly instalments under the Exchange Agreement, it should not impact the peak daily flow received by SDCWA from MWD.

its actual delivery that year. In the case of the per-acre-foot equivalents of the RTS and the Capacity charge reported by SDCWA and used in Table 4 (rows j and l) and Table 6B (rows 8 and 9), I believe SDCWA was using the projected water delivery that calendar year. The difference between the amounts reported in row 7 versus row 8 of Table 6B is as follows. The amount in row 7 ($88/AF) is the MWD-wide RTS charge per acre foot, obtained by taking the target amount to be raised through this charge ($130M in CY 2021) and dividing it by the past ten-year rolling average total delivery of M-water to all MWD member agencies (1,475,544 AF). However, the amount of M-water taken by SDCWA has been declining over the past 10 years (see Tables 8 and 9 below), so that amount of M-water projected to be taken by SDCWA in CY 2021 is below its proportionate share of that ten-year average. Dividing SDCWA's proportional share of the $130M RTS charge by the lower amount of its projected delivery of M-water in CY 2021 raises SDCWA's average per acre-foot RTS charge from the systemwide average of $88/AF to $161/AF (row 8).

Table 7 summarizes the results of this analysis. It shows SDCWA's average supply costs of QSA water and M-Water in FY 2021, broken down into three components: cost per unit for water supply, cost per unit for conveyance, and cost per unit for fixed charges. It also shows the marginal supply cost of QSA water and the long- and short-run marginal supply costs of M-water. In FY 2021, the average cost of M-water from MWD was a little higher than the average cost of QSA water, $ 1,075/AF versus $1,049/AF, and the short- and long-run marginal costs of M-water were also higher than those of E-water.

TABLE 7 | SDCWA's Supply Cost for Untreated E-Water vs. M-Water

	CY 2021	
ITEM	E-WATER	M-WATER
Average cost ($/AF)		
Water supply	$515	$243
Conveyance	$534	$534
Fixed charges		$298
Total	**$1,049**	**$1,075**
Long-run Marginal cost ($/AF)	**$501**	**$865**
Short-run Marginal cost ($/AF)	**$501**	**$777**

Table 8 extends the analysis back in time to 2003 when delivery of QSA started, on a CY basis. Following the methodology employed in Tables 6A,B and 7, the cost reported in column (C) of Table 8 represents the average cost of QSA water for SDCWA, while the cost reported in column (B) is the marginal cost of QSA water. The cost reported in column (G) is the long-run marginal cost of M-water for SDCWA.[39] I do not have the data needed to calculate SDCWA's average cost

[39] The sum of columns (D) and (E) constitutes the short-run marginal cost of MWD water.

of MWD water over the period 2003-2020. I don't know the per-acre-foot equivalent of the short-run MWD RTS charge (SDCWA's actual annual payment by divided by the amount of M-water actually delivered that year), but it is probably larger than the amount recorded in column F in the same way that row 8 in Table 6B is larger than row 7. I also do not know the per-acre-foot equivalent of the annual MWD Capacity charge, corresponding to row 9 in Table 6B. Those two missing items should be added to the number in column (G) to calculate the average cost of M-water. This would significantly reduce the cost difference between QSA water and M-water, shown in column (I), and reverse it in some years.

Two conclusions emerge from this analysis:

(1) While the annual average cost of QSA water for SDCWA may have been higher than that of M-water from MWD in some individual years, that difference would not have been large. Quite often the costs would have been about the same. Sometimes, including recently, the average cost of QSA water was lower than that of M-water.

(2) It is unlikely that the importation of QSA water starting in 2003 had a significant role in the widening of the gap between the all-in SDCWA rate and the all-in MWD rate starting around 2010, as depicted in Figure 5.

TABLE 8 | SDCWA's Supply Cost for Untreated E-Water vs. M-Water

	QSA (E-WATER)				MWD M-WATER						
CY	QSA OVERALL RATE ($/AF) (A)	MWD EXCHANGE RATE ($/AF) (B)	QSA TOTAL COST ($/AF) (C)		TIER 1 UNTRD RATE ($/AF) (D)	ACCESS + POWER + STEWARDSHIP ($/AF) (E)	READINESS TO SERVE ($/AF) (F)	TIER 1 UNTRD TOTAL COST ($/AF) (G)		RATIO QSA/MWD (C)/(G) (H)	QSA WATER SHARE* (I)
2003	258	253	$511		$73	$253	$52	$378		135.1%	1.5%
2004	267	253	$520		$73	$253	$52	$378		137.4%	3.0%
2005	276	258	$534		$73	$258	$50	$381		140.0%	5.5%
2006	286	258	$544		$73	$258	$49	$380		143.1%	6.8%
2007	225	258	$483		$73	$258	$48	$379		127.4%	10.5%
2008	214	278	$492		$73	$278	$49	$400		123.0%	14.4%
2009	191	314	$505		$107	$314	$53	$474		106.6%	26.2%
2010	226	314	$540		$101	$314	$60	$475		113.6%	33.9%
2011	238	372	$610		$103	$372	$60	$535		114.0%	35.2%
2012	312	396	$708		$104	$396	$78	$578		122.6%	41.1%
2013	332	453	$785		$106	$453	$78	$637		123.3%	36.6%
2014	363	445	$808		$140	$445	$94	$679		118.9%	31.5%
2015	381	424	$805		$148	$424	$91	$663		121.4%	35.9%
2016	383	438	$821		$156	$438	$89	$683		120.2%	40.9%
2017	385	465	$850		$201	$465	$100	$766		110.9%	50.1%
2018	429	486	$915		$209	$486	$83	$778		117.6%	55.6%
2019	464	522	$986		$209	$522	$82	$813		121.3%	74.7%
2020	494	547	$1,041		$208	$547	$87	$842		123.5%	87.6%
	* QSA share of combined QSA + MWD supply										

Q. Tables 7 and 8 show that SDCWA pays a higher unit cost for water supply for QSA water compared to MWD M-water, but exactly the same unit cost for conveyance. Is this surprising?

A. The fact that the water supply cost per unit of QSA water is higher than that for M-water is not a surprise. The fact that the conveyance cost per unit of QSA water is the same as that of M-water *is* something of a surprise.

Q. Why is it not a surprise that the water supply cost per unit of QSA water is higher than that for M-water?

A. Three factors explain why the supply cost of MWD M-water is relatively low.

1) There is no water supply cost per se for the water that MWD obtains from the Colorado River under its own water right of 550,000 AF.

2) MWD does pay for the 108,000 AF of Colorado River water that it contracted to obtain from IID in 1988; that price was represented by IID as $128/AF.

In the negotiation with IID, MWD required that the price of this water "not exceed -- indeed, remain below – the cost for State Water Project deliveries south of the Tehachapi's (at the time $249/AF inclusive of power charges to get the water over the mountains)."[40] IID had wanted to receive a higher price which MWD rejected. The outcome was that IID did not sell an additional 200,000 AF to MWD which had been on the table. This is the supply that SDCWA contracted for with IID in 1998, at an initial cost (in 2003) of $253/AF, roughly twice what MWD had been willing to pay in 1988.

3) The supply cost component of water projects – whether the SWP or the lining of the Coachella and All-American canals – are typically based on the historical construction cost of the project, not the future replacement cost. With inflation over time, the supply cost of water from an older project is lower than that of a more recently constructed project: older water is cheaper. The SWP, the major NON-Colorado River source of MWD water, was constructed in the 1960s and is older water.

Q. Why is it something of a surprise that the conveyance cost of QSA water is exactly the same as that of M-water?

A. The Exchange Rate set by MWD is based on its cost of transporting all of its water, not just water from the Colorado River but also SWP water from Northern California. The setting of this rate was beset by contention from the very beginning – there was what has been called a "wheeling-rate war" between SDCWA and MWD in which their other past feuds became

[40] Norris Hundley, *The Great Thirst*, University of California Press, Revised edition, 2001, p. 474.

entangled.[41] The wheeling rate that emerged reflected MWD's desire "that SDCWA continue paying its full share of MWD expenses"[42] rather than being a fine-grained calculation of the economic cost to MWD of transporting and exchanging QSA water.

SDCWA has stated that the real point-to-point cost to MWD for performing the exchange of QSA water is less than half the Exchange Rate charged by MWD.[43] However, I am not in a position to make my own assessment of that statement.

SDCWA first sued MWD with regard to the proposed Exchange Rate in 1997. The litigation continued on and off since then, picking up in 2010, and continuing in some form to the present day. The Court of Appeal ruled in 2017 that the Exchange Rate is not illegal. That does not make it actually fair or reasonable. The Court held that: ""[s]ubstantial deference must be given to [Metropolitan's] determination of its rate design. Rates established by the lawful rate-fixing body are presumed reasonable, fair and lawful."[44]

Q. Could the sharp increase in SDCWA's all-in water rate be due to the desalinated seawater from the Carlsbad Facility?

A. At a CY 2021-unit cost of $2,752/AF,[45] water from the Carlsbad Facility is significantly more expensive for SDCWA than purchased MWD water with an all-in rate of $1,075/AF. But this is unlikely to explain much of the escalation in the SDCWA's all-in water rate for two reasons.

[41] Hundley, *op. cit.*, pp 483-501.
[42] Hundley, ibid.
[43] For example, Dan Denham presentation to SDCWA Imported Water Committee, January 26, 2017.
[44] 2017 Ruling, p. 29, citing a 2004 ruling in SDCWA's earlier litigation against MWD.
[45] Presentation by Jeremy Crutchfield to SDCWA Board of Directors, October 22, 2020.

TABLE 9 | Total Water Use in SDCWA Service Area, Broken Down By Source

		Water Authority Supplies				
Fiscal Year	Local Supplies	Seawater Desalination	QSA	From MWD	Total Water Used	Total Supplied by SDCWA
1999	150,173	-	-	454,436	604,609	454,436
2012	111,914	-	156,604	282,948	551,466	439,552
2013	104,081	-	183,500	296,472	584,052	479,971
2014	97,185	-	180,256	325,729	603,170	505,985
2015	53,668	-	180,123	305,039	538,830	485,162
2016	62,875	25,599	179,347	187,057	454,877	392,003
2017	74,910	34,421	178,278	189,919	477,528	402,618
2018	125,699	34,907	194,326	163,639	518,570	392,871
2019	98,526	40,036	192,241	132,831	463,634	365,108
2020	116,706	33,157	230,430	82,843	463,137	346,431
2021	138,171	47,530	274,702	42,322	502,725	364,554
	BREAKDOWN OF ALL SOURCES BY SHARE					
Fiscal Year	Local Supplies	Seawater Desalination	QSA	From MWD		
1999	24.8%	-	-	75.2%		
2012	20.3%	-	28.4%	51.3%		
2013	17.8%	-	31.4%	50.8%		
2014	16.1%	-	29.9%	54.0%		
2015	10.0%	-	33.4%	56.6%		
2016	13.8%	5.6%	39.4%	41.1%		
2017	15.7%	7.2%	37.3%	39.8%		
2018	24.2%	6.7%	37.5%	31.6%		
2019	21.3%	8.6%	41.5%	28.6%		
2020	25.2%	7.2%	49.8%	17.9%		
2021	27.5%	9.5%	54.6%	8.4%		
	BREAKDOWN OF SDCWA SUPPLY BY SOURCE					
Fiscal Year		Seawater Desalination	QSA	From MWD		
1999		-	-	100.0%		
2012		-	35.6%	64.4%		
2013		-	38.2%	61.8%		
2014		-	35.6%	64.4%		
2015		-	37.1%	62.9%		
2016		6.5%	45.8%	47.7%		
2017		8.5%	44.3%	47.2%		
2018		8.9%	49.5%	41.7%		
2019		11.0%	52.7%	36.4%		
2020		9.6%	66.5%	23.9%		
2021		13.0%	75.4%	11.6%		

First, the sharp increase in SDCWA's all-in rate began around 2010, but SDCWA did not start receiving Carlsbad water until 2016.

Second, since 2016 Carlsbad water has accounted for only a small fraction of the water delivered by SDCWA -- see Table 9.

Table 10 compares the unit cost (average cost) of the three sources of water used by SDCWA: QSA (E-water); desalinated water from the Carlsbad facility; and M-water from MWD.

TABLE 10 | SDCWA's Untreated Water Supply Cost

	WATER SOURCE	Supply Share	Unit Cost ($/AF)		
a	QSA (E-water)	75.4%	$1,049		
	Desal (Carlsbad)	13.0%	$2,725		
b	MWD (M-water)	11.6%	$1,075		
	WEIGHTED AVERAGE		$1,271		
a = Melded QSA ($515) + MWD Exchange rate ($534)					
b = Full service Tier 1 untrd ($777) + RTS ($161) + Capacity ($137)					

If SDCWA had not used any Carlsbad Desal water and, instead, delivered a 75-25 mix of E- and M-water in CY 2021, its water cost would have been $1,056/AF instead of $1,271/AF, a savings of $215/AF. However, Carlsbad Desal water is more reliable than E- or M-water because it is not derived from streamflow that is being affected by climate change. Moreover, the $215/AF cost differential between Carlsbad and E/M-water accounts for only part of the $399/AF differential between SDCWA's and MWD's rates for untreated water (Table 5). So, something else is at work. I believe that two other factors contributed to the rate differential: (1) SDCWA invested in some major water supply infrastructure just before and after 2010, a period when MWD happened not to be making any unusually large investments. (2) Between 2010 and now, SDCWA experienced twice as large a reduction in member agency demand as MWD and that would have caused the rate differential to widen, given that both agencies have very high fixed costs.

Q. Could the fact that SDCWA made some major infrastructure investments soon before and after 2010 help explain the widening of the gap between the all-in SDCWA rate and the all-in MWD rate starting around 2010?

A. Yes. In those years, SDCWA made some major investments in water supply infrastructure projects, including the following:[46]

Olivenhain Dam (2003)	$198M
Coachella Canal Lining (2006)	$129M
Twin Oaks Treatment Plant (2007)	$179M
All-American Canal Lining (2009)	$149M

[46] Amounts and dates taken from presentation to SDCWA Board, 6-9-2015.

San Vicente Pipeline (2011)	$300M
Lake Hodges Pumped Storage (2012)	$208M
San Vicente Dam Raise (2014)	$825M
Carlsbad Desal Facility (2015)	$1,000M

Figures 5A and 5B together chart SDCWA annual capital improvement program expenditures between FY1991 and FY 2021. Annual CAPEX expenditures from 2006 through 2010 reached levels above $250M, roughly double the amount in the years before or since then. These were substantial financial commitments for SDCWA.

To illustrate the scale of this financial commitment by SDCWA, it is useful to make the comparison with MWD's capital improvement expenditures (Figure 6). In the recent period, MWD had CIP expenditures exceeding $300M only in FY 2007-2008-2009, and its annual CIP expenditure in those peak years was about $500M, less than twice SDCWA's peak annual expenditure, while MWD delivers three to four times more water than SDCWA.

It is not that MWD has never undertaken capital investments on the scale experienced by SDCWA around 2010. MWD had made comparably scaled financial commitments at the time of the construction of the State Water Project.

CIP investments tends to occur in cycles, and the period around 2010 found SDCWA and MWD at different phases of their investment cycles.

Figures 7A and 7B show that SDCWA took on significant debt to finance these investments, but this large debt burden will be extinguished by 2039.

FIGURE 5a | SDCWA CIP Spending FY 1991-2014[47]

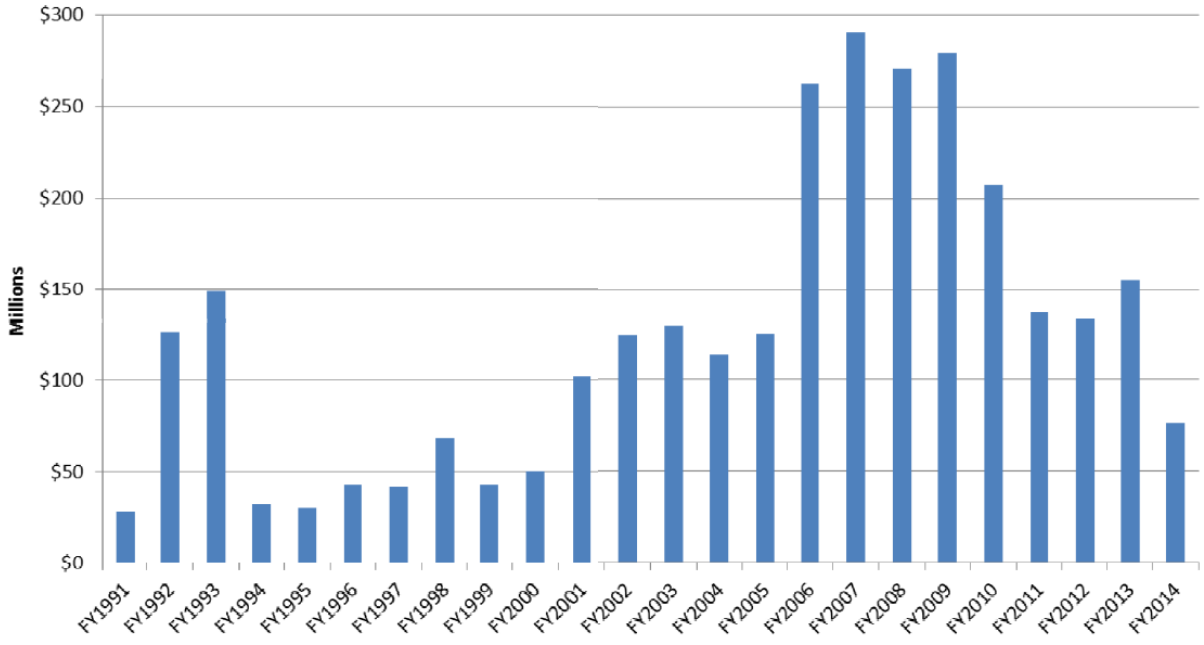
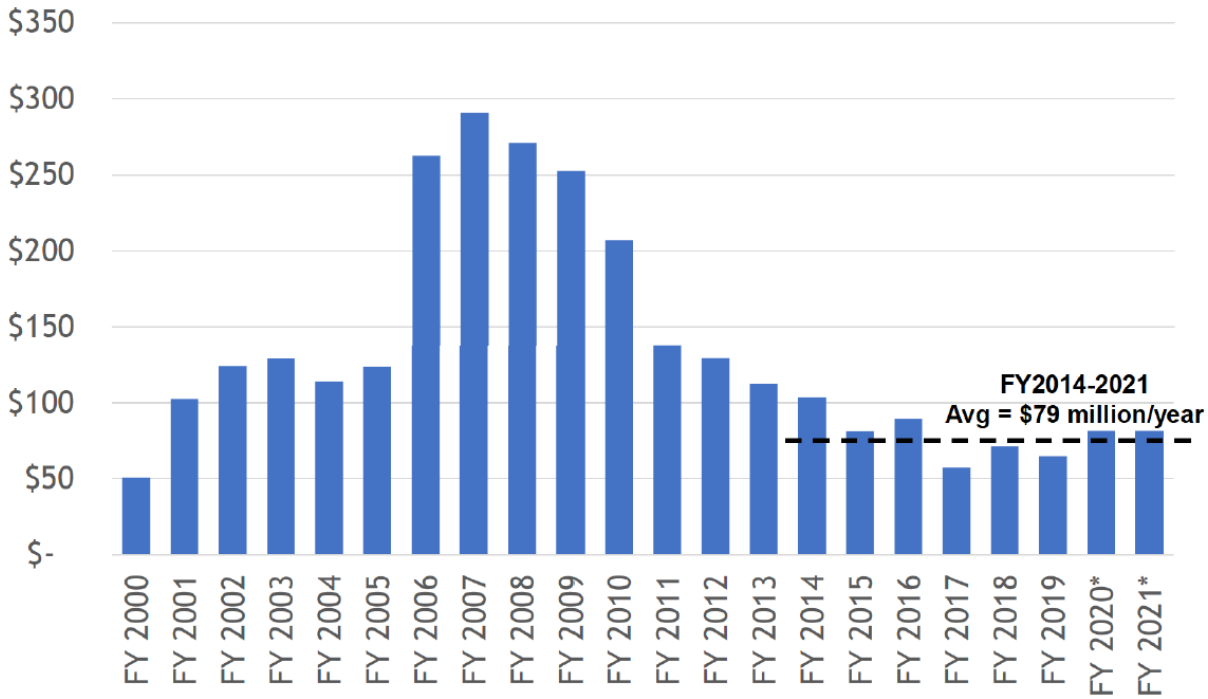


FIGURE 5b | SDCWA CIP Spending FY 2000-2021[48]



[47] Presentation to SDCWA Board, 6-28-2012.
[48] Presentation to SDCWA Board, 1-28-2021.

FIGURE 6 | MWD CIP Expenditures FY 1996-FY 2025[49]

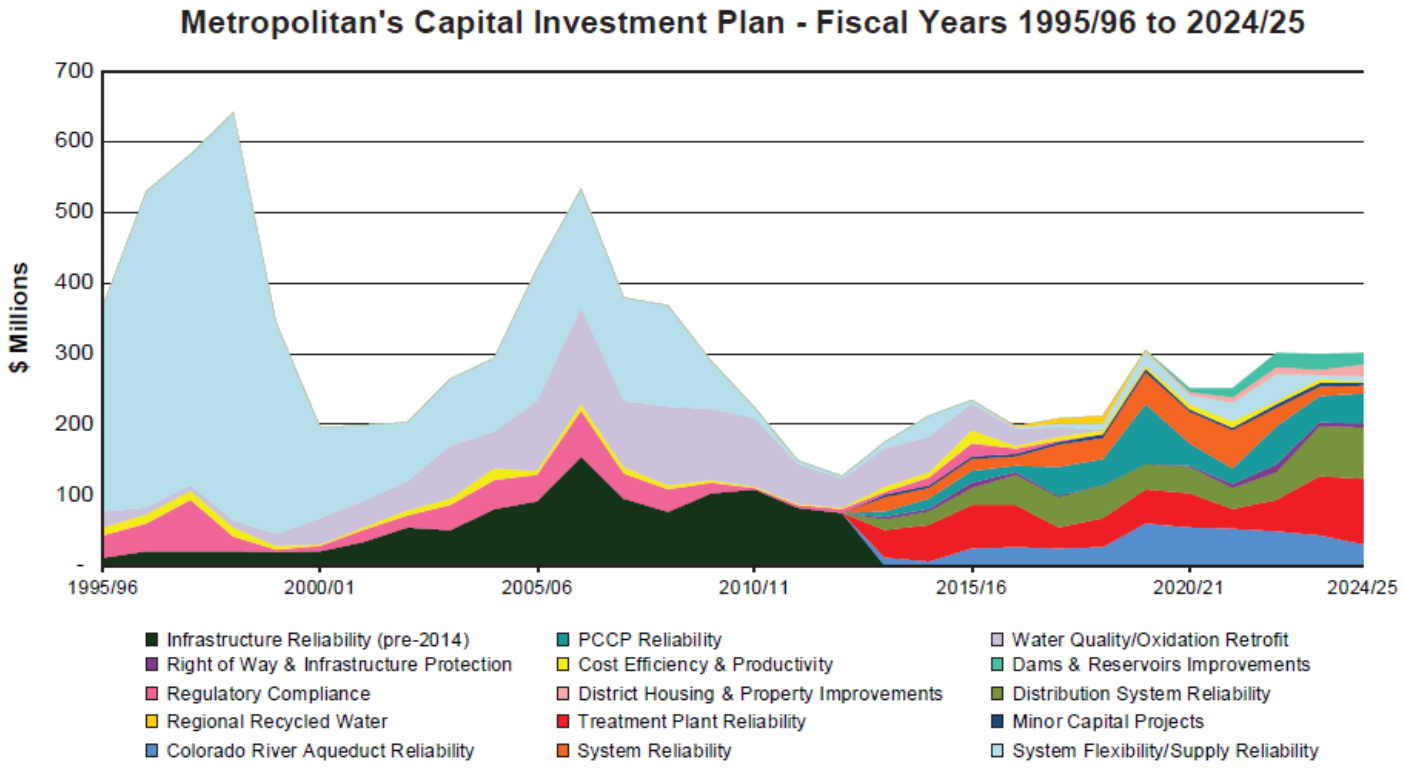
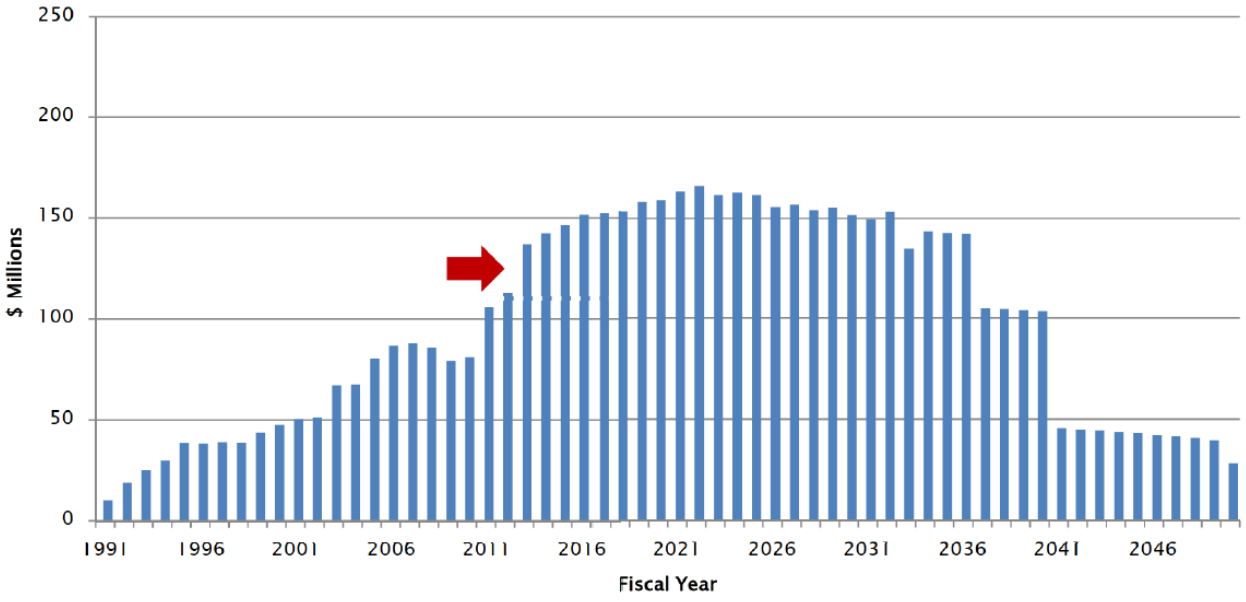
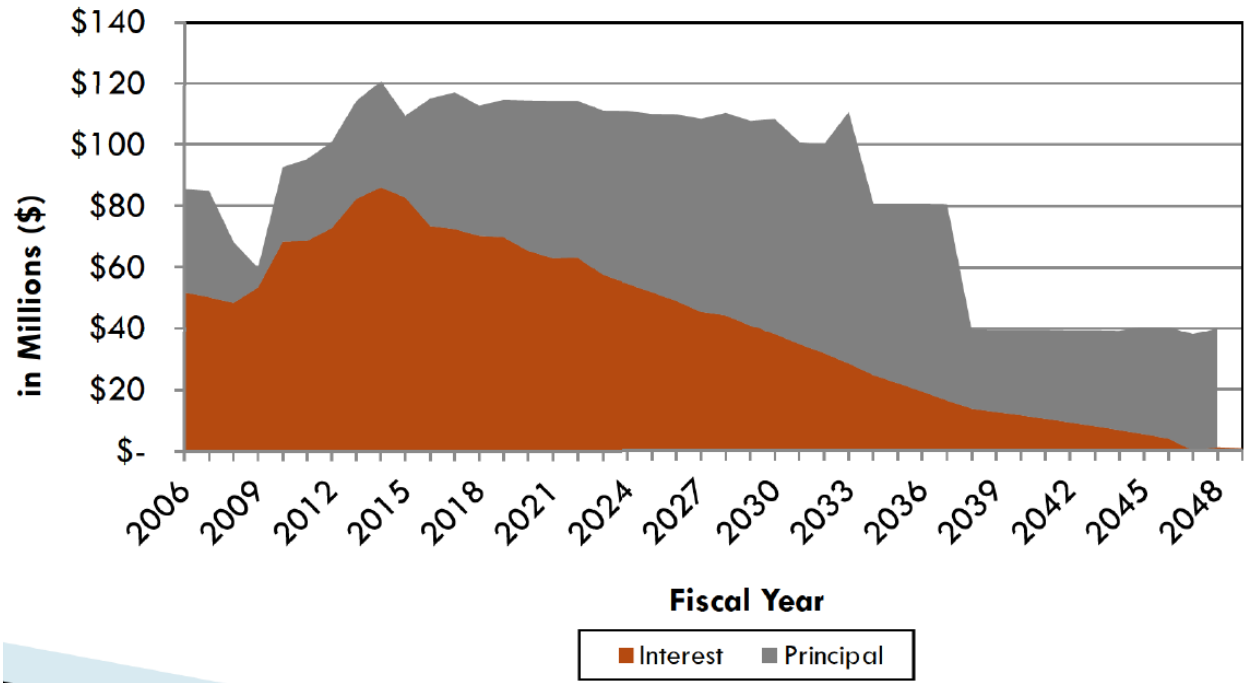


FIGURE 7a | Paying For Major Infrastructure: Debt Serviced Through 2050[50]



[49] Figure 5-2 in MWD 2020 Annual Report.
[50] Presentation to SDCWA Board, 6-28-2012.

FIGURE 7b | SDCWA Debt Service[51]



Q. Was SDCWA hit harder than MWD by a reduction in the revenue-earning supply of water to member agencies?

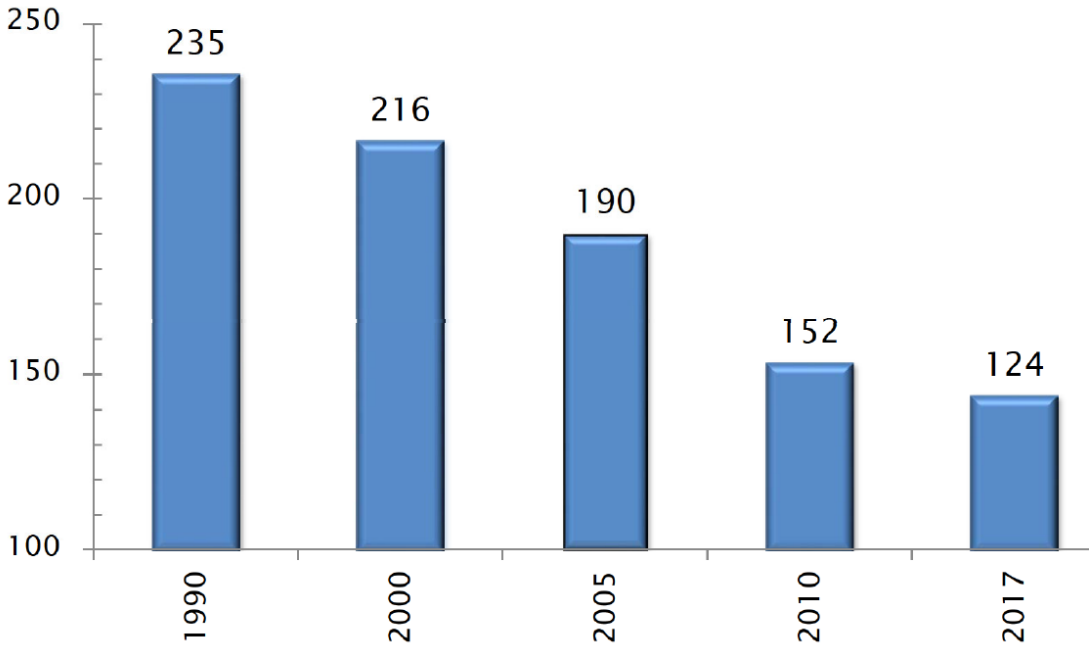
A. Yes.

Figure 3 above depicts something else that changed for RMWD besides the price of SDCWA water. The amount of water purchased by RMWD from SDCWA fell dramatically from around 30,0000 AF through about 2006 to around 14,297 AF in 2020. The reduction in water demand may have been especially pronounced in RMWD because of the large component of agricultural water use, which is likely to be more price-sensitive than urban use generally. However, a striking reduction in water demanded by member agencies was occurring at this time throughout SDCWA's service area. The phenomenon was not limited to RMWD. It was driven by two things: a very substantial reduction in per capita water use in SDCWA's service area combined with increased development of member agency local supplies.

Figure 8 documents the very substantial decline in per capita water use in SDCWA's service area. Per capita use declined by 19% between 1990 and 2005 and by even more between 2005 and 2017 -- 35%.

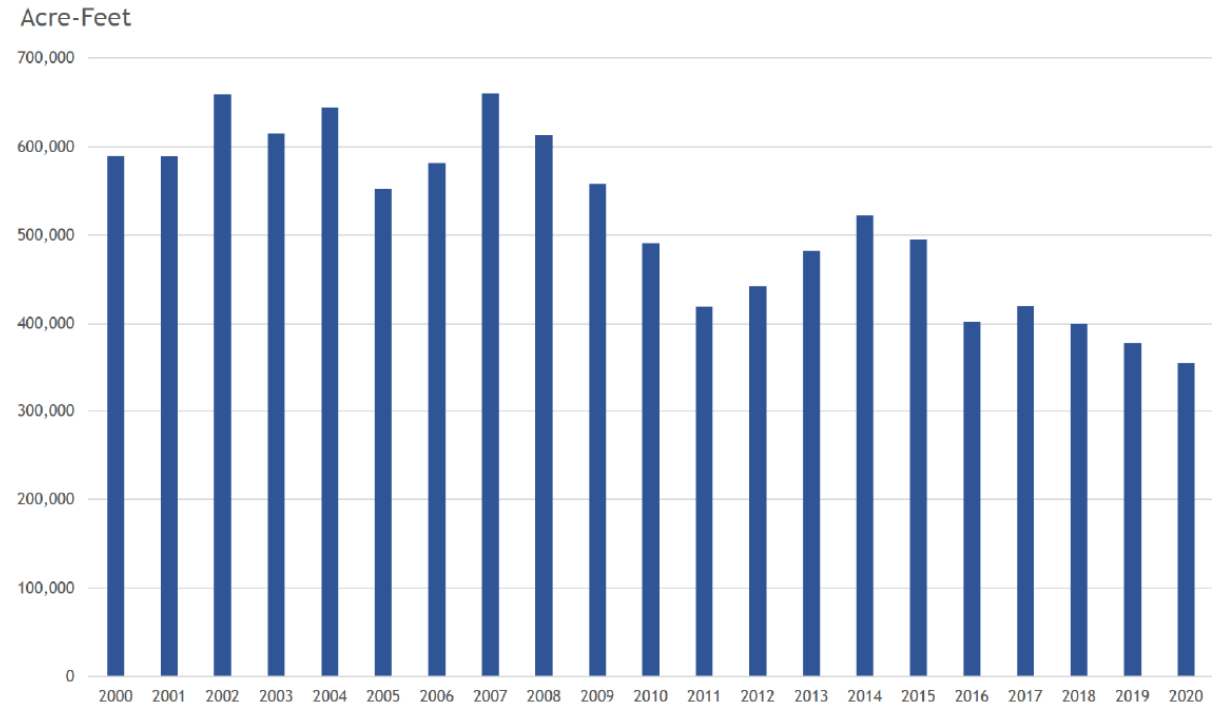
[51] Presentation to SDCWA Board, 1-26-2017.

FIGURE 8 | Decline in Per Capita Potable Water Use in SDCWA Service Area[52]



The reduction in water sales by SDCWA to its member agencies was even larger than the reduction in per capita water use, as shown in Figure 9.

FIGURE 9 | SDCWA Supply to Member Agencies[53]



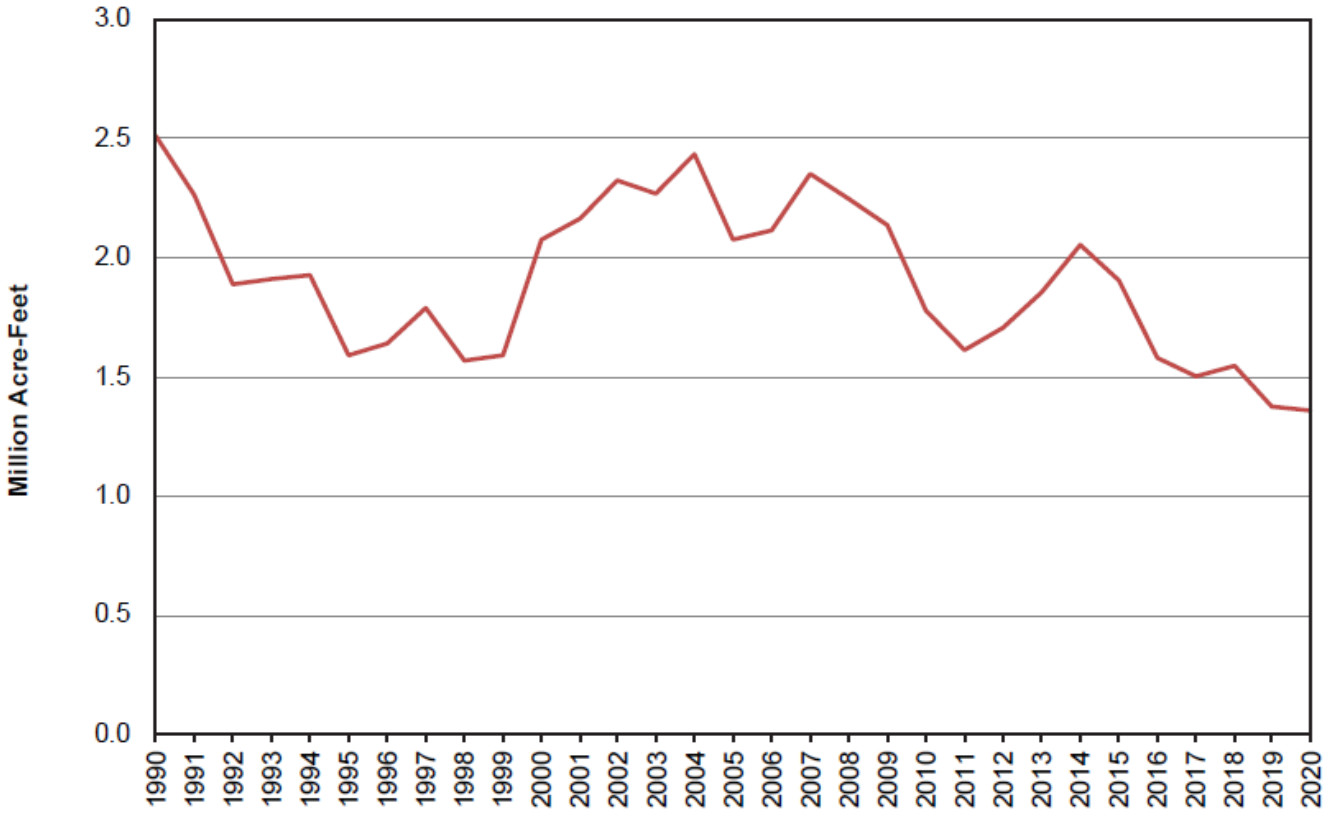
[52] Presentation by Tim Bombadier to SDCWA Board, February 22, 2018.
[53] Presentation to SDCWA Board of Directors, January 28, 2021.

Sales to member agencies declined from over 600,000 AF in 2008 to about 365,000 AF in 2020, a reduction of almost 40%.

The fact that sales to member agencies declined by more than the reduction in per capita use signifies the effect of increased development of member agency local supply.

MWD also experienced a reduction in the volume of water purchased from it by its member agencies. MWD's sales to member agencies are shown in Figure 11. Note that MWD includes in this data the QSA water that it supplies to SDCWA under the Exchange Agreement. However, as noted above, it earns significant revenue from this water. Between 2008 and 2020, there was a 20% reduction in MWD's sales of revenue-earning water. This is about half the magnitude of the reduction in SDCWA's sales of revenue-earning water shown in Figure 10.

FIGURE 10 | MWD Supply to Member Agencies (Fiscal Years)[54]



[54] Figure 3-8 in MWD 2020 Annual Report.

Q. Could SDCWA's larger reduction in the supply of revenue-earning water help explain the widening of the gap between the all-in SDCWA rate and the all-in MWD rate starting around 2010?

A. Yes, assuming that, for both SDCWA and MWD, a large share of operating costs is fixed costs.

Q. Is it the case that, for both SDCWA and MWD, a large share of their operating costs is fixed costs?

A. Yes. Table 11 presents a breakdown of SDCWA operating expenditures in FY 2020. Table 12 similarly presents a breakdown of MWD's operating expenditures for FY 2021.

TABLE 11 | SDCWA Expenditures FY 2020

		ITEM	$ Thousands	Percent	Cost Type
		Water Supply			
a		Colorado River Water			
b		MWD Wheeling Cost	$119,184	15.1%	Fixed
c		All other Colorado River water costs	$124,414	15.8%	Fixed
d		Water Purchased from MWD	$82,967	**10.5%**	**Variable**
e		Carlsbad Desal Plant	$97,934	12.4%	Fixed
f		All Other Water Supply Expenses	$61,639	7.8%	Fixed
g	= a + ... + f	Subtotal - water supply	$486,138	61.7%	
h		Operating Departments*	$54,252	6.9%	Fixed
i	= g + h	**COST OF WATER OPERATIONS**	$540,390	68.5%	
j		Debt Service*	$148,716	18.9%	Fixed
k		CIP Expenditures*	$81,111	10.3%	Fixed
l		Equipment Replacements*	$3,012	0.4%	Fixed
m		Grant Expenditures*	$13,162	1.7%	Fixed
n		Other Expenditures*	$1,944	0.2%	Fixed
	= i + ... + n	**TOTAL**	**$788,335**	**100.0%**	
	* NOTE: "Variable" means that this revenue varies directly with the quantity of water delivered that year by SDCWA to its member agencies. "Fixed" means that the revenue does not vary directly with the quantity of water delivered that year.				
	* FY20 obtained by halving FY20 & 21 amount in Table 1.				
	SOURCE: SDCWA Adopted Budget FY 2021 & 2022, Table 1, p.26.				

For SDCWA, I estimate that only about 15% (= row d/row i) of its cost of operation in FY 2020 was variable cost, namely the portion associated with its purchase of M-water.[55] Back in 2010, however, M-water constituted a larger component of SDCWA's supply than now. Instead of being about 24% of SDCWA's supply in 2020 (Table 9), M-water was about two-thirds of SDCWA's supply in 2010, QSA water being the rest. As a rough estimate, I assume that the purchase of M-water – SDCWA's only variable cost component – might have accounted for about 30% of SDCWA's cost of operation in 2010.

For MWD, I estimate that only about 12% (= rows a + c) of its cost of operation in FY 2021 is variable cost. I assume that the proportion was roughly the same back in 2010.

TABLE 12 | MWD Planned Expenditures FY 2021

					Cost
	ITEM	$ Thousands	Percent		Type
	State Water Project				
a	Variable Transportation & OAC*	$166,984	9.2%		Variable
b	All other SWP costs	$473,784	26.0%		Fixed
c	Colorado River Power Costs	$52,237	2.9%		Variable
d	Supply Programs	$68,683	3.8%		Fixed
e	Demand Management	$48,532	2.7%		Fixed
f	Operating Departments*	$529,254	29.1%		Fixed
g	Recycled Water Program Planning Costs	$15,000	0.8%		Fixed
h	Other Operating costs	$14,878	0.8%		Fixed
i	Subtotal - cost of water operations	$1,369,352	75.2%		
j	Capital Financing	$408,690	22.5%		Fixed
k	Increase/(Decrease) in Required Reserves	$42,400	2.3%		Fixed
l = i + j + k	TOTAL	$1,820,442	100.0%		
NOTE: "Variable" means that this expenditure varies directly with the quantity of water delivered that year by MWD its member agencies. "Fixed" means that the expenditure does not vary directly with the quantity of water delivered that year.					
* Estimate					

[55] The cost associated with the MWD Exchange Agreement would become a variable cost if SDCWA decided to take less than its committed quantity of IID Transfer water or canal lining water, but I see that as highly unlikely at present.

Q. How could SDCWA's larger reduction in the supply of revenue-earning water help explain the widening of the gap between the all-in SDCWA rate and the all-in MWD rate starting around 2010?

In the case of SDCWA in 2010, under my assumptions 70% of its total operating cost was fixed cost and would not change if it sold less water; 30% of its total operating cost was variable costs and this *would* fall if it sold less water. If it sold 40% less water, its total variable cost would go down by 40%. Its total operating cost – fixed plus variable -- would go down by only 12%: 70% of that cost would not change, while the other 30% would fall by 40%.

Its total operating cost would fall by 12%, but this cost would now have to be raised from the sale of 40% less water. SDCWA would be financing 88% of the previous cost while selling only 60% of the previous quantity of water. This would raise the unit cost per acre-foot sold by 47%.

Turning to MWD in 2010, under my assumptions 88% of its total operating cost was fixed costs and would not change if it sold less water. 12% of its total operating cost was variable costs and this *would* fall if MWD sold less water. If it sold 20% less water, its total variable cost would go down by 20%. Its total operating cost – fixed plus variable -- would go down by only 2.4%: 88% of that cost would not change, while the other 12% would fall by 20%.

MWD's total operating cost would fall by 2.4%, but this cost would now have to be raised from the sale of 20% less water. MWD would be financing 97.6% of the previous cost while selling only 80% of the previous quantity of water. This would raise the unit cost per acre-foot sold by about 22%, or just under half SDCWA's increase in unit cost. Table 13 summarizes these calculations.

TABLE 13 | Impact of Sales Reduction on Unit Cost

SDCWA	MWD
Total cost drops by 12% (= 0.4*0.3)	Total cost drops by 2.4% (= 0.2*0.12)
AF sold drops by 40%	AF sold drops by 20%
Cost ($/AF) *rises* by 47% (= 0.88/0.6)	Cost ($/AF) *rises* by 22% (= 0.976/0.8)

Two conclusions result from this analysis:

1) When the cost of water supply contains a large, fixed cost component, a reduction in the quantity of water supplied raises the unit cost to provide water, and this puts upwards pressure on rates charged for the water.
2) Since SDCWA experienced about twice as large as a sales reduction starting in 2010 as that experienced by MWD, this would have caused the rate differential between SDCWA's water rate and MWD's water rate to widen after 2010.

Q. In summary, what caused the differential between SDCWA's all-in water rate and MWD's all-in water rate to widen starting around 2020?

A. Here are my conclusions:

1) Given the way that QSA water was priced under the Exchange Agreement with MWD, the importation of QSA water did not have a significant role in the widening of the rate differential that started around 2010.
2) Using water from the Carlsbad Desalination Facility contributes in some degree to the rate differential but only since 2016: it was not a factor in 2010 -2015.
3) SDCWA's investment in some major water supply infrastructure projects just before and after 2010, a period when MWD happened generally not to be making major infrastructure investments, caused the rate differential to widen starting around 2010.
4) The fact that SDCWA experienced a 40% reduction in member agencies' demand for its water between 2010 and now, while MWD experienced only a 20% reduction, also would have caused the rate differential to widen.

Q. Was the reduction in member agency demand for SDCWA water starting around 2010 caused by the increase in SDCWA's all-in water rate?

A. On the whole, I believe the answer is no.

I believe the reduction in member agency demand starting around 2010 was driven by two longer-run trends that were set in motion before the differential in SDCWA and MWD all-in rates started to widen in 2010. Those trends were

1) Increased conservation which accelerated following the experience of the 2007-2009 drought in California and motivated Governor Schwarzenegger's 2009 initiative requiring that urban water demand be reduced by 20% by the year 2020.
2) increased development of local supplies, including expanded use of treated groundwater and treated wastewater.

Higher water rates at the retail level will have complemented these trends,[56] but I do not believe that higher retail water rates were generally the prime mover.

[56] There is some evidence that urban water agencies with increasing block rates that sharpened those rate structures during the 2014-2016 drought had more success in meeting Governor Brown's conservation mandate than other urban water agencies.

Q. Did the increase in SDCWA's water rates cause agricultural water use to decline in SDCWA's service area?

A. Table 14 presents data on the trends in total water use and agricultural water use within SDWCA's service area and within RMWD, using data from their respective Urban Water Management Reports.

In both cases, there was a substantial drop in both total water use and agricultural water use between 2005 and 2010, and between 2015 and 2020. By comparison, the changes in water use between 2010 and 2015 were smaller. The drop in water use between 2005 and 2010 came about in the aftermath of the 2007-2009 drought; the drop between 2015 and 2020 was in the aftermath of the 2014-2016 drought.

It looks as though the drought experiences may have had more impact on water use than the increase in SDCWA water rates following 2010.

TABLE 14 | Trends in Water Use, SDCWA and RMWD

	SDCWA*			RMWD**	
YEAR	AGRICULTURAL USE (AF)	TOTAL USE (AF)		AGRICULTURAL USE (AF)	TOTAL USE (AF)
2005	83,480	642,152		19,298	24,154
2010	43,515	566,443		11,854	18,158
2015	41,055	539,361		12,312	20,062
2020	37,100	463,128		8,876	14,297
* Fiscal year					
** Calendar year					

Q. Will the differential between SDCWA water rates and MWD water rates stay this wide in future, or widen, or become smaller?

A. I don't know.

The recent trend has been for the average cost of M-water to SDCWA to grow faster than the that of QSA water. That would tend to narrow the differential between SDCWA's all-in rate and MWD's all-in rate.

Q. Are the rates that SDCWA has charged its member agencies unfair?

A. I will note two facts.

1) So far, I have not been presented with any evidence that would support a claim of unfairness by SDCWA.

2) Whether or not one agrees with this, it is worth quoting what the California Court of Appeal has stated: ”Rates established by the lawful rate-fixing body [of a water agency] are presumed reasonable, fair and lawful.”

Q. Has FPUD and/or RMWD paid an unfairly high share of SDCWA’s fixed charges?

A. No.

The report by London Moeder Advisors, *Rainbow MWD and Fallbrook PUD Cost-Benefit Analysis of SDCWA Membership* dated 9-15-2020 asserts that, in the years from 2009 to 2019, FPUD and RMNWD paid an excessively large share of the fixed charges collected by SDCWA and, over that period, subsidized the other member agencies by $49.5 M. It also asserts that, over this period, FPUD and RMWD achieved a benefit-to-cost ration of 0.12 from the payment of fixed charges, while the remaining SDCWA member agencies benefited from this imbalance, representing a benefit-to-cost ratio of 1.04.

I have analyzed those assertions – see Appendix A – and find that they lack foundation.

2.3 THE FINANCIAL IMPACT OF DETACHMENT

This section analyzes both the financial impact on the other member agencies of SDCWA if FPUD and/or RMWD detach from SDCWA and also the financial impact on FPUD and RMWD.

I start with the financial impact on SDCWA member agencies. Then I discuss the financial impact on FPUD and RMWD.

The detachment of a member agency reduces the revenues received by SDCWA. It also to some degree reduces the expenses incurred by SDCWA in operating in its water supply and distribution system. The key question is the *net* impact: will SDCWA's revenues be reduced by as much or more than its operating expenses?

Q. How large are FPUD and RMWD in relation to the other SDCWA member agencies?

A. FPUD and RMWD accounted for 1.7%[57] of the population served by SDCWA in FY 2020 and 8.1%[58] of the acreage in SDCWA's service area.[59] Tables 15 shows the breakdown of SDCWA deliveries over the period FY 2017 – FY 2021 to FPUD and RMWD versus other member agencies.[60] Over this period, FPUD accounted for an average of 2.3% of all SDCWA deliveries to member agencies, and RMWD accounted for 4.4%. which represents a higher rate of usage per capita, but not per acre, than the average across all member agencies.

Going forward, FPUD's share of water delivered to SDCWA member agencies will fall as the Santa Margarita Conjunctive-Use Project comes on-line.

About 42% of the water received by FPUD and RMWD has come under the SDCWA's Permanent Special Agricultural Water Rate (PSAWR) program for agricultural water users in the SDCWA service area.

TABLE 15 | SDCWA Deliveries to FPUD & RMWD FY 2017-2021

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	5 - YEAR AVERAGE
ALL MEMBERS (AF)	405,400	392,871	365,083	346,431	376,465	377,250
FPUD (AF)	9,101	10,007	7,766	7,893	8,822	8,717
RMWD (AF)	16,983	19,240	14,831	14,386	17,082	16,504
FPUD (%)	2.2%	2.5%	2.1%	2.3%	2.3%	2.3%
RMWD (%)	4.2%	4.9%	4.1%	4.2%	4.5%	4.4%

Source: SDCWA Annual Reports

(TABLE CONTINUED…)

[57] = 54,944/323,060.6.
[58] = 75,658/934,777.5.
[59] These and the following statistics are taken from the SDCWA Annual Report FY 2020, consulted online at sdcwa.org/annualreport/2020/diversification-and-operation/water-sources-and-uses.php on 6/11/2021.
[60] Data supplied to me by SDCWA in an email on 10-7-2021.

Acre Feet Deliveries - Includes certified and non-certified ag water

	FY'17	FY '18	FY '19	FY'20	FY'21
Carlsbad	12,149	13,780	12,095	11,719	12,501
Del Mar	939	1,078	961	954	1,046
Escondido	14,886	9,526	12,435	7,416	12,286
Fallbrook	**9,101**	**10,007**	**7,766**	**7,893**	**8,822**
Helix	24,960	25,713	24,480	21,035	24,756
Lakeside	2,604	2,839	2,643	2,879	3,223
National City	2,978	246	495	526.9	296
Oceanside	21,249	22,510	19,902	19,844	22,240
Olivenhain	17,475	19,432	16,817	17,189	19,548
Otay	27,002	29,638	27,385	28,309	30,126
Padre Dam	9,346	10,321	9,300	9,585	10,244
Camp Pendleton	134	188	201	166	163
Poway	8,635	10,231	8,535	8,837	9,752
Rainbow	**16,983**	**19,240**	**14,831**	**14,386**	**17,082**
Ramona	4,406	4,872	4,291	4,075	4,510
Rincon del Diablo	4,981	5,468	4,738	4,839	5,271
San Diego	153,496	152,193	143,551	140,505	137,049
San Dieguito	3,984	2,660	3,382	3,127	3,820
Santa Fe	7,450	5,819	6,435	5,642	6,911
South Bay	10,691	1,709	3,531	1,929	2,897
Vallecitos	10,910	12,634	10,724	10,877	12,053
Valley Center	20,220	22,526	16,500	16,684	18,846
Vista	16,332	4,156	9,340	3,361	7,401
Yuima	4,494	6,088	4,747	4,653	5,624
Total	**405,400**	**392,871**	**365,083**	**346,431**	**376,465**

Q. If FPUD and/or RMWD leave SDCWA's service area, which of SDCWA's revenue sources shown in Table 3 would be affected?

A. If FPUD and/or RMWD leave SDCWA's service area, SDCWA's revenue from every row in Table 3 would be affected. The revenue items fall into four groups:

A. Volumetric charges on deliveries to member agencies
B. Fixed service charges applied to member agencies
C. Annual charges borne by properties in the SDCWA service area
D. Charges paid by new meters for properties within the SDCWA service area

All of these revenue items will be reduced if FPUD and RMWD leave SDCWA's service.

So far, at least four estimates have been presented of the financial impact on SDCWA and its remaining member agencies if FPUD and RMWD depart:

(i) SDCWA presented its estimate of the financial impact on pages 54-62 of its Combined Response dated 9-18-2020. This contained estimates of the financial impact both in a single year and in a ten-year sequence. SDCWA staff provided backup for that analysis in a zoom call on 6-23-2021 and then in a spreadsheet and memo emailed to me on 7-2-2021.
(ii) I provided an estimate of the financial impact at the Advisory Committee meeting on June 14, and I corrected an error in my presentation and my report on June 18.
(iii) My October Draft Report contains an analysis of the financial impact combining what I had presented in June and what SDCWA had presented in their 2020 Combined Response.
(iv) In comments on my Draft Report date 10-25-2021, FPUD and RMWD submitted their own analysis of the financial impact, replicating the decadal analysis submitted by SDCQA in 2020 but with differences.

Below, I present a new analysis which replaces the one contained in my October Draft Report.

I will not present a multi-year analysis. I feel that there is now too much uncertainty about future water supply, future water demand, and future rate schedules to justify making a projection of the annual financial impact over the coming decade. Therefore, I restrict my analysis to an estimate of the financial impact in CY 2022.

A key variable is how much water FPUD and RMWD would purchase from SDCWA as their wholesale supplier if they stayed within the SDCWA service area.

I based my June analysis on the FY 2020 delivery levels for FPUD and RMWD as reported in SDCWA's *2020 Comprehensive Annual Financial Report*, namely 7,822 AF for FPUD and 14,479 AF for RMWD.[61] Since then, FPUD's Santa Margarita Conjunctive-Use Project has come online, replacing up to about 4,000 AF formerly received by FPUD from SDCWA. In recognition of this, SDCWA had projected FPUD's FY 2022 water use as 4,130 AF. FPUD's projection, consistent with the 2020 Urban Water Management Plan, is 4,045 AF. I will use 4,100 AF as a rough estimate of FPUD water use in CY 2022. SDCWA had projected RMWD's FY 2022 water use as 13,924 AF; RMWD projects it as 13,750. I will use 14,000 AF as a rough estimate of RMWD water use in 2022.[62] In line with FPUD and RMWD estimates, I assume that 1,600 AF of the FPUD's 4,100AF, and 6,000 AF of RMWD's 14,000 AF, are received under SDCWA's PSAWR rate. To assess the loss of revenue, I use SDCWA's CY 2022 water rates.

[61] Those are different from the FY 2020 delivery levels listed in Table 14, which come from an email from SDCWA dated 10-4-2021.
[62] FPUD and RMWD also propose lower bound estimates of their 2022 water use that are 15% lower, on the grounds that Urban Water Management generally overstate future water demand by about 15%. Since the 2020 Urban Water Management Plans were delivered in June 2021, a 15% overstatement for the year beginning six months later seems too high. I will stick with the single projection given above.

Table 16 presents my estimate of the annual revenue loss to SCDCWA in CY 2022 if FPUD and/or RMWD detach from the SDCWA service area.

There appears to be some question as to whether SDCWA would continue to receive all, some, or none of the property tax revenue if FPUD and/or RMWD detach. If SDCWA would continue to receive all the property tax revenue, the overall one-year revenue loss for SDCWA amounts to $32.9 M; if it would receive none of the property tax revenue, the one-year revenue loss is $33.3 M. To put this in context, Table 17 shows the percentage breakdown of SDCWA's overall revenue in FY 2020. 88.1% of SDCWA revenue came from water sales (row f). If FPUD and RMWD both detach, that revenue would be reduced by $31.3 M (row m in Table 16). The remaining revenue loss hits Other Revenue items in Table 16.

TABLE 16 | SDCWA Revenue Reduction CY 2022

				FPUD		RMWD		FPUD + RMWD
			Unit	Quantity	Revenue	Quantity	Revenue	Revenue
		Item	Rate	Change (AF)	Reduction ($)	Change (AF)	Reduction ($)	Reduction ($)
		M&I Water supply						
a		Water Supply	$1,009	2,500	$2,522,500	8,000	$8,072,000	$10,594,500
b		Transportation*	$173	0	$0	2,400	$415,200	$415,200
c		Treatment	$310	2,500	$775,000	8,000	$2,480,000	$3,255,000
		Ag Water supply						
d		Water Supply	$799	1,600	$1,278,400	6,000	$4,794,000	$6,072,400
e		Transportation	$173	1,600	$276,800	6,000	$1,038,000	$1,314,800
f		Treatment	$310	1,600	$496,000	6,000	$1,860,000	$2,356,000
g	= a + .. + f	**Subtotal - volumetric charges**			$5,348,700		$18,659,200	$24,007,900
h		**Customer Service Charge**			$561,780		$1,057,632	$1,619,412
i		**Storage Charge**			$1,052,568		$1,560,780	$2,613,348
j		**Supply Reliability Charge**			$661,248		$1,000,512	$1,661,760
k		**Infrastructure Access**			$604,812		$756,288	$1,361,100
l	= h + .. + k	**Subtotal - charges**			$2,880,408		$4,375,212	$7,255,620
m	= g + l	**SUBTOTAL - CHARGES PAID BY MEMBER AGENCY**			$8,229,108		$23,034,412	$31,263,520
n		**"All-in rate" ($/AF)**		4,100	$2,007	14,000	$1,645	
		OTHER REVENUE						
o		**Property Taxes****			$160,000		$190,000	$350,000
p		**Availability Standby Charge***			$257,637		$463,673	$721,310
q		**Capacity Charges***			$103,396		$831,042	$934,438
r	= m + p + q	**TOTAL WITHOUT PROPERTY TAX**			$8,590,141		$24,329,127	$32,919,268
	= r + o	**TOTAL WITH PROPERTY TAX**			$8,750,141		$24,519,127	$33,269,268
	*Taken from FPUD/RMWD spreadsheet submitted 10-25-2021.							
	** Rounded up from values used by SDCWA Combined Response 9-18-2020							

TABLE 17 | SDCWA Breakdown of Revenues FY 2020

		ITEM	$ Thousands	Percent	Revenue Type*
		Water Related Revenue			
a		Water Sales	$420,165	63.3%	**Variable**
b		Infrastructure Access Charge	$36,942	5.6%	Fixed
c		Customer Service Charge	$25,600	3.9%	Fixed
d		Storage Charge	$65,000	9.8%	Fixed
e		Supply Reliability Charge	$37,430	5.6%	Fixed
f	= a + .. + e	SUBTOTAL Operating revenue	$585,137	88.1%	
		Other Revenue			
g		Property Tax	$15,526	2.3%	Fixed
h		Standby Availability Charge	$11,164	1.7%	Fixed
i		Capacity Charges	$17,983	2.7%	Fixed
j	= g + h + i	SUBTOTAL Property related	$44,673	6.7%	Fixed
		Other Income			
k		CIP	$2,726	0.4%	Fixed
l		Hydroelectric Revenue	$3,192	0.5%	Fixed
m		Investment Income	$6,789	1.0%	Fixed
n		Other Revenue	$21,542	3.2%	Fixed
o	= k + ..+ n	SUBTOTAL Other Income	$34,248	5.2%	Fixed
	= f + J + o	**TOTAL REVENUE**	**$664,058**	**100.0%**	

* NOTE: "Variable" means that this revenue varies directly with the quantity of water delivered that year by SDCWA to its member agencies. "Fixed" means that the revenue does not vary directly with the quantity of water delivered that year.

As for the reduction in SCDCWA's expenditure if FPUD and/or RMWD detach from SDCWA's service area, Table 11 above showed how SDCWA's expenditures broke down in FY 2020. Because the short-run marginal cost of M-water to SDCWA is larger than that of E-water, if SDCWA faced a reduction in its deliveries to member agencies, it generally would be better financially for SDCWA to take less M-water rather than less E-water.[63] Therefore, for present purposes, M-water is the only variable input for SDCWA, and the cost of M-water is the only variable cost in SDCWA's budget; all the other cost items represent fixed costs. As Table 11 showed, only about 15% of SDCWA's cost of water operations is a variable cost (row d/row f), while 85% represents a fixed cost.

Table 18 presents my estimate of the reduction in SDCWA's annual expenditure in CY 2022 if FPUD or RMWD or both detach from the SDCWA service area. I assume that detachment leads

[63] There are some logistical constraints on SDCWA's logistical ability to do this: it receives E-water in equal monthly amounts, which may limit the extent to which it can reduce M-water in peak delivery months.

SDCWA to purchase less treated M-water from MWD and I apply MWD's CY 2022 full-service Tier 1 treated rate. In the first year of detachment, that will have no impact on the amount of the Readiness to Serve charge paid by SDCWA to MWD (see short-run expenditure reduction), but over ten years it will build up to the amount shown as the long-run expenditure reduction. To account for the future long-run RTS impact, I apply MWD's CY 2022 RTS charge calculated as a per-acre-foot charge based on system-wide usage.

I do not know whether detachment would affect SDCWA's maximum daily delivery from MWD. It would have no effect in the first year (CY 2022) but if It did reduce maximum daily deliveries then, after three years, this would lower the Capacity charge paid by SDCWA to MWD. In the absence of other information, however, I assume no impact on the Capacity charge paid by SDCWA to MWD.

The short-run reduction in SDCWA annual expenditure is $20.7M. In the long run, when the full impact on the RTS charge paid by SDCWA takes effect, the expenditure reduction is $22.3M.

TABLE 18 | SDCWA Expenditures Reduction CY 2022

		FPUD		RMWD		FPUD + RMWD
	Unit	Quantity	Expenditure	Quantity	Expenditure	Expenditure
Item	Rate	Change (AF)	Reduction ($)	Change (AF)	Reduction ($)	Reduction ($)
M-water, full service, Tier 1 trd	$1,143	4,100	$4,686,300	14,000	$16,002,000	
MWD RTS charge - short run	0	4,100	$0	14,000	$0	
MWD RTS charge - long run	$88	4,100	$360,800	14,000	$1,232,000	
TOTAL REDUCTION - short-run	$1,143	4,100	**$4,686,300**	14,000	**$16,002,000**	**$20,688,300**
TOTAL REDUCTION - long-run	$1,231	4,100	**$5,047,100**	14,000	**$17,234,000**	**$22,281,100**

Table 19 presents my resulting estimate of the reduction in SDCWA net revenue in CY 2022 if FPUD and/or RMWD detach from SDCWA's service area. The short-run (immediate) reduction in annual net revenue is $12.2M or $12.6M, depending on whether SDCWA retains or loses the property tax revenue from FPUD and RMWD. The long-run reduction in annual net revenue after a decade is $10.6M or $11M.

TABLE 19 | SDCWA Net Revenue Impact CY 2022

Item	FPUD	RMWD	FPUD + RMWD
REDUCTION IN REVENUE			
Without property tax loss	$8,590,141	$24,329,127	$32,919,268
With property tax loss	$8,750,141	$24,519,127	$33,269,268
REDUCTION IN EXPENDITURE			
Short-run	$4,686,300	$16,002,000	$20,688,300
Long-run	$5,047,100	$17,234,000	$22,281,100
CHANGE IN NET REVENUE			
SHORT-RUN			
Without property tax loss	$3,903,841	$8,327,127	$12,230,968
With property tax loss	$4,063,841	$8,517,127	$12,580,968
LONG-RUN			
Without property tax loss	$3,543,041	$7,095,127	$10,638,168
With property tax loss	$3,703,041	$7,285,127	$10,988,168

This differs from my previous estimate in my Draft Report and from the estimates submitted by SDCWA and by FPUD/RMWD. The year is different, the assumed annual amounts of water are different, the water rates are different and some of the other cost items accounted for are different.

Two important differences are the following:

1) In its analysis of the financial impact of a detachment, SDCWA included an accounting for the use of reserves. In my Draft Report, I deferred to SDCWA's assessment of this item, which I understand was based on the financial model they use to manage their various reserve accounts. I exclude that item here, for two reasons. I myself am not an expert in debt finance and municipal accounting, so that I cannot form my own assessment of SDCWA's reserve accounts and their funding.[64] But, as I now understand SDCWA's rationale for including the item, I do not believe it is appropriate.

   As I understand it, SDCWA was making the following argument. It argued that its water rates in CY 2022 were unduly low because it was drawing down reserves on a temporary basis to cover certain cost items that would normally be covered through the rate schedule. Had rates been set in the usual manner, the rates would have been higher,

[64] In my previous experience as an expert witness in water rate litigation, a colleague with expertise in municipal bond finance was the one who testified on the funding of reserve accounts.

making the amount of revenue foregone by SDCWA if the delivery of water to FPUD and RMWD were discontinued larger by approximately $3.6 M.[65]

I believe that it is more appropriate for me to make my assessment based on SDCWA's water rates as they are, and not as they might have been.

However, I do acknowledge that the following is a valid assertion. If the CY 22022 water rates that I use in Table 16 to calculate the reduction in SDCWA net revenue are unduly low because of a temporary and unusual reliance on funds obtained by drawing down reserves, my estimate will understate the revenue lost due to FPUD/RMWD detachment when SDCWA cannot draw down reserves in the same manner.

2) The FPUD/RMWD analysis reduced its estimate of the financial impact of detachment on SDCWA by the cost of the North County ESP Pumping Station that will not be needed in the event of detachment. The Pumping Station project is said to cost $35 million, and this is divided into 10 annual amounts of $3.5 million which are subtracted from FPUD/RMWD's estimate of the annual financial impact of detachment over the ten-year period FY 2022 – FY 2031. I do not agree with that adjustment.

   For the sake of argument, I assume that the North County ESP Pumping Station would indeed cost $35M. The adjustment proposed by FPUD/RMWD would have merit if (i) there had been a decision to go ahead and fund construction of the project and this was reflected in the current rates, and (ii) it was being cash funded out of those current rates. As I understand the situation, neither of those conditions holds. According to an email from SDCWA on 12-22-2021, "[T]he final phase of the ESP construction to provide complete service from the south to Rainbow and Fallbrook was scheduled to be done, and the initial construction had been budgeted (not funded)" when Fallbrook and Rainbow announced their intention to seek detachment.

   At that point, the North County project was put on hold. Had it continued on schedule, according to an email from SDCWA 12-21-2021, it would have been debt financed over a 30-year period. Thus, the FPUD/RMWD adjustment is based on what SDCWA's rates might have been, rather than what they are.

   There seems to be a degree of inconsistency in the position adopted by FPUD/RMWD – past financial commitments incurring ongoing payments and debt service appear not to be relevant when assessing FPUD/RMWD detachment, but future investments that would not be incurred *are* relevant to that assessment.

[65] This refers to the foregone deliveries assessed by SDCWA in Table 4.7 of the Combined Response of 9-18-2020 and, specifically, the last row of that table.

Q. Is the amount of $12.2 – 12.6M short-run impact on SDCWA's net revenue just a one-year phenomenon?

A. No.

There will be a recurring annual loss of net revenue for SDCWA once the detachment occurs, lasting for as long as SDCWA has to pay for the financial commitments that it has incurred to date. As elaborated below, these financial commitments last for varying periods of time and stretch far into the future.

The exact annual financial impact in the future will vary from year to year, depending on SDCWA's annual finances and rates.

The future financial impact will be lessened to the extent that SDCWA may find another buyer for the water that it would have delivered to FPUD and RMWD. But that will not fully offset the financial impact of FPUD/RMWD detachment for two reasons:

(1) The payment from the sale may not cover all the payments made annually to SDCWA by FPUD/RMWD as member agencies.
(2) The water not delivered to FPUD/RMWD does not belong to FPUD and RMWD individually. Any financial benefit to SDCWA in the event that it sells the water that would have been delivered to FPUD/RMWD to some other party belongs collectively to SDCWA member agencies, and not to FPUD and RMWD individually.

Q. How large is this net financial impact in relation to SDCWA's total operating revenue and operating expenses?

A. SDCWA's actual operating revenues and expenses totaled around $569 million in FY 2020. My estimate of a CY 2022 net revenue loss of about $12.2M amounts to 2.1% of the FY 2020 operating revenue and expense.

Q. What is the financial impact on FPUD and RMWD?

A. To answer this, I use the same assumptions as above. I focus on CY 2022, and I assume that FPUD obtains 4,100 AF from its wholesale supplier, whether SDCWA or EMWD, while RMWD receives 14,000 AF. FPUD and RMWD are planning to switch their wholesale supplier because this will lower the cost of their wholesale supply. Here I calculate the cost saving to FPUD and RMWD in their wholesale supply for CY 2022, recognizing that they may also bear some other expenses relating to their water equipment.

FPUD and RMWD avoid the cost they would have paid to SDCWA for this supply of water. Figure 16 shows that cost. Not every row in Table 16 represents a cost paid by FPUD and RMWD. Some of the revenue items lost by SDCWA in the event of detachment are paid by property owners within the FPUD and RMWD service areas (namely, rows o + p + q in Table 16). Row m in Table

16 totals up the portion of the revenue lost by SDCWA that is a cost paid by FPUD and RMWD to SDCWA. The totals in row m are a mix of variable charges (volumetric payments) and fixed charges. Row n in Table 16 converts the total payment (row m) into an equivalent payment per acre-foot received, i.e., an "all-in" amount, for each agency separately. The all-in cost of SDCWA water to FPUD amounts to $2,007/AF; that cost to RMWD amounts to $1,645. This reflects the fact that RMWD receives more than three times the amount that FPUD receives from SDCWA. Thus, when SDCWA's fixed charges are averaged over the amount of water delivered by SDCWA, the unit cost for RMWD is lower than for FPUD.

Table 20 compares what FPUD and REMWD would have paid SDCWA if they remained member agencies in CY 2022 with what they would pay if they became member agencies of EMWD. Row b in Table 20 is the same as row m in Table 16 and shows what they would pay SDCWA. Row h shows what they would pay if served by EMWD, based on my understanding that they would be asked to pay the MWD Tier 1 treated water rate, plus their shares of MWD's RTS and Capacity charges to EMWD, plus a markup of $11/AF to cover EMWD's cost of collecting MWD's charges from them. I estimate that the cost savings to FPUD and RMWD combined in CY 2022 amounts to about $7.7 million. FPUD and RMWD's net gain is less than SDCWA's net loss (Table 20).

TABLE 20 | Savings in Water Cost when FPUD & RMWD Switch from SDCWA to EMWD

			SDCWA	EMWD			
			Unit Rate	Unit Rate		FPUD	RMWD
		Item	FPUD	FPUD/RMWD	Other members	Expenditure	
			($/AF)	($/AF)	($/AF)	($)	($)
		SDCWA WHOLESALE SUPPLIER					
a		SDCWA average untreated supply cost*	$1,271				
b		SDCWA treatment charge	$310				
c	= d - a - b	SDCWA Wholesaler "markup"	$252				
d		**SDCWA all-in treated rate**	**$1,833**				
		MWD WHOLESALE SUPPLIER					
g	= a + b	MWD Full service Tier 1 treated		$1,143	$1,143		
h		MWD RTS charge		$122	$122		
i		MWD Capacity charge*		$28	$28		
j		EMWD Wholesaler "markup"		$11	$246		
k	= c + d + e + h	**EMWD all-in treated rate**		**$1,304**	**$1,539**		
l		WATER DELIVERY (AF)				4,100	14,000
m	= i * l	SDCWA WHOLESALE WATER COST ($)					
n	= j * l	EMWD WHOLESALE WATER COST ($)				$5,346,400	$18,256,000
	= m - n	**COST SAVINGS ($)**					

2.4 A DEPARTURE FEE

I was asked to address the possibility of a financial obligation to be imposed on FPUD and RMWD if they are permitted to detach from SDCWA, such as a departure fee.

I am aware that there is currently disagreement among the parties with respect to whether LAFCO has the legal authority to prescribe conditions that include a financial obligation such as a departure fee. I am not being asked to opine on that legal question, and I am not offering an opinion on that question. Instead, I am being asked to examine whether there is a sound economic justification for imposing a financial obligation of FPUD and RMWD and, if so, what an appropriate obligation could be. However, the decision maker here is the LAFCO Commission.

There are two basic questions:

(1) Should some form of financial obligation be placed on FPUD and RMWD as a condition for approving their detachment from SDCWA?
(2) If the answer is yes, how large a financial obligation, and for what period of time?

Here, I offer some suggestions to LAFCO for answering these questions.

Q. Do the parties agree on this?

A. No. They disagree.

As I understand their positions, SDCWA argues that, if they detach, FPUD and RMWD should be liable for covering their shares of about $21 billion of bonded and other indebtedness. The combined share could amount to about $1 billion. In contrast, FPUD and RMWD argue that they should be able to detach without any further financial liability.

In my judgment, as an economist experienced in the economics of water, neither position – a liability of about $1 billion nor a liability of zero – is reasonable.

Q. Is there a sound economic justification for imposing some continuing financial obligation?

A. Yes.

Since 2000, SDCWA has made major infrastructure investments and has taken on substantial contractual commitments for a more reliable water supply. The infrastructure investments and the purchase commitments have benefited all member agencies, including both FPUD and RMWD. These commitments are long-term in nature, and they impose a fixed and ongoing financial burden on SDCWA and its member agencies.

Behind this disagreement lies the difficult challenge of financing San Diego County's water supply system and, more generally, Southern California's water supply system, in an era of conservation, growing recycling of wastewater, and increasing water supply uncertainty due to climate change.

Supplying water, as an industry, is exceptionally capital intensive – more so than supplying electricity, natural gas, telecom services, or any other utility industries. The infrastructure involved in water supply is exceptionally long-lived compared to that in other utility industries. The infrastructure is dominated by major economies of scale, which make it uneconomic to expand the infrastructure by small gradual increments. It has to be sized to meet future needs looking quite far into the future. Moreover, once installed, water supply infrastructure has little salvage value in any alternative use – if unneeded, it becomes a classic example of a stranded asset.

Over the past two decades, SDCWA has made major infrastructure investments and has made major long-term commitments to obtain some independent, and highly reliable, sources of water. It will be paying for those commitments for the next 20-25 years or more.

The question confronting LAFCO is whether SDCWA member agencies with a distinctive set of needs and situated at a distinctive location should be allowed to walk away scot-free, entirely unencumbered by any of the financial commitments that SDCWA has assumed on behalf of its member agencies.

Q. If a departure fee were to be imposed, what would be the purpose?

A. The purpose of imposing some financial obligation on FPUD or RMWD if they are permitted to detach from SDCWA is to provide a level of financial protection for SDCWA and the remaining member agencies in the short run while they adjust to the changed financial situation of a detachment.

The purpose is to cover SDCWA's own financial obligations that are fixed, ongoing and unavoidable for the duration of a period of adjustment. These include the following:

- SDCWA is committed to paying for 78,700 AF of canal lining water through 2112.
- It is committed to paying IID for 200,000 AF of conserved water through 2047
- Under the exchange agreement, SDCWA is committed to paying MWD to convey this water for the same period of time as in those underlying supply contracts.

A departure fee is intended to promote flexibility and efficiency in the management of scarce water resources and in the operation of a supply network that is essential to the wellbeing of the regional economy. It is not appropriate that the departure fee afford such protection in perpetuity. It is important that SDCWA and all its member agencies receive an economic signal about the need for efficient network organization and rationalization. Compensation continuing for the long run would work against the objective of promoting the efficient use of the region's water infrastructure assets.

Q. What portion of SDCWA's outstanding water-supply related obligations should serve as the basis for determining a departure fee?

A. That is a judgment call for LAFCO.

On the one hand, like every other SDCWA member agency, FPUD and RMWD have benefited from all of the financial obligations incurred by SDCWA because member agencies are bound together by an integrated infrastructure network. Each member agency benefits to some degree from all investments in the infrastructure either directly or indirectly.

A member agency benefits directly from an investment in a particular source of supply or in a particular component of the infrastructure if it is directly served by that particular infrastructure component or it directly receives water from that particular supply source. But, even if a member agency is not served directly by that particular component and does not directly receive water from that particular supply source, the member agency still benefits indirectly through being part of an integrated water distribution network. If *other* member agencies receive water from that particular source or through that particular component, it makes it possible for *this* member agency to receive water from another source within SDCWA's portfolio, thereby benefiting indirectly.

On the other hand, it is reasonable to recognize that FPUD and RMWD are in a somewhat special situation by virtue of both their particular location at the furthest end of SDCWA's distribution system and their rural and agricultural local economies.

In the light of these factors, I recommend that a departure fee be limited to the portion of SDCWA's outstanding obligations that relates specifically to QSA water. QSA water constitutes about 80% of the water FPUD and RMWD have received in the past two years.

Q. What is the portion of SDCWA's outstanding obligations that relates to QSA water?

A. In its submission on 9-18-2020, SDCWA presented a table breakdown of its contractual water supply payment obligations as, follows:[66]

TABLE 21 | SDCWA Contractual Water Supply Payment Obligations

Desc.	CY 2021 Cost	Remaining Term (as of 1/1/2021) (yrs)	Escalation Factor	Net Present Value (3% Discount)
IID	$135,000,000	27	2.5%	$3,401,733,753
MWD Exchange - IID	$106,800,000	27	4.6%	$3,642,717,018
Canal	$1,233,099	93	3.0%	$114,678,207
MWD Exchange - Canal	$41,491,800	93	4.6%	$9,029,224,611
Desal	$111,846,000	26	3.0%	$2,907,996,000
Total	**$396,370,899**			**$19,096,349,589**

[66] Table 4.3.

The first four rows of this table cover SDCWA's payments relating to QSA water. SDCWA is committed to making annual payments that run through 2047 (for IID Transfer water) and 2112 (for canal lining water). This year (CY 2021), the annual payments for QSA water amount to $284.525 M. This committed annual payment is projected to grow over time based on price adjustments built into SDCWA's contracts with IID, MWD and other parties. The combined total financial obligation over the lives of these QSA commitments amounts to just under $16.2 billion.

LAFCO might use SDCWA's current annual payment for QSA water of around $285 million as a starting point for thinking about what a fair and reasonable departure fee could be.

Q. What is the underlying logic of the position being adopted by FPUD and RMWD?

A. The position being adopted by FPUD and RMWD – that, once they detach from SDCWA, they should not be liable for any ongoing financial obligation to SDCWA – would be reasonable if SDCWA were supplying water to its member agencies solely on a pay-as-you-go ("PayGo") basis. If that were the case, a member agency which no longer received water from SDCWA should have no obligation for any further payment to SDCWA. But, SDCWA does not supply water to its member agencies solely on a PayGo basis – nor does MWD, nor does any other wholesale water supply agency that I know of.

A departure fee is intended as a payment for obligations incurred by having received water in the past; it is not a payment for water to be received currently.

Q. Why does SDCWA not supply water to its member agencies on a PayGo basis?

A. SDCWA does not supply water to member agencies on a PayGo basis because that would be extremely burdensome to them financially. This is so for at least two reasons.

1) Much of the infrastructure being financed – dams, aqueducts, treatment plants, etc.[67] – has a useful life of 40 years to over 100 years. Financing this infrastructure on a cash basis at the time of construction would be burdensome, and also unfair, for contemporary water users. Debt finance is generally far more reasonable.
2) In the case of IID Transfer, IID would only agree to sell this water to SDCWA on a long-term basis. It was unwilling to sell water to SDCWA (or MWD) on a year-by-year basis. That was the commitment a buyer had to make in order to receive IID water with its senior water right.

Q. Why don't water agencies rely more on property tax revenues to pay for long-term debt service and water purchase commitments?

A. Public and municipal water agencies used to rely almost entirely on property tax revenue to finance their debt service and other long-term financial commitments. However, they stopped

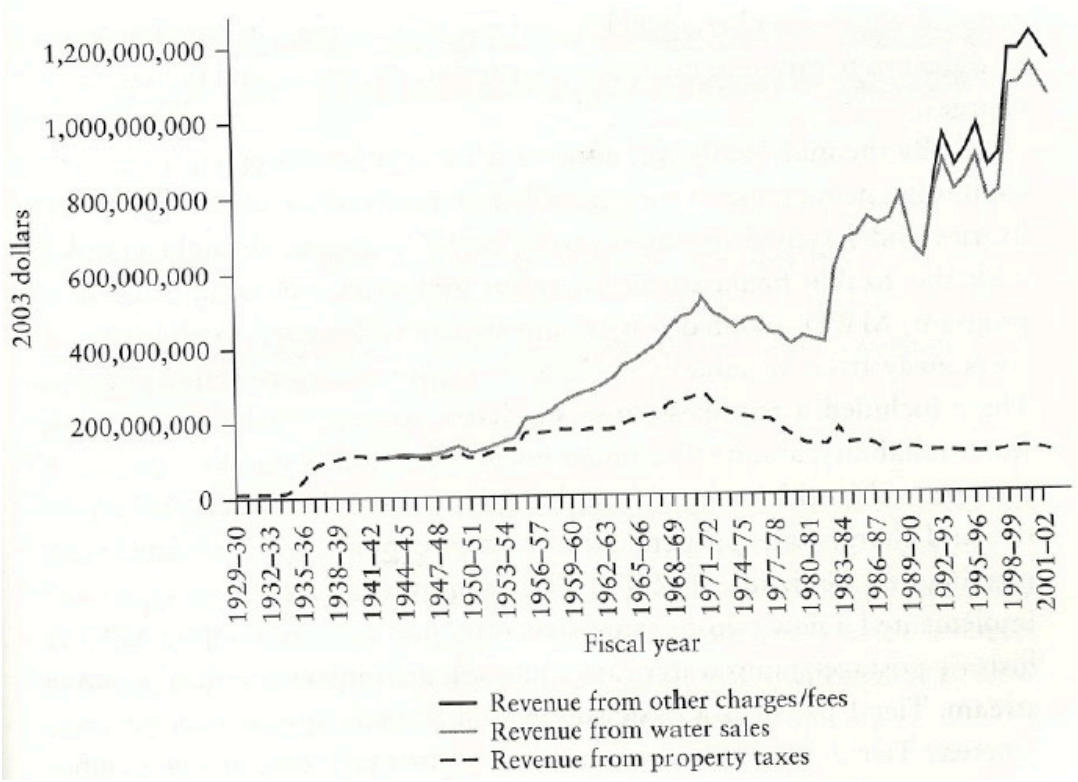
[67] See for example the recent major investments by SDCWA listed on page 18 above.

doing this in the 1960s and 1970, and switched instead to relying on revenue from water sales raised particularly via volumetric water rates.

Figures 11a and 11b illustrate the switch from property tax to water sales as the foundational revenue source for the case of MWD.

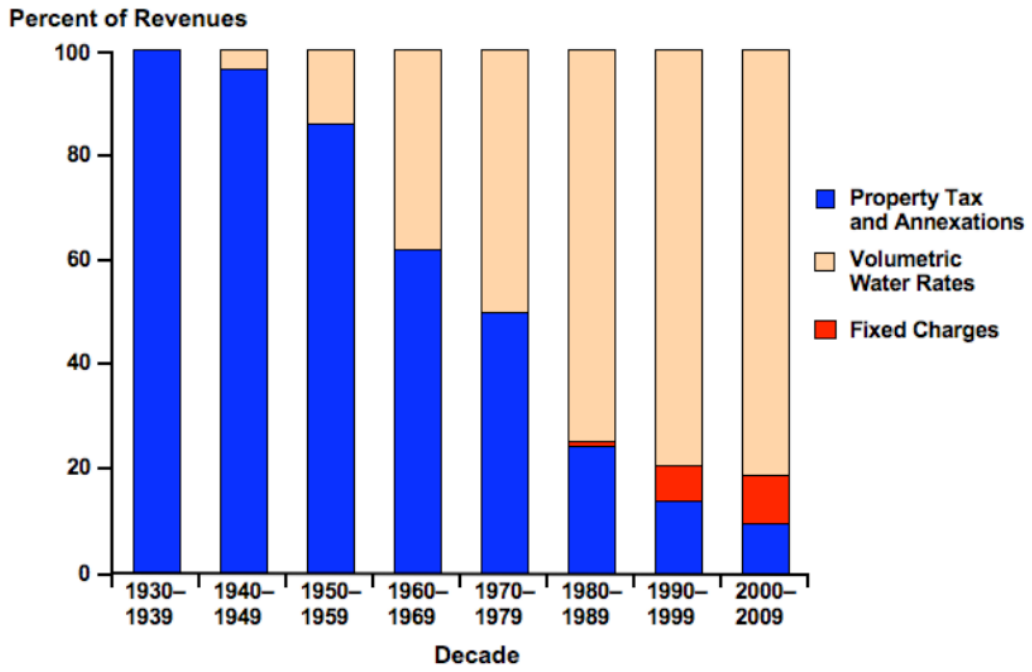
The switch – at MWD and elsewhere – was motivated in part by concerns of fairness. In the case of MWD, for example, the City of Los Angeles had the highest property tax base of all member agencies, but it was using relatively little M-water from MWD because it had access to its own water from Mono Lake. Other growing member agencies had small property tax bases but were far more heavily reliant on water from MWD. Charging member agencies based on their usage of water was seen as fairer (and more efficient economically) than charging based on their property values.

FIGURE 11a | Changing Sources of MWD Revenue Over Time[68]



[68] Steven P. Erie, Beyond Chinatown. Stanford University Press, 2006, Figure 3.1,

FIGURE 11b | MWD Revenue Sources[69]



Q. What is a fair share of SDCWA's contractual obligation to pay for QSA water to assign to FPUD and RMWD?

A. This is something for LAFCO to decide.

It could be based on FPUD and RMWD's shares in either total deliveries to SDCWA member agencies or in deliveries for municipal and industrial use as opposed to deliveries made under SDCWA's special PSAWR agricultural rate program.

Table 22 provides an example of the calculation of these shares using the data for FY 2021.[70] In FY 2021, FPUD and RMWD together accounted for 6.9% of total water deliveries to all member agencies, and 4.8% of deliveries for M&I (non-PSAWR) use.[71]

[69] Metropolitan Water District, *Report of the Blue Ribbon Committee*, April12, 2011, Figure 2.6.
[70] Other years could also be used – the share in an earlier year, or the average share over a span of several past years.
[71] In my October Draft report, I had used FPUD and RMWD's shares in projected FY 2021 deliveries of SDCWA water. Now I am using their shares in the actual, realized FY 2021 deliveries, which turned out to be larger than had been projected.

TABLE 22 | FPUD/RMWD Share in SDCWA Water Deliveries

	FY 2012 ACTUAL		FY 2013 ACTUAL		FY 2014 ACTUAL		FY 2015 ACTUAL		FY 2016 ACTUAL	
	Delivered (AF)	Share	Delivered (AF)	Share	Delivered (AF)	Share	Delivered (AF)	Share	Delivered (AF)	Share
PSAWR DELIVERIES										
Fallbrook	3,953	10.3%	4,348	10.0%	4,811	10.0%	3,853	9.4%	3,039	9.6%
Rainbow	8,025	21.0%	9,769	22.4%	11,413	23.8%	9,688	23.6%	7,846	24.8%
Subtotal	11,978	31.3%	14,117	32.4%	16,224	33.8%	13,541	33.0%	10,885	34.3%
All Member Agencies	38,267		43,610		47,941		41,055		31,696	
M&I DELIVERIES										
Fallbrook	8,163	2.0%	8,594	2.0%	8,535	1.9%	7,876	1.8%	6,430	1.8%
Rainbow	12,441	3.1%	12,745	2.9%	11,567	2.5%	10,486	2.4%	9,204	2.6%
Subtototal	20,603	5.1%	21,339	4.9%	20,102	4.4%	18,362	4.1%	15,633	4.3%
All Member Agencies	401,285		436,439		458,044		444,107		360,307	
ALL DELIVERIES										
Fallbrook	12,116	2.8%	12,942	2.7%	13,346	2.6%	11,729	2.4%	9,468	2.4%
Rainbow	20,466	4.7%	22,514	4.7%	22,980	4.5%	20,173	4.2%	17,050	4.3%
Subtotal	32,582	7.4%	35,456	7.4%	36,325	7.2%	31,902	6.6%	26,518	6.8%
All Member Agencies	439,552		480,048		505,985		485,162		392,003	

	FY 2017 ACTUAL		FY 2018 ACTUAL		FY 2019 ACTUAL		FY 2020 ACTUAL		FY 2021 ACTUAL	
	Delivered (AF)	Share	Delivered (AF)	Share	Delivered (AF)	Share	Delivered (AF)	Share	Delivered (AF)	Share
PSAWR DELIVERIES										
Fallbrook	2,602	8.3%	2,971	8.3%	1,843	7.3%	1,830	7.8%	1,998	6.9%
Rainbow	7,937	25.4%	8,807	24.7%	6,002	23.9%	5,654	24.2%	7,256	25.2%
Subtotal	10,538	33.7%	11,778	33.0%	7,845	31.2%	7,484	32.0%	9,255	32.1%
All Member Agencies	31,254		35,696		25,118		23,370		28,831	
M&I DELIVERIES										
Fallbrook	6,499	1.7%	7,035	2.0%	5,922	1.7%	6,063	1.9%	6,823	2.0%
Rainbow	9,046	2.4%	10,433	2.9%	8,830	2.6%	8,732	2.7%	9,826	2.8%
Subtototal	15,545	4.2%	17,469	4.9%	14,752	4.3%	14,795	4.6%	16,649	4.8%
All Member Agencies	374,147		357,175		339,965		323,061		347,634	
ALL DELIVERIES										
Fallbrook	9,101	2.2%	10,007	2.5%	7,766	2.1%	7,893	2.3%	8,822	2.3%
Rainbow	16,983	4.2%	19,240	4.9%	14,831	4.1%	14,386	4.2%	17,082	4.5%
Subtotal	26,083	6.4%	29,247	7.4%	22,597	6.2%	22,279	6.4%	25,904	6.9%
All Member Agencies	405,400		392,871		365,083		346,431		376,465	

	3-YEAR AVERAGE		5-YEAR AVERAGE		10-YEAR AVERAGE	
	Delivered (AF)	Share	Delivered (AF)	Share	Delivered (AF)	Share
PSAWR DELIVERIES						
Fallbrook	1,891	7.3%	2,249	7.8%	3,125	9.0%
Rainbow	6,304	24.5%	7,131	24.7%	8,240	23.8%
Subtotal	8,194	31.8%	9,380	32.5%	11,364	32.8%
All Member Agencies	25,773		28,854		34,684	
M&I DELIVERIES						
Fallbrook	6,270	1.9%	6,469	1.9%	7,194	1.9%
Rainbow	9,129	2.7%	9,373	2.7%	10,331	2.7%
Subtototal	15,399	4.6%	15,842	4.5%	17,525	4.6%
All Member Agencies	336,887		348,396		384,216	
ALL DELIVERIES						
Fallbrook	8,160	2.3%	8,717	2.3%	10,319	2.5%
Rainbow	15,433	4.3%	16,504	4.4%	18,570	4.4%
Subtotal	23,593	6.5%	25,222	6.7%	28,889	6.9%
All Member Agencies	362,660		377,250		418,900	

Source: SDCWA Annual Reports

Q. What annual payment would be assigned to FPUD and RMWD, based on SDCWA's QSA-related financial obligations?

A. This is a decision for LAFCO.

The amount of the departure fee depends on (i) what one takes as SDCWA's annual expenditure commitment for QSA water, and (ii) what one takes as FPUD's share and RMWD's share of that annual cost.

Table 23 illustrates what an annual departure fee might be if it is framed as FPUD/RMWD's share of SDCWA's annual QSA payment commitment in CY 2021 ($284,524,900), using their three-year average share of either all deliveries or deliveries for M&I (non-PSAWR) use.

TABLE 23 | Calculation of a Departure Fee

	Share	Annual payment
USING THE SHARE OF M&I DELIVERIES		
FPUD	1.9%	$5,295,156
RMWD	2.7%	$7,710,209
Total	**4.6%**	**$13,005,365**
USING THE SHARE OF ALL DELIVERIES		
FPUD	2.3%	$6,402,041
RMWD	4.3%	$12,107,975
Total	**6.5%**	**$18,510,016**

These calculations could be modified in any manner that LAFCO sees fit.

In particular, the FPUD/RMWD share could be calculated for a different set of years.

There is also the question of for how many years an annual departure fee would be paid – that is also something to be decided by LAFCO. I offer some thoughts below.

Q. Why should FPUD and/or RMWD be required to make an annual payment to SDCWA if they do not receive any water from SDCWA that year? How is that fair?

A. The logic of a departure fee is that it is not a payment being made in exchange for the delivery of water. Instead, it is a payment being made in exchange for being permitted to detach from financial commitments previously made on behalf of FPUD and RMWD along with the other SDCWA member agencies. It is a payment for obligations incurred by having received water in the past, for the purpose of providing some limited financial relief to SDCWA while it adapts to the change in its financial circumstances.

Q. If FPUD and RMWD detach from SDCWA, would it possible for SDCWA to sell the water that it otherwise would have delivered to FPUD and RMWD to some other water agency that is *not* a member agency, thereby recouping lost revenue?

A. In theory, one mechanism by which SDCWA might recoup lost revenue is to sell water that otherwise would have been delivered to FPUD and RMWD to a *non-member* water agency. Logical possibilities are to sell water to MWD itself or to individual member agencies served by MWD. The water distribution systems serving MWD and SDCWA are sufficiently interlinked that this ought to be possible in principle, although there could be some operational complications and constraints.

From a purely economic perspective, Southern California as a region would be better served if there could be a more open and collaborative relationship between MWD and SDCWA, its largest single customer.[72]

However, depending on the price SDCWA was able to negotiate for the sale of any unneeded water, the revenue earned might not fully offset the net revenue lost by the detachment of FPUD and RMWD.

Q. Wouldn't the justification for a departure fee be eliminated if SDCWA could work out an arrangement to resell part of the QSA water?

A. No, the economic justification for a departure fee would not be eliminated, for at least two reasons.

First, it is unlikely that SDCWA could arrange and implement a long-run financial adjustment within a year from when detachment occurs. A&N Technical Services states that almost all California water transfers are negotiated in less than 12 months.[73] Negotiation is not the same as implementation, especially where regulatory approval is required. *Short-run* transfers (leases) in California are often negotiated and consummated within twelve months, but that is because they are exempted from the conventional legal requirements for the transfer of an appropriative water right in California (proof of no injury and proof of the historical right) on condition that the water is being transferred for a period of one year or less. With regard to the proposed new transfer cited by A&N between Glenn-Colusa Irrigation District and Marin Municipal Water District, the newspaper article that they reference actually states the following: "If an agreement is worked out, it would be for a one-time transfer occurring in 2022."

[72] The agreement announced on December 14 whereby SDCWA will make available to MWD some of the groundwater which it has stored in the Semitropic Water Bank, while a temporary arrangement for 2022, may be a harbinger of a new and more productive relationship between the two agencies.

[73] Email dated 11-8-2021. On 11-5-2021, SDCWA submitted an email disputing this claim by A&N Technical Services.

It is thus likely that it will take SDCWA several years to work out and implement the adjustments needed as a permanent fix for the financial issues raised by detachment.

Second, assuming that SDCWA can replace the net revenue lost by the detachment through the resale of some QSA water to another party, as I noted above, the QSA water no longer delivered to FPUD and RMWD does not belong to them individually. Any financial benefit from resale of that water belongs collectively to SDCWA member agencies.

Q. In the event of a detachment, would the departure fee be paid annually for a period of several years or in one lump sum?

A. This is something for LAFCO to decide. As noted above, the detachment will cause an ongoing loss of annual net revenue, not a one-time loss.

Q. Over how long a period should FPUD and RMWD bear an obligation for a departure fee?

A. This is something for LAFCO to decide.

The purpose of the financial obligation is to provide an appropriate level of protection for SDCWA and the remaining member agencies in the short run while they adjust to the changed situation of a departure.

I do not think it likely that the adjustment will be completed quickly.

If the departure fee involves an annual payment, the period during which FPUD and RMWD bear that financial obligation to SDCWA should not exceed 10 years. In the water industry, a period of 10 years would typically count as the short run for planning purposes. The period should not be less than three years, given the time likely to be needed to for SDCWA to arrange a permanent remedy for the financial impact of detachment on its member agencies.

Q. Could there be a different approach to determine the amount of their financial obligation to SDCWA in the event that FPUD and RMWD detach?

A. Yes, there are other possible approaches besides the one I outlined above, based on assigning to FPUD and RMWD a share of SDCWA's annual payment commitment for QSA water.

For example, FPUD and RMWD could be obligated to make a pre-specified payment to SDCWA based on the contingency that SDCWA fails to earn a pre-specified level of revenue from water sales that year, or on the contingency that SDCWA fails to be able to sell a pre-specified quantity of water, or on some other contingency.

In principle, this is something that could be negotiated between SDCWA, FPUD and RMWD. In the end, however, LAFCO has the final decision on whether to approve the terms of a detachment.

2.5 WATER SUPPLY RELIABILITY

The IID Transfer and canal lining agreements and some of SDCWA's major infrastructure investments listed above were motivated by SDCWA's desire to increase the reliability of its water supply portfolio.

That raises two questions:

(A) Is SDCWA's wholesale supply of water actually more reliable than the wholesale supply of EMWD, which will become FPUD and RMWD's wholesale supplier if they depart from SDCWA?
(B) If SDCWA's wholesale supply is more reliable, does that justify the higher cost of water when staying with SDCWA as a wholesale supplier?

In this report, I do not address question (B). That is a policy judgment for FPUD and RMWD Boards of Directors and perhaps LAFCO to make. This section contains my analysis of question (A).

Q. What are the threats to the reliability of supply for FPUD and RMWD?

A. There are conceptually two distinct kinds of threat: (1) A situation occurs where the wholesale supply agency – SDCWA, MWD or EMWD – does not itself have access to sufficient water to provide all the water that FPUD and/or RMWD wishes to obtain; the supply provided to them is curtailed or rationed. (2) A physical break or disruption occurs on a major pipeline supplying FPUD and/or RMWD and there is not sufficient connectivity remaining in the wholesale agency's distribution system to deliver the amount of water that FPUD and/or RMWD wishes to receive. In one case, the wholesale agency lacks sufficient water; in the other, it (temporarily) lacks sufficient connectivity.[74]

Q. With regard to the possibility of an insufficient water supply, how could that differ as between SDCWA vs EMWD?

A. FPUD and MWD could face differences in the reliability of their water supply when served by EMWD versus SDCWA in two ways: (1) SDCWA and EMWD have supply portfolios with differing degrees of reliability, and (2) the member agency status currently proposed for FPUD and RMWD within EMWD will be different from the status they currently have within SDCWA, and that gives them a different degree of access to their wholesaler's full supply portfolio.

[74] I do not analyze (2) here because that is beyond my expertise.

Q. How do EMWD and SDCWA differ in the reliability of their water supply?

A. EMWD relies on M-water from MWD for about half of its supply; the rest is local supplies from local groundwater, recycled water and desalination of brackish local groundwater.[75] However, under their proposed arrangement with EMWD, FPUD and RMWD would not have any access to EMWD's local supplies; they would be 100% reliant on M-water from MWD.

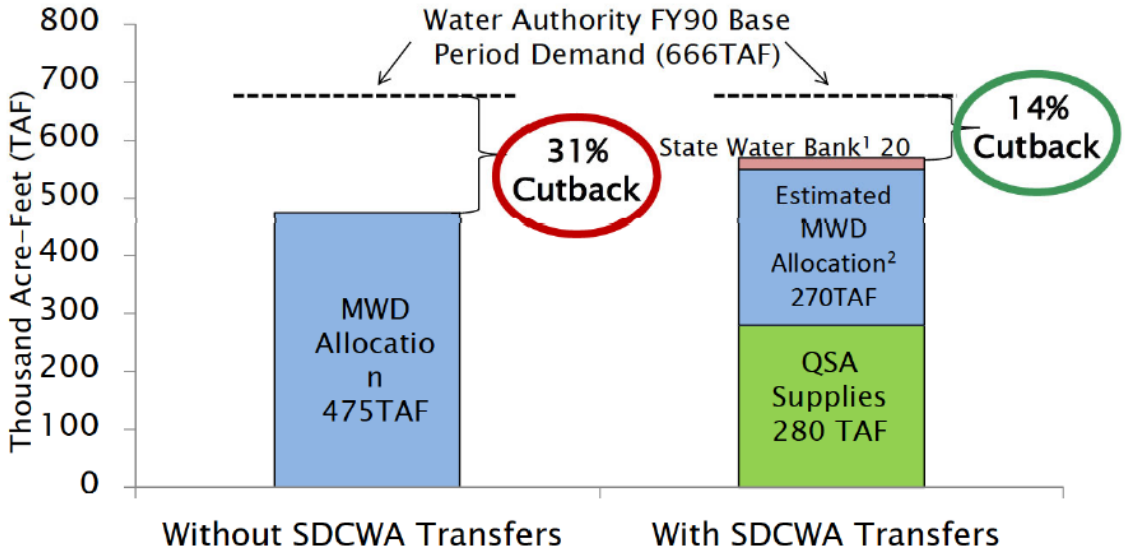
SDCWA relied on M-water from MWD for 24% of its supply in CY 2020 and about 12% in CY 2021 (Table 9). This is projected to decline even further over the next decade. The rest of SDCWA's supply portfolio is (i) QSA water from the Colorado River which comes under a higher priority water right than most of MWD's Colorado River M-water and (ii) water from the Carlsbad Desal facility which is fully protected against streamflow uncertainty.

Q. Has the distinctive reliability of SDCWA's supply portfolio actually made any difference?

A. Yes. It would have made a difference if SDCWA had QSA water in the 1991 drought, it did make a difference that SDCWA had QSA water in the 2007-2009 drought, and it made a difference that SDCWA had desal water in the 2015-2016 drought.

Figure 12 is a presentation made to the SDCWA Board on 6-28-2012 showing what difference it would have made if SDCWA had access to QSA water in the 1991 drought: member agency deliveries would have been reduced by 14% instead of 31%.

FIGURE 12 | What if SDCWA had QSA Transfers in 1991?



[75] The figure of 50% reliance on MWD comes from an interview with EMWD's General Manager Mouawad in *Municipal Water Leader* dated December 1, 2021, accessed at https://municipalwaterleader.com/joe-mouawad-of-eastern-municipal-water-district-diversifying-supply-for-efficiency-minded-customers/. EMWD's 2020 Urban Water Management Plan gives the reliance on MWD as 60% in CY 2020.

Due to the drought in 2009, SDCWA faced a 13% cut from MWD in its FY 2010 delivery of M-water. However, because of its access to QSA water, SDCWA was able to reduce deliveries to its member agencies by only 8%.

Under the drought emergency regulation adopted in May 2015, FPUD and RMWD were required to reduce their monthly water use starting in June 2015 through February 2016 by 36% compared to the level in 2013. In February 2016, the emergency regulation was amended to allow for new local drought-resilient supplies developed after 2013. In March 2016, the supply from the Carlsbad Desalination Facility was certified as drought resilient. This lowered FPUD and RMWD's mandated water use reduction from 36% to 28%. In May 2016, the conservation mandate was replaced with a localized "stress test" under which a wholesale water agency could document its ability to meet demands for 2017 - 2019 should dry conditions continue. Based on the availability of SDCWA's drought resilient supply, the conservation requirement for FPUD and RMWD was reduced from 28% to 0%.

Q. How does MWD water have supply reliability issues?

A. Both of MWD's sources of M-water – SWP water and Colorado River water -- have some supply reliability issues.

Q. What are the supply reliability issues with SWP water?

A. There are supply reliability issues for SWP water with regard to (i) the amount of water available for it to take from its source, the Feather River in the Sacramento Valley, and (ii) the ability to convey that water through the Sacramento/San Joaquin Delta to SWP member agencies south of the Delta.

Q. What are the supply reliability issues with regard to the amount of water SWP can obtain from the Sacramento Valley?

A. There are two long-standing reliability issues and one newer issue now coming into focus.

The long-standing issues are that (i) droughts are a fact of life in California, and (ii) the SWP has relatively little carryover storage compared, say, to the Colorado River – two consecutive years of drought in Northern California could create a difficult situation for SWP supply.

The new factor now coming more clearly into focus is climate change. For almost twenty years now, scientists have been warning that climate change will make California's droughts worse – both more frequent and more severe.[76] The new feature is a recognition that not only will droughts become more frequent and more severe in California, but they will also become *harder to predict* on a seasonal basis. The higher temperatures currently being experienced in California

[76] This was a major finding from the State of California's Climate Scenarios Project. I served on the steering committee for this project from 2003 to 2011.

are making seasonal forecasts of streamflow runoff less reliable, with past forecast methods turning out this year to be too optimistic.[77] Snowmelt in the Sacramento River Basin was forecast in early May this year to be about 800,000 AF less than had been predicted in early April based on the past relationship between snowpack and runoff. This was equivalent to 10% less Sacramento River system runoff than had been predicted by California's Department of Water Resources using its standard models and methods.[78]

Q. Has the SWP supply to member agencies diminished in recent years?

A. Yes.

One indication is the changing estimates of the average Table A amount that the SWP can deliver from the Delta which have appeared biennially in the SWP Delivery Capability Reports since 2005. The estimated average Table A delivery from the Delta was 2.818 MAF/yr in the 2005 Report and 2.414 MAF/yr in the most recent 2019 Report. This change is due to increased environmental regulation over the last three decades aimed at protecting native species of fish in the Delta.

In addition, however, actual SWP deliveries have decreased since 2006 in a manner indicative of climate change. Through 2012, there were only two years in SWP history where it delivered low supplies relative to the Table A amounts – 1991, where it delivered 20% of Table A, and 2008 where it delivered 35%. Since then, there have been six years of very low SWP supplies amounting to 35% of Table A entitlements in 2013, 5% in 2014, 20% in 2015, 35% in 2018, 20% in 2020 and 5% this year. On December 1 of this year, before the onset of the rains, the SWP set its initial 2022 allocation to M&I and agricultural contractors at 0%.

Q. What is the Sacramento-San Joaquin River Delta and how does it affect the conveyance of SWP water?

A. The Delta is a web of channels and reclaimed islands at the confluence of the Sacramento and San Joaquin Rivers. It originated through sea level rise after the last ice age bringing a steady accumulation of sediment into a large freshwater marsh which commingled with vast quantities of organic matter from the vegetation, forming an area of shallow channels and sloughs amid low islands of peat and tule. Starting around 1850 with the planting of orchards to provide fresh fruit for the gold mining camps, these Delta lands were drained to reclaim them for farming and protected by levees to form a network of islands separated by freshwater channels. By 1900, nearly half of the Delta's land area had been reclaimed. By the 1920's reclamation of almost all the farmable land in the Delta had been completed.

[77] As noted below, the same is turning out to be true for the forecasts of streamflow used for the Colorado River.
[78] Abatzoglou, J. et al. "California's Missing Forecast Flows in Spring 2021 – Challenges for seasonal flow forecasting," CaliforniaWaterBlog.com, Posted on July 18, 2021.

When the Central Valley Project (CVP) came into operation in the late 1940s, and then the SWP in the 1960s, the Delta became the hub of the system for transporting water from the Sacramento Valley to the San Joaquin Valley and Southern California. Water stored behind dams in the Sacramento Valley is released into the Sacramento River and flows naturally into the northern end of the Delta. It flows south on the eastern side of the Delta, kept separate by the various islands from brackish water on the far western side of the Delta, which would be harmful for water supply purposes. The water flows in the channels between the Delta islands ("Tracts") but, instead of following the natural course of streamflow in a westerly direction to exit the San Francisco Estuary at the Golden Gate, it is sucked by powerful pumps at the southern end of the Delta into two major aqueducts that convey the water to CVP and SWP users in the San Joaquin Valley and Southern California.

Q. What are the supply reliability issues with regard to the ability to convey SWP water through the Sacramento/ San Joaquin Delta to SWP member agencies south of the Delta?

A. The integrity of the levees has long been a concern. The levees were quite often poorly designed and constructed, they were generally poorly maintained, and they are subject to natural erosion. Moreover, the Delta islands are mainly peat soil which is highly erodible with wind action. The land inside the islands is now mostly below sea level. This land subsidence has triggered failures of some levee and flooding of some islands.

It has also long been known that there are several major earthquake faults within the vicinity of the Delta that are capable of generating ground shaking which could likely lead to levee failure, although so far there have been no significant earthquakes in or closely adjacent to the Delta since the late 1800s.

Between 1900 and 1982, there were over 160 levee failures, but significant improvements were then made to the levee system and there was no major levee failure for the next 22 years. On a sunny June day in 2004, with calm seas, the Upper Jones Tract levee failed spontaneously inundating the entire island with more than 150,000 AF. It took three weeks to repair the levee, using special equipment which had to be brought down from Seattle, and an additional five months to de-water the island, which lay 3 meters below sea level, for a total cost of about $90 million.

Around the same time, new data mapping became available showing that the Delta islands lie further below sea level than previously thought, up to 8 meters in some cases. The implication was that, if a levee was breached, the task of restoring the land would be more arduous than expected because of the great volume of water that would have to be extracted.[79]

[79] Jeffrey Mount and Robert Twiss, "Subsidence ,Sea Level Rise and Seismicity in the Sacramento-San Joaquin Delta." *San Francisco Estuary & Watershed Science*, vol. 3, issue 1 (March 2005).

Sea level rise due to climate change adds a new risk on top of seismicity. The sea level off San Francisco has risen about 10" since 1900 and is projected to rise by a meter or more by 2100. The threat from sea level rise becomes acute during a storm coming at high tide, because that increases the chance of waves overtopping levees and destroying them.

Q. What is the current assessment of the supply reliability issues with regard to the ability to convey SWP water through the Delta?

A. Between land subsidence within the Delta Islands, the fragility of the Delta levees, the threat of an earthquake and the anticipated rise in sea level due to climate change, there is a very high likelihood – in fact, a certainty – of significant levee failures in the Delta during this century. Indeed, there is a high likelihood that *multiple* levees might fail at the same time, whether due to an earthquake or a winter storm at high tide, rather than a single levee failing as in June 2004. If several Delta levees were breached simultaneously, the physical resources would probably not be available to repair them all and the islands would be irreversibly flooded.[80] Depending on their location, the flooding of multiple islands would increase the risk of brackish water intruding and comingling with CVP and SWP water being conveyed through the Delta, thereby shutting down those projects' deliveries.

Q. If it is certain that the current conveyance of CVP and SWP project through the water will not endure, what is California's policy response?

A. California's policy response, which emerged in the aftermath of the 2009 Delta Reform Act and became known as WaterFix, was to re-rout the conveyance of CVP and SWP project water underneath the Delta through two deep tunnels that would provide an alternative to conveyance using the Delta channels thereby eliminating dependence on the integrity of the Delta levees. More detailed engineering and financial analysis for the development of an EIR/EIS was initiated in 2015. In 2017, MWD approved its participation for a 26% share in the project (a 47% share in the SWP's 55% stake in the project). The estimated cost of WaterFix was about $17 billion in 2017 dollars, with MWD's 26% share amounting to $4.3 billion. MWD's Board subsequently authorized the acquisition of an unsubscribed share of the project, bringing its total share to 64.6% and its cost to about $10.8 billion. In 2019, however, incoming Governor Newsom announced that he did not support a two-tunnel Delta project but preferred a smaller one-tunnel project instead. Planning documents are being developed for a one-tunnel project, now named the Delta Conveyance Project. A preliminary cost estimate released in August 2020 was $15.9 billion (in 2020 dollars) and MWD has not yet determined its participation in the new project.

[80] "Over the next 50 years there is a two-thirds chance of catastrophic levee failure in the Delta leading to multiple island flooding's and the intrusion of sea water" PPIC 2007, p. v

Q. Will the Delta Conveyance Project fix the reliability issues for SWP?

A. If the Delta Conveyance Project is completed, it will eliminate the present risk associated with the ability to convey SWP and CVP water to users south of the Delta. It will maintain the current ability to convey SWP water against the threat of future disruption. It is a means of preserving the status quo.

It will not fix the unreliability associated with declining streamflow in the Sacramento River Basin due to the effects of climate change.

Q. Will the Delta Conveyance Project raise the cost of SWP water?

A. For sure.

The Delta Conveyance Project does not generate any additional water supply. It prevents future reductions in SWP deliveries to member agencies south of the Delta that would be caused by failures of the levees in the Delta. In effect, SWP member agencies will have to pay more for the same water that they receive at present.

Q. When will the Delta Conveyance Project be completed?

A. That is not known at present. Once the Project is fully financed and authorized, which could perhaps take another three to five years, construction is expected to ramp up over a period of about ten years – so, perhaps, about 15 years from now.

Q. How important is MWD's Colorado River water as a source of supply for MWD compared to its SWP water?

A. As noted earlier, MWD was formed to bring water from the Colorado River to Southern California. The Colorado River constituted MWD's only source of supply until SWP deliveries started arriving in the 1970s. The Colorado River remained MWD's dominant source of water until the QSA was implemented in 2003.[81] Between 1982 and 2002, MWD took an average of over 1.1 MAF annually from the Colorado River alongside an average of 860,000 AF annually from the SWP. Over this period, the Colorado River made up 56.8% of MWD's supply while the SWP made up 43.2%. The access to Colorado River water shielded MWD from the worst effects of drought on SWP supplies in 1977 and 1991.

The situation changed once the QSA came into effect in 2003. MWD's firm supply of Colorado River water was reduced to about 600,000 AF.[82] In consequence, MWD has come to rely more

[81] In the fifty years prior to 2003, California overall had exceeded its 4.4 MAF annual apportionment of Colorado River water almost every year, drawing on Arizona's and Nevada's unused apportionments. About half of the time California took more than 5 MAF.
[82] See footnote 7 above.

on its SWP supply. Between 2003 and 2020, the Colorado River made up about 37% of MWD's supply, while the SWP made up about 63%.

Q. Apart from the reduction in MWD's water right once the QSA was implemented, are there any supply reliability issues affecting Colorado River water?

A. Climate change, which has been impacting the availability of streamflow in the Sacramento River Basin, is also affecting streamflow in the Colorado River Basin.

The drought in the Colorado River Basin has actually been more severe and more sustained than that in the Sacramento River Basin.

Lake Mead was last at full capacity (an elevation of 1,221 feet) in 2000. Over the subsequent 22 years, the watershed has experienced 17 dry years. According to Udall and Overpeck (2017): "Between 2000 and 2014, annual Colorado River flows averaged 19% below the 1906–1999 average, the worst 15-year drought on record. Approximately one-third of the flow loss is due to high temperatures now common in the basin, a result of human caused climate change."[83] The drought continued, with dry winters in 2019-2020 and in 2020-2021.

Until now, water users were shielded by the availability of extensive storage in the basin, including in Lake Mead and Lake Powell, the two largest reservoirs in the U.S. However. Those reservoirs have been depleted since 2000 and are now at the lowest levels ever reached since first being filled (Lake Mead around 1935, Lake Powell in 1980). Between January 1 and October 1 of this year, the water level in Lake Mead dropped by 16 feet and it dropped by another 10 feet by the end of December, for a total of 26 feet this calendar year, to a level of 1,066 feet on 12-28-2021. A decline of one foot in the level of Lake Mead corresponds to a reduction of about 85,000 AF held in storage. Lake Mead is now at 35% of its capacity.

Q. Is the historically low water level in Lake Meade currently an issue for California's water supply from the Colorado River?

A. It is not currently an issue for California.

It *is* an issue for Arizona and Nevada under the Interim Guidelines for the Colorado River Lower Basin promulgated by the Secretary of the Interior in 2007 in response to then seven years of drought in the Colorado River Basin.

The Secretary of the Interior functions as the master of the river for the Colorado River Lower Basin and must approve all diversions in the Lower Basin. The 2007 Guidelines set limits on diversions by the three Lower Basin states depending on the amount of water in storage at Lake Mead. Those limits are now taking effect.

[83] Xiao, Udall and Lettenmaier, "On the Causes of Declining Colorado River Streamflows" *Water Resources Research*, August 2018 subsequently modified this analysis to estimate that 50% of the flow reduction from 2000 to 2014 was due to higher temperatures.

The limits are tied to specific water elevations in Lake Mead. Under the Interim Guidelines, as supplemented by the 2019 Drought Contingency Plan for the Lower Basin, Tier Zero applies in a calendar year when the January 1 elevation is projected to fall below 1,090 feet. This has been in effect since January 2020. Under Tier Zero, Arizona forfeits 192,000 AF of its 2.8 MAF annual entitlement to Colorado River water, and Nevada forfeits 8,000 AF of its annual entitlement to 300,000 AF.

Tier One applies when the elevation at Lake Meade on January 1 is projected to fall below 1,075 feet (which happened this May).[84] Under Tier One, Arizona forfeits a total of 512,000 AF of its Colorado River entitlement, and Nevada forfeits 21,000 AF. In August, the Secretary of the Interior announced that the Tier One restrictions will take effect starting January 2022. Those apply to Arizona and Nevada but not California.

On December 15, California, Arizona and Nevada signed a new agreement, called the 500+ Plan, to spend up to $100 million to add an annual 500,000 AF to storage in Lake Mead in each of 2022 and 2023 to prevent the reservoir level from becoming perilously low.[85] It is not yet clear where the extra 500,000 AF of water will come from. So far, it appears that it may come mainly from reduced agricultural use, with growers in the three states being paid to fallow land.

Q. Could a historically low water level in Lake Meade become an issue for California's water supply from the Colorado River?

A. Yes.

California starts to forfeit some of its annual entitlement to Colorado River if the projected January 1 elevation falls below 1,045 feet, which triggers what is known as Tier 2b.[86] [87] Under Tier 2b, California forfeits 200,000 AF of its 4.4 MAF entitlement to Colorado River water; Arizona forfeits 640,000 AF; and Nevada forfeits 27,000 AF.

If the projected January 1 elevation of Lake Mead falls below 1,025 feet, this triggers Tier Three for that year.[88] Under Tier Three, California forfeits 350,000 AF, Arizona forfeits 720,000 AF, and Nevada forfeits 30,000 AF.

The Bureau of Reclamation issues five-year projections of future conditions in the Colorado River system in January every year and then updates them in April and September (but known as the August projection). The projections released this September, looking through January 2026, project zero chance that Lake Mead will be below 1,025 feet in January 2022, a 25% chance in

[84] To put this in perspective, as explained below Lake Mead is holding water to meet a delivery of 9 MAF to the Lower Basin states and to Mexico, plus there is 0.6 MAF of evaporation loss from Lake Mead. At an elevation of 1,075 feet, Lake Meade is storing about 9.6 MAF.
[85] The federal government will also contribute $100 million. This is expected to raise the reservoir level by about 16 feet.
[86] Tier 2a is triggered if the elevation falls below 1,050 feet. That tier impacts only Arizona (which forfeits 592,000 AF) and Nevada (which forfeits 25,000 AF).
[87] At an elevation of 1,045 feet, Lake Mead is storing about 7.3 MAF.
[88] At an elevation of 1,025 feet, Lake Mead is storing about 6 MAF.

January 2023 (thereby triggering Tier Three), a 44% chance in January 2024, a 59% chance in January 2025, and a 62% chance in January 2026.

The Bureau also projected that, while there is zero chance that Lake Mead will fall below 1,000 feet in January 2022 or 2023, there is a 12% chance that it will fall below 1,000 AF in January 2024, a 19% chance in January 2025, and a 22% chance in January 2026. An elevation below 1,025 feet, such as 1,000 feet, was not anticipated in the 2007 Interim Guidelines and would necessitate more drastic actions by the Lower Basin states.[89]

Obviously, conditions may change between now and January 2023 or January 2025, but as of today there is a real probability that Tier Three may take effect within the next three to five years, thus triggering a reduction in the amount of water that California can obtain from the Colorado River.

Q. If California did have to reduce the amount of water it takes from the Colorado River water, would that affect MWD and SDCWA equally?

A. No.

Reductions in the diversion of Colorado River water are governed by the seniority of the right to that water within California. Under the 1931 Seven-Party Agreement among California users of Colorado River water, there are four tranches of seniority. The first two seniority tranches take up the full current allocation of 4.4 MAF. The senior allocation is 3.85 MAF for Palo Verde Irrigation District, the Yuma Project, and Imperial Irrigation District. Junior to this is an allocation of 550,000 for MWD.[90]

SDCWA obtains all of its Colorado River water in a transfer or exchange with IID, and this water is covered by IID's seniority.

Some of MWD's Colorado River water comes from a transfer agreement with Palo Verde Irrigation District (about 50,000 AF) and is covered by that seniority. The remainder of MWD's Colorado River water comes from its lower seniority right of 550,000 AF, and this is junior to the QSA water which SDCWA obtains from IID.

Therefore, if California is required to forfeit some of its entitlement to Colorado River water, the reduction would be disproportionately larger for MWD than for SDCWA.

Exactly how the reduction would be apportioned among the California users is something that could be modified in future negotiations, including negotiations among the Lower Basin States,

[89] The 2019 Drought Contingency plan itself expires at the end of 2026, by which time a new Drought Contingency Plan will have to be negotiated.

[90] Following this is an additional allocation of 662,000 AF to MWD, followed by an allocation of 300,000 to Imperial Irrigation District and Palo Verde Irrigation District. These would come into play in the event of a surplus supply of Colorado River water.

and also between them and the Upper Basin states, to formulate a post-2026 Drought Contingency Plan. Those negotiations are likely to be brutal.[91]

Q. Will the water supply situation in the Colorado River get better in the long run?

A. No.

In addition to climate change, there is a second calamitous threat to the Colorado River Basin states' entitlements to Colorado River water. Even without climate change, the fact is that the river was over-allocated when the Colorado River Compact was negotiated among the states in 1922. The seven basin states divided up among themselves water that did not actually exist.

The negotiators of the Compact believed that the natural flow of the Colorado River at Lees Ferry was 17.5 MAF. The Compact itself allocated 16.5 MAF – 7.5 MAF each to the Upper and Lower Basins, and 1.5 MAF held for an eventual arrangement with Mexico.[92] This was mistaken in two ways. It overlooked evaporation and operational losses, and it overestimated streamflow.

Because of evaporation and operational losses, there is a water deficit built into the Lake Mead Budget. With releases from Lake Powell upstream and side inflows, the annual inflow into Lake Mead would average 9.0 MAF. Lake Mead is intended to deliver 9.0 MAF to the Lower Basin and to Mexico. However, there is an evaporation loss of 0.6 MAF from Lake Mead itself, and there are evaporation and operational losses downstream of Lake Meade also amounting to about 0.6 MAF. The result is a structural deficit of 1.2 MAF.

At the time the Compact was negotiated, some government hydrologists had lower estimates of the average natural flow of the Colorado River over the prior period 1878-1920, including 14.2 MAF and 15 MAF.[93] These turned out to be closer to the mark. The average over the period 1906-2017 is 14.8 MAF, but with a clear downward trend. The average flow between 2000 and 2018 was only 12.8 MAF; extended through 2021, this average falls to 12.4 MAF.

At its maximum extent (Tier 3), the 2019 Drought Contingency Plan brought about a reduction of 1.1 MAF in total diversions by Lower Basin States, which more or less removed the structural deficit at Lake Mead with an average annual streamflow at Lees Ferry of 14.8 MAF. But, Tier Three is not adequate if the "new normal" average streamflow is 12.4 MAF. Closing that gap might require some cap on Upper Basin diversions along with a substantial increase – perhaps a doubling – in the reductions imposed on the Lower Basin states under a post-2026 Drought Contingency Plan.

[91] The executive director of the Colorado River Board of California, which coordinates California's users of Colorado River water, was quoted last month as saying that the basin states must grapple with the "new normal" of reduced flows. "We're dealing with a new reality, and it's got to change the way we think about putting our long-term plans together" *FarmProgress*, September 17, 2021, accessed at https://www.farmprogress.com/print/444857.

[92] The treaty with Mexico was negotiated in 1944.

[93] The story of these estimates and their neglect by the parties negotiating the Compact is recounted by Kuhn and Fleck, *Science Be Dammed: How Ignoring Inconvenient Science Drained the Colorado River*. University of Arizona Press, 2019.

Q. If MWD is forced to withdraw less water from the Colorado River, and at the same time faces a very much reduced SWP allocation, would that necessarily reduce the amount of water it will deliver to its member agencies, including EMWD?

A. Not necessarily – it depends on several factors including, in the first instance, (i) how much MWD's diversion of Colorado River water and allocation of SWP water are cut back, (ii) how much MWD is able – and decides -- to cushion that blow by drawing on its dry-year reserve of stored surface water and groundwater that year, and (iii) How MWD goes about allocating the remaining shortfall among its member agencies.

Q. How large is MWD's dry-year storage reserve?

A. In the 1991 drought, MWD had a very small dry-year reserve[94] limited primarily to storage in within-district reservoirs. Following the end of the drought, MWD has actively built up a large portfolio of dry-year balances, using both groundwater storage and surface water storage, and located within Southern California, in the San Joaquin Valley, in Coachella Valley, and in Lake Mead. Coming in to 2021, MWD had about 3.2 MAF in dry-year storage, a record high level. Its total storage capacity now amounts to almost 6 MAF.

Q. To what extent would MWD's dry-year storage reserve cushion the blow of a reduced SWP and Colorado River supply?

A. MWD's annual delivery is about 1.6-1.75 MAF, so its beginning of year storage in 2021 represented a roughly two-year reserve supply. As late as early November, it was expecting to end 2021 with about 2.5 MAF in reserve storage, having drawn down about 700,000 AF of its reserve during 2021.[95] If the drought had continued into 2022 and beyond, MWD would have been able to rely on this storage reserve for a second and probably third year.

However, there are two potential complications. One is the fact that there can be some logistical constraints on MWD's ability to access and deploy its reserves at particular times. With storage in groundwater banks, there are constraints on put/take capacity and there may be constraints arising from the need to coordinate with other conjunctive use partners; there is a capacity constraint on the CRA; and there may be a constraint on the amount that MWD can withdraw from storage in Lake Mead when the lake level is dangerously low. The other concern is longer multi-year droughts than we have experienced so far. The period 2014-2016 was the longest multi-year period of critical water shortage experienced so far in modern California. But projected climate change scenarios conducted for California indicate the possibility of significantly longer droughts in the future. It is not clear that MWD yet has the practical capacity to sustain a more severe drought and a longer run drought, especially on the Colorado River.

[94] Dry-year storage balances are distinct from emergency storage balances which are reserved for emergency events such as supply interruptions from earthquakes or pipe ruptures etc. MWD currently aims to hold 0.75 MAF in emergency storage.
[95] MWD staff presentation to Board Water Planning and Stewardship Committee, item 6a, November 8, 2021.

Q. If MWD is short of water, how does it limit the supply available to its member agencies?

A. In 1990 (as noted above) MWD had adopted a first-ever drought management plan which called on member agencies to voluntarily cut their water usage. As that drought grew more severe, this became a mandatory requirement ultimately cutting back municipal water deliveries by 30% and agricultural deliveries by 90%. That rationing program ended when the drought abated.

In 2007, with the possibility of drought re-appearing, MWD initiated a process to develop what became its Water Supply Allocation Plan (WSAP), adopted in February 2008 and put into effect in April 2009, covering the period July 2009 – April 2011.

In 2014, when another dry year was anticipated, the WSAP was updated and then implemented in April 2015, covering the period July 2015 – June 2016.

The 2014 version remains MWD's official policy for allocating supplies in the event of shortage.

Key features of the WSAP are that (1) it does not impose mandatory cutbacks but, instead, uses an economic incentive to encourage member agencies to achieve their targeted reduction in water use, and (2) the targeted reduction is tailored to the circumstances of each member agency based on several factors including its dependence on MWD at the retail level and its existing level of per capita use.

As in the 1990 program, there are tiers of reduction corresponding to the degree of regional water shortage. In Tier 3, which applied in 2015-2016, depending on their situation, member agencies received an allocation from MWD that at a minimum is 7.5% less than their baseline allocation and is no more than 30% below that baseline.[96] In Tier 5, MWD member agencies receive an allocation that at a minimum is 12.5% below their baseline allocation and is no more than 37.5% below that baseline.

However, if a member agency needs to exceed its WSAP allocation, it can do so on payment of a surcharge of $1,480/AF above the MWD Tier 1 water rate[97] for excess water up to 15% over the WSAP allocation, or a surcharge of $2,960/AF for excess water beyond 15% over the WSAP allocation.

[96] Member agencies more heavily dependent on MWD received a smaller cutback.
[97] For comparison, the MWD Tier 1 rate for treated water is $1,104/AF in 2021.

Q. Isn't supply reliability for an urban water agency in California becoming a non-issue because in any future drought the governor will mandate a cutback in per-capita use, following Governor Brown's precedent in 2015-2016, and that will take care of a shortage arising from reduced supplies?

A. No – that is likely too simplistic.

What happens will depend on multiple factors: (i) how severe the drought is and how great a shortage in supply it generates; (ii) whether the governor intervenes and how large a reduction in per capita consumption he mandates; and (iii) to what extent water users actually comply with the governor's mandate. Consumer compliance with a governor's conservation mandate should not be taken for granted. During Governor Brown's 2015-2016 conservation mandate there was less than perfect compliance. While RMWD met its conservation target during the period June 2015 – February 2016, FPUD did not; nor did EMWD. Moreover, during the drought this summer, there was significantly less conservation than had been requested by Governor Newsom.[98]

While SDCWA and MWD member agencies have experienced a remarkable reduction in per-capita water use since around 2010, one cannot necessarily count on that trend to be repeated indefinitely. Looking into the future, demand hardening may become more noticeable.

In short, I do not think it prudent to assume that, as a general proposition, having a more reliable water supply in the future – whether from a more senior right to Colorado River water or from desalination – will have no economic value and will no longer be worth paying for.

Q. Suppose FPUD and RMWD join EMWD and, some time thereafter, MWD faces a shortage of water and imposes an allocation on its member agencies including EMWD. Will FPUD and RMWD experience the same degree of shortage as other member agencies served by EMWD?

A. They may face a larger degree of shortage than some other EMWD wholesale customers.

EMWD is a both a retailer and a wholesaler of water. While about half of EMWD's water supply is local supplies, those are used almost exclusively for EMWD's retail customers. EMWD's wholesale customers receive only M-water from MWD. However, there is a difference with respect to how different wholesale customers receive M-water. By virtue of its location, one existing wholesale customer, Rancho California Water District (RCWD), takes water directly from turnouts on an MWD pipeline, as would FPUD and RMWD if they join EMWD. Other wholesale customers receive M-water pumped by EMWD through EMWD-owned and operated booster stations and transmission lines. These other wholesale customers are therefore connected to

[98] Kurtis Alexander "Californians fail to meet Newsom's water-savings target amid growing drought" *San Francisco Chronicle*, September 22, 2021.

EMWD's distribution system, while RCWD and also FPUD/RMWD if they join are isolated from EMWD's distribution system.[99]

While FPUD and RMWD would – like EMWD's other wholesale customers – receive only M-water from EMWD, their isolation from the EMWD distribution system might leave them a bit more vulnerable in the event that MWD cuts its supply to EMWD: being connected to EMWD's distribution system would make it possible to tap into EMWD's local supply if EMWD were willing to allow that.[100]

RMWD could be especially vulnerable in a shortage of MWD water since it has no local supplies, while most of EMWD's other wholesale customers have substantial local supplies. RCMWD would join the City of Perris as the only wholesale customers entirely dependent on MWD water from EMWD.[101]

Q. Doesn't EMWD's Technical Memorandum of February 12, 2020, demonstrate that EMWD has adequate supplies such that even with a Regional Shortage Level 5 (a 30% cut in MWD deliveries) no wholesale customer, including FPUD and RMWD, would run short of supply or be forced to pay MWD's allocation penalty surcharge?

A. EMWD's memorandum does reach that conclusion, but under some assumptions not all of which seem realistic.

In addition to the Regional Shortage level, which determines the magnitude of the reduction in MWD deliveries, the outcome depends on the base period consumption used by MWD and the adjustments applied to that baseline to account for population growth as well as other adjustments that MWD might apply when calculating the required reduction in member agency use (e.g., 30% reduction under Shortage level 5).

As explained in Appendix B, EMWD's analysis assumed that the baseline allocation to which MWD applied a 30% delivery cut was 47% higher than EMWD actually needed. That is why EMWD projected it had more than enough water for its member agencies, including FPUD and RMWD, in the event of a 30% cut by MWD.

Looking to the future, the notion that EMWD could absorb a 30% cut in MWD deliveries with no ill effect does not strike me as plausible.

[99] The EMWD water rate proposed for FPUD and RMWD shown in Table 11 matches the rate currently paid by RCWD – the MWD Full-Service Tier 1 rate plus a share of MWD's RTS and Capacity charges plus an administrative fee of $11/AF. Other wholesale customers who make use of EMWD's distribution system pay in effect the MWD Full-Service Tier 1 rate plus an EMWD charge of $246/AF.

[100] Despite being isolated from EMWD's distribution system, FPUD and RMWD could in theory obtain virtual access to EMWD's local supply through an in-lieu arrangement under which EMWD forebears from taking some MWD water, substituting more local supply, while FPUD and RMWD divert the additional quantum of water from MWD turnouts. However, that is not presently incorporated and priced into EMWD's agreement with FPUD and RMWD.

[101] With the Santa Margarita Conjunctive Use Project online, about half of FPUD's total use is now local supply. About 58% of RCWD's total use is local supply; for the City of Hemet and Lake Hemet NWD, local supply is about two-thirds of the total use; for the City of San Jacinto, it is 98% of total use.

Q. Is urban growth in EMWD's service area also a possible consideration here?

A. Yes.

In 2019, Riverside County was identified as the fifth fastest growing county in the country. Based on data from the 2020 UWMP, EMWD's retail service population and its current wholesale service area population are each expected to grow by around 22% between 2020 and 2035. Demand for water is expected to grow more over this period -- by 46% in the retail service area and by 59% in the current wholesale service area. By 2035, EMWD will need to supply an additional 75,315 AF/yr (an increase of 49% overall).

While EMWD plans to increase its recycled water supply by 31% and its groundwater supply by 38%, it will also need an extra 24,920 AF/yr from MWD by 2035, an increase of 27% compared to now.

If FPUD and RMWD join EMWD's service area that adds an extra demand of about 17,600 AF/yr in 2030 and 2035, raising the need for extra MWD water to 42,543 AF/yr in 2035, an increase of 46% compared to now.

Q. In summary, how does the reliability of supply for FPUD and RMWD differ if they join EMWD compared to the reliability they have with SDCWA?

A. Riverside County is the fastest growing county in California. EMWD relies on MWD for half of its supply, and it is that half which will have to meet the needs of EMWD's growing wholesale population. SDCWA now relies on MWD for less than 20% of its supply, but it fully shares its non-MWD supply with its member agencies. SDCWA's non-MWD supply is QSA water from the Colorado River, which comes under a higher priority water right than most of MWD's Colorado River M-water, and water from the Carlsbad Desal facility which is fully protected against streamflow uncertainty.

Q. Is it likely that FPUD and/or RMWD will find themselves running out of water if they detach from SDCWA and join EMWD?

A. No.

While FPUD and RMWD are taking something of a gamble on supply reliability if they switch from SDCWA to EMWD, the gamble ultimately is not one of running out of water but, rather, paying a higher price than they had anticipated to get by during a drought.

For surface water users in Southern California (unlike some groundwater users) the risk is not that the tap runs dry but, rather, that a temporary solution in a drought emergency turns out to be a rather expensive proposition.

2.6 WHAT IS THE PROBLEM?

The issue confronting LAFCO – the desire on the part of FPUD and RMWD to detach from SDCWA because of the high cost of SDCWA water – is obviously a serious problem. It raises issues that go beyond FPUD and RMWD, and beyond SDCWA. It points to some fundamental difficulties that are endemic to the economics of water supply in San Diego County that may need to receive more sustained attention.

Q. Is the problem that SDCWA is using water that is just too expensive?

A. No.

Of course, the problem is the high cost of SDCWA water. But the fact is that there is *no* cheap water available in Southern California. All water is expensive and will become even more so in the future.

My analysis above indicates that SDCWA's QSA water is no more expensive than M-water from MWD.

Desal water from Carlsbad is significantly more expensive. But, desal has real economic value as an insurance against both drought and state-mandated conservation reductions in water use, and it proved its value during the drought in 2015-2016.

Like all forms of insurance, desal water becomes economically more valuable if it can be shared across a larger number of persons at risk – that is to say, if it can be shared across a wider swathe of Southern California water users, including other member agencies of MWD. If there is a will to do this on both sides and if a price can be agreed, the economic value of the Carlsbad facility could be enhanced through more widespread sharing using in-lieu arrangements with other MWD members.

As noted above, SDCWA's use of Carlsbad water accounts today for barely over half the cost differential between SDCWA's and MWD's wholesale water rates. Two other factors are at work besides the cost of SDCWA's water supply portfolio.

One major driver of water supply cost is the cost of distribution infrastructure. That varies with several factors including timing and age: with continued inflation in construction costs, older infrastructure built long ago provides cheaper water than infrastructure built recently – until the older infrastructure needs a major investment for maintenance or replacement. Due to the happenstance of timing, SDCWA was significantly upgrading its storage and distribution infrastructure at a time when MWD was not making any unusually large infrastructure investments. This will be reversed in the future as MWD engages with the Delta Conveyance Project.

Another major driver of water costs is the fact that the overwhelming portion of water supply costs are what economists call fixed costs – costs that are not reduced much when the agency delivers less water. Then, almost the same cost has to be spread across fewer units of water supplied, which propels the unit cost upwards.

Rather than the expense of the SDCWA's water supply portfolio, these two factors are the main reason why the gap between SDCWA's and MWD's wholesale rates widened starting around 2010.

Q. Would recycling treated wastewater be a much cheaper source of potable water supply?

A. I do not think so.

Recycling treated wastewater for direct or indirect potable use is not necessarily a cheap source of supply. The cost depends on many factors, including location, treatment method, and the way in which the treated effluent is introduced into the potable distribution system. In some cases, recycled water is cheaper than desalinated water. In other cases, it may not be cheaper. In 2017, an MWD white paper assessed the cost of recycled water as a source of potable supply and found that it ranges from $1,222/AF to $3,224/AF in 2017 dollars.[102]

Even if it is not cost-effective as a source of water supply, recycled water has other important benefits that can justify its use, including environmental benefits and also economic benefits as a solution to overcapacity in wastewater collection, treatment and disposal systems.

Q. If it is not SDCWA's supply sources, what is the real problem with SDCWA water?

A. There are two underlying problems: a problematic fiscal model and a problematic governance model.

Q. What is problematic about SDCWA's fiscal model?

A. There is a structural Imbalance in SDCWA's finances. The imbalance arises from a mismatch between the share of revenues that are variable versus fixed and the share of expenditures that are variable versus fixed.[103] This imbalance is not unique to SDCWA. It is experienced by MWD and by many other water agencies.

If a water agency's variable/fixed split between revenues does match the variable/fixed split between its costs, any variation in the quantity of water that it sells should have little impact on its net revenue. Otherwise, sales variation can have a significant impact.

[102] MWD *California WaterFix Finance and Cost Allocation*, August 2017.

[103] I use "variable" and "fixed" in their economic sense. If an expenditure is fixed in this sense, this does not mean that it cannot be reduced; it means that it cannot be reduced *just by selling less water*. Some of the comments on my October Draft Report seem to have misunderstood that distinction.

For most water agencies in practice, the share of their costs that is fixed is far larger than the share of their revenues that is fixed. This is good news if there is a rising trend in water sales. Selling more water raises revenues more than it raises costs (because their revenue has a larger variable cost component than their expenditure). But, for many water agencies in Southern California, the sales trend is downwards, not upwards.[104] With a downward sales trend, revenue falls by more than costs, causing net revenue to drop.

Tables 11 and 12 above showed the split between variable and fixed components of expenditure for SDCWA and MWD. Table 23 below presents MWD's split between variable and fixed components of revenue, which can be compared with SDCWA's split shown in Table 17. Table 24 uses these data to compare the variable/fixed split between expenditures and revenues overall for SDCWA and MWD.

TABLE 24 | MWD Revenue Breakdown

	ITEM	$ millions	Percent		Revenue Type
	Water Related Revenue				
a	Water Sales	$1,188.0	75.7%		**Variable**
b	Readiness to Serve Charge	$134.5	8.6%		Fixed - short-run
c	Capacity Charges	$30.5	1.9%		Fixed - short-run
d	Subtotal Operating Revenue	$1,353.0	86.2%		
	Other Revenue				
e	Property Tax	$146.9	9.4%		Fixed
f	Power Sales	$15.9	1.0%		Fixed with regard to water sales
g	Investment Income	$28.9	1.8%		Fixed
h	Other Revenue	$24.5	1.6%		Fixed
i	**TOTAL REVENUE & OTHER INCOME**	**$1,569.2**	**100.0%**		

NOTE: "Variable" means that this revenue varies directly with the quantity of water delivered that year by MWD its member agencies. "Fixed" means that the revenue does not vary directly with the quantity of water delivered that year.

[104] With EMWD and Riverside County being notable exceptions.

TABLE 25 | Shares of Fixed vs Variable Revenue & Cost, SDCWA and MWD

		SDCWA		MWD	
		% VARIABLE	% FIXED	% VARIABLE	% FIXED
	REVENUE				
a	As Share of Operating Revenue	72%	28%	88%	12%
b	As Share of Total Revenue	63%	37%	76%	24%
	EXPENDITURE				
c	As Share of Operating Expenditure	15%	85%	16%	84%
d	As Share of Total Expenditure	11%	89%	12%	88%
SOURCE					
a	Table 17, row a/row f. Table 23, row a/row d.				
b	Table 17, row a/row p. Table 23, row a/row i.				
c	Table 11, row d/row i. Table 12, (rows a + c)/row i.				
d	Table 11, row d/row o. Table 12, (rows a + c)/row l.				

SDCWA and MWD are in a very similar position with respect to expenditures: the fixed costs of water supply account for about 85% of the cost of operations in the case of SDCWA and 84% for MWD. On the revenue side, fixed revenue sources account for only 28% of SDCWA's revenue but for significantly less – 12% -- in the case of MWD.

The difference in variable/fixed revenue split between SDCWA and MWD is testimony to SDCWA's foresight in introducing the Infrastructure Access Charge in 1998 and the Supply Reliability Charge in 2015. However, even though SDCWA's mismatch between the variable/fixed split of revenue and expenditure is less severe than MWD's mismatch, it still constitutes a serious financial problem for SDCWA in an era of declining deliveries to member agencies.

Consider the following hypothetical example. In FY 2020, SDCWA earned water operating revenue of $585.1 M (Table 17) and it delivered 354,007 AF of water. That corresponds to an ex post all-in revenue rate of about $1,653/AF.[105] Suppose SDCWA delivered 1,000 AF less to some member agencies. About 72% of the all-in rate is variable revenue which will be lost when sales decline by 1,000 AF, leading to a revenue loss of about $1.2M (= 0.72*1653*1000). On the expenditure side, about 15% of the $1,653/AF is variable cost, so SDCWA's saving in expenditures when it delivers 1,000 AF less to member agencies amounts to only about $0.25M (= 0.15*1653*1000). Using these figures, when SDCWA deliveries decline by 1,000 AF its net revenue falls by $0.94 M – unless the rate structure is altered to offset this.

[105] This is an ex post all-in rate which will differ from the all-in rate stated when the next year's rates are announced, since that is based on a projection of sales. Also, $1,653 is the all-in rate averaged over all member agencies. Because the balance of fixed and variable charges varies among member agencies, one member agency's all-in rate will be different from another's – as exemplified by the difference between FPUD and RMWD in row n of Table 16.

This back-of-the envelope calculation is intended as an illustration of the phenomenon that is in play not only with detachment by member agencies but also with demand roll-off when member agencies substitute increased use of local recycled water for SDCWA delivery. Such roll-offs are projected to occur between now and 2030 in an amount exceeding 60,000 AF.

Detachment is certainly different than demand roll-off because, with a roll-off, the agencies are still members of SDCWA and can in theory be assessed charges that would offset the net revenue loss; with detachment the members cannot be assessed charges except in the case of a departure fee. However, the difference between detachment and roll-off may turn out not to be that large in practice: both phenomena are financially detrimental to SDCWA.

Q. What is problematic about SDCWA's governance model?

A. Just as SDCWA's fiscal model is essentially the same as that of many other water agencies including MWD so, too, its governance model is not particularly different from that of other water agencies, including MWD. Under this common model, member agencies are represented on the Board of Directors, and the Board decides infrastructure investments through some form of majority voting. But investment decisions are made without any upfront commitment by member agencies to take and pay for the water that will be generated. This strategy commits current resources without guaranteeing the future revenues to pay for new investments. Almost thirty years ago, this was flagged as a problem for MWD by a 1993 Blue Ribbon Task Force.[106] The Task Force stated that it was

> "troubled to learn, for example, that some of the member agencies most strongly supporting big-ticket projects like the [Eastside] reservoir also had the most aggressive plans to reduce their future MWD water purchases and develop independent supplies. In effect, such agencies appear to want MWD to develop costly backup capacity-or insurance-for their local supply strategies, while seeking to shift the costs for these benefits on to Metropolitan and other agencies and consumers."[107]

A consequence was that:

> "Current users-which control the Board-will have incentives to define new and future capacity investments in ways that may shift the costs of system improvements that actually benefit both current and future consumers exclusively onto future users."[108]

This is ultimately a problem of governance. The Task Force asserted that "regional governance concerns are at the heart of MWD's planning, pricing, and strategic implementation activities" and it concluded that:

[106] I served as a consultant to the Task Force's Subcommittee on IRP and Rate Structure.
[107] Metropolitan Water District Blue Ribbon Task Force, *Final Report*, January 1994, p.23.
[108] Op cit., p 17.

> "Governance skills also will determine if MWD can actually pay for its future projects. With bond and property tax revenues limited, and in an era of high business and consumer rate sensitivity, MWD can no longer afford to build major facilities and hope that member agencies will buy enough water to pay for them over several years."[109]

In the same vein, MWD's 2010-2011 Blue Ribbon Committee remarked:

> "The challenge going forward for MWD, and its members is to develop a business model, and associated governance approach, that manages risks associated with investments in both imported and local resources and infrastructure."[110]

It is certainly understandable that member agencies of an organization like SDCWA or MWD like the flexibility to change their supply portfolio in the future without being tied down by purchase commitments. But this can also be financially detrimental to the wholesaler organization and to other member agencies. Water supply infrastructure is massively capital intensive and very long-lived. It cannot be funded on a PayGo basis; it needs a long-term financial commitment. The problem was less severe in the past when property tax revenues provided the main repayment source for water infrastructure investments. That source of revenue stability is now lacking.

MWD's 2010-2011 Blue Ribbon Committee identified two elements of a solution: (i) MWD should aim for water supply security through diversity in the supply portfolio, and (ii) MWD should play an increased role in facilitating and managing transfers and trades in water among member agencies. MWD and SDCWA have both made great progress with respect to (i), but almost none with respect to (ii).

Q. Are water transfers a solution?

A. It depends. There are two different conceptualizations of urban water marketing in Southern California, a top-down conception and a bottom-up conception.

Q. What is the difference between the top-down and the bottom-up conceptions of water marketing?

A. In the top-down conception, SDCWA and MWD are the principal actors in the water transfer activity in Southern California, initiating and implementing transfers through the water distribution networks that they control.

The drawback with this approach is the fact that the necessity for water transfers arises increasingly from the local needs of member agencies reflecting a diversity of local factors – their changing customer mixes, their different potentials for water conservation, and their different opportunities for demand management and for increasing local supply through new recycling

[109] Ibid.
[110] Metropolitan Water District, *Report of the Blue Ribbon Committee*, April 12, 2011, pp 50-51.

and/or groundwater development. This diversity creates differences in the need for, and economic value of, water supply reliability. Differences in the individual circumstances of SDCWA and MWD member agencies create the potential for a significant regional economic benefit from water transfers. In economics, gains from trade are generated, and markets thrive, where there is sufficient heterogeneity among the potential market actors. That level of heterogeneity now exists in Southern California – not so much as the aggregate regional level (SDCWA versus MWD) but at the level of individual water agencies – for example, RMWD versus the City of San Diego.

To take advantage of the variety in individual member needs and to overcome the financial challenges confronting Southern California's water at a time of climate change, it will be important that local member agencies step up, take more responsibility for the water they obtain through regional wholesalers, commit financially on a long- rather than short-term basis, and become leading actors in shaping their individual supply portfolios through water transfers and exchanges as needed. In that scenario, SDCWA and MWD will to some degree become facilitators and providers of assistance rather than the principals. For this to work, it will also be essential to have a strong degree of cooperation and collaboration between SDCWA and MWD as Southern California's two premier water supply agencies.

APPENDIX A

REVIEW OF LONDON MOEDER ADVISORS "*RAINBOW MWD & FALLBROOK PUD COST-BENEFIT ANALYSIS OF SDCWA MEMBERSHIP*"

The LMA Report contains three sections, each of which I consider in turn.

1. Fixed Charge Analysis

LMA note that, over the period 2010 – 2019, SDCWA received approximately $1.233 billion in revenue from fixed charges from member agencies – the customer service charge, storage charge, supply reliability charge and infrastructure access charge. The charges paid by FPUD and RMWD over that period amounted to approximately $56 million, or 4.5% of the SDCWA total.

LMA go on to observe that between 2010 and 2019 there were a total of 908,302-to-925,093-meter equivalents served by the SDCWA system. FPUD and RMWD consistently comprised approximately 2.7% to 2.9% of all meter equivalents served by SDCWA.

LMA note that had FPUD and RMWD's share of all SDCWA member agency fixed charges been the same as their share of meter equivalents (2.8%), FPUD and RMWD would have paid a total of $34.5 million in fixed charges to SDCWA over the period 2010 – 2019, instead of $56 million. LMA imply that FPUD and RMWD paid more than their fair share of SDCWA fixed charges.

I disagree.

While SDCWA allocates the total fixed charge revenue to be raised through the infrastructure access charge among member agencies in proportion to their share of the meter equivalents served by the Authority, it allocates the total revenue to be raised through each of the other three fixed charges in proportion to member agencies' share of the three- or five-year rolling average of all water purchases or M&I water purchases.

That FPUD's and RMWD's combined share of all fixed charges is 4.5% while their combined share of meter equivalents is 2.8% reflects the fact, on average, *FPUD and RMWD customers use more water per meter equivalent than do customers of the other SDCWA member agencies.*

By way of example, in FY 2019, FPUD and RMWD together accounted for 5.9% of the water supplied by SDCWA to member agencies, while at the same time accounting for 2.9% of the meter equivalents. Specifically, In FY 2019 FPUD and RMWD received 22,253 AF from SDCWA for use by their 26,542-meter equivalents (ME), amounting to a usage of 0.8384 AF per ME. In FY 2019, the other member agencies combined received 356,277 AF for use by 898,551 ME, amounting to an average usage of 0.3965 AF per ME. *The average usage of SDCWA water per meter equivalent within the FPUD and RMWD service areas in FY 2019 was more than twice that of the other member agencies* (0.8384 AF/ME versus 0.3965 AF/ME).

Based on my own experience of analyzing the costs of municipal water supply systems in California, I see no reason for apportioning the fixed costs of water supply among wholesale customers of a supply agency like SDCWA based on the member agencies' shares of the total number of meter equivalents serviced by the wholesale agency.

From an economic perspective, it is more appropriate to allocate fixed costs among member agencies based on (i) their share of annual water deliveries, or on something like (ii) their share of peak hourly or daily deliveries. Those variables are more likely to drive the fixed costs experienced by SDCWA than the number of meter equivalents serviced by the individual member agencies.

2A. Benefits Received by FPUD and RMWD

The LMA report equates the degree to which FPUD and RMWD benefit from their membership in SDCWA to the share of their water supply *not* "received from" MWD.

For example, the report states that, prior to 2020, 85% of FPUD's water supplies "were received directly from MWD facilities," the remaining 15% being received from SDCWA facilities. From this, the report infers that FPUD benefits from SDCWA membership only for 15% of its water supply.

LMA makes a parallel argument with respect to RMWD.

This argument is not correct.

Even if FPUD and RMWD were to receive *all* of their water supply as treated water from MWD's Skinner Water Treatment Plant delivered to them via flow control facilities owned by MWD, all of that water is a benefit of their SDCWA membership. FPUD and RMWD would not be in a position to receive a single drop of water from the Skinner Plant if (1) SDCWA were not a member agency of MWD, and (2) had not contracted with MWD to receive that water.

Some of the water from Skinner is QSA water that belongs to SDCWA, not MWD. The rest of the water from Skinner is MWD water (from the State Water Project or obtained under MWD's rights to Colorado River water) which has been purchased by SDCWA from MWD as a member agency. Either way, all of the water received by FPUD and RMWD from Skinner belongs to SDCWA and comes to FPUD and RMWD as a benefit of their membership in SDCWA. FPUD and RMWD cannot assert a sort of riparian right to water flowing in MWD-owned facilities through their service areas.

Therefore, LMA's conclusion that, over the period 2010 – 2019, FPUD and RMWD benefited from their membership of SDCWA only in the amount of $6.5 million is not correct.

2B. Benefit – to – Cost Ratio

The LMA Report's benefit-cost analysis is not correct.

The measurement of the benefits received by FPUD and RMWD is not correct for the reason I have stated above (in 2A).

The measurement of the "fair share of fixed charges" attributed by LMA to FPUD and RMWD is not correct for the reason I have stated above (in 1).

Consequently, the estimate in the Report that FPUD and RMWD have subsidized the remaining member agencies by $49.5 million over the period 2010 – 2019 lacks foundation and is incorrect. The same observation applies to the statements in the LMA report that (1) during the years of 2010 through 2019, FPUD and RMWD achieved a benefit-to-cost ratio of 0.12 from the payment of fixed charges, and (2) the remaining MDCWA member agencies have benefited from this imbalance representing a benefit-to-cost ratio of 1.04. Both statements lack foundation and are incorrect.

3. Reallocation of Fees

The LMA Report assesses the financial impact of FPUD and RMWD de-annexation on the remaining member agencies. The report observes that, between 2010 and 2019, FPUD and RMWD paid SDCWA an average of approximately $5.6 million annually in fixed charges. The report goes on to state that $5.6 million per year "represents the hypothetical amount that SDCWA will have to re-allocate to the remaining member agencies in order to avoid an increase in variable water rates."

The statement just cited is not correct, for two reasons.

First, under de-annexation, in addition to the loss of revenues from the fixed charges considered by LMA (the customer service charge, storage charge, supply reliability charge and infrastructure access charge), SDCWA would also lose some quantum of revenue from property taxes, capacity charges and the availability standby charge. These revenues are used to finance some of SDCWA's fixed costs of operation that would still be incurred by SDCWA for the benefit of its member agencies after de-annexation.

Secondly, SDCWA also uses a large portion (in fact, the majority) of the revenue from its variable water rates to cover fixed costs of operation. Under de-annexation, SDCWA's water rate revenue would go down, but it would still incur the same fixed costs that are paid for through variable water rates.

With a reduced volume of water delivered due to the de-annexation of FPUD and RMWD but the same fixed costs, SDCWA would have to raise not only its fixed charges but also its variable water rates in order to offset the revenue loss.

Consequently, LMA's estimate of $5.6 million for the annual financial impact of de-annexation on the remaining SDCWA member agencies is a significant understatement.

APPENDIX B

REVIEW OF EMWD TECHNICAL MEMORANDUM "*ANALYSIS OF EASTERN MUNICIPAL WATER DISTRICT'S WATER SUPPLY AND SYSTEM RELIABILITY WITH THE POTENTIAL ANNEXATION OF FALLBROOK PUBLIC UTILITY DISTRICT AND RAINBOW MUNICIPAL WATER DISTRICT" FEBRUARY 12, 2020.*

This EMWD memorandum evaluates how annexation of FPUD and RMWD into EMWD's wholesale service area would impact EMWD's water supply portfolio under three planning scenarios and in three alternative Regional Shortage Levels (1, 3 and 5) as defined in MWD's Water Supply Allocation Plan (WSAP).

The memorandum finds that, under all of the conditions evaluated adequate supplies existed such that no single EMWD retail agency, including RMWD and FPUD, would be subject to the MWD allocation surcharge even at a Regional Shortage Level 5.

Context

In 1990, MWD had adopted a first-ever drought management plan which called on member agencies to voluntarily cut their water usage. As that drought grew more severe, this became a mandatory requirement ultimately cutting back municipal water deliveries by 30% and agricultural deliveries by 90%. That rationing program ended when the drought abated.

In 2007, with the possibility of drought re-appearing, MWD initiated a process to develop what became its Water Supply Allocation Plan (WSAP), adopted in February 2008 and put into effect in April 2009, covering the period July 2009 – April 2011.

In 2014, when another dry year was anticipated, the WSAP was updated and then implemented in April 2015, covering the period July 2015 – June 2016.

The 2014 version remains MWD's official policy for allocating supplies in the event of shortage.

Key features of the WSAP are that (1) it does not impose mandatory cutbacks but, instead, uses an economic incentive to encourage member agencies to achieve their targeted reduction in water use, and (2) the targeted reduction is tailored to the circumstances of each member agency based on several factors including its dependence on MWD at the retail level and its existing level of per capita use.

As in the 1990 program, there are tiers of reduction corresponding to the degree of regional water shortage. When MWD has a shortage, this is said to be an "allocation" situation. In a Tier 1 Shortage, depending on their situation member agencies face a reduction in the amount of water allocated to them by MWD amounting to between 5% and 7.5% of the amount that would

have been allocated in the absence of shortage.[111] In a Tier 3 Shortage, which applied in 2015-2016, member agencies face a reduction in the amount of water allocated to them by MWD amounting to between 15% and 22.5% of the amount that would have been allocated in the absence of shortage. In a Tier 5 Shortage, member agencies face a reduction in the amount of water allocated to them by MWD amounting to between 25% and 37.5% of the amount that would have been allocated in the absence of shortage.

However, if a member agency wishes to exceed its WSAP allocation, it can still do so on payment of a surcharge. The surcharge amount is $1,480/AF above the MWD Tier 1 water rate[112] for excess water up to 15% over the WSAP allocation, or $2,960/AF for excess water beyond 15% over the WSAP allocation.

Thus, rather than placing an absolute limit on the amount of water it will deliver to a member agency in a shortage situation, as in 1990, with the WSAP program MWD employs stiff financial incentives to constrain the demand for its water during an allocation year.

EMWD'S Analysis

EMWD analyzed three shortage scenarios.

One scenario was the 2015 Drought. This scenario considered how EMWD's customers, along with FPUD and RMWD, would have fared during the severe drought conditions resulting in 2014-2016 under the emergency conservation order issued by Governor Brown.

Another scenario was current day conditions, as of 2019 (the report was finalized in February 2020). This scenario considered how EMWD's customers, along with FPUD and RMWD, would have fared had MWD implemented an allocation during 2019.

The final scenario was future conditions in 2035. This scenario considered how EMWD's customers, along with FPUD and RMWD, would fare in the future, using projections for 2035 taken from EMWD's 2015 Urban Water Management Plan.

For my purposes, the current day conditions (2019) scenario seems most relevant. I confine my remarks here to that scenario. For that scenario, EMWD used several assumptions, the most important being the following:

1. The base period used to calculate MWD's allocation was calendar year 2013 and 2014 – this is the base period previously used for an allocation by MWD and it represents the most recent period where demands were not influenced by drought response both at the

[111] Member agencies more heavily dependent on MWD receive a cutback at the lower end of the scale. In addition, there is a reward for having lowered per capita water use as between a baseline period and the current year, which takes the form of a small additional allocation based on the amount of the reduction in per capita water use. Member agencies also receive a credit (in the form of a larger allocation) for "extraordinary" local supply being put to use during an allocation period.

[112] For comparison, the MWD Tier 1 rate for treated water is $1,104/AF in 2021.

local and state level. That is consistent with MWD's intent to define a base period that reflects non-drought conditions.

2. The allocation year is 2019.
3. The adjustment for population growth between the base period and the allocation period was based on population estimates generated by the California Department of Finance. Since the base period was 2013-2014, the growth rate was calculated as the growth from the 2013-2014 average population value to the 2019 population value.
4. Allocation year local supplies were assumed to be equal to actual local supply usage in calendar year 2019.
5. No adjustments permitted by the WSAP for conservation demand hardening or low per-capita use were applied.
6. No extraordinary local supplies were considered.
7. While 2019 was actually a wet year rather than a dry year, the hydrology still resulted in reduced service area demands – accordingly, 2019 totals were assumed to reflect a dry year with some degree of customer conservation in place.

EMWD's technical analysis demonstrated that, under these conditions in 2019, EMWD and all the agencies it served (plus FPUD and RMWD if it served them) would be in compliance with MWD's shortage allocation, regardless of whether the Shortage Level was Tier 1, Tier 3 or Tier 5. Neither EMWD nor its member agencies (including FPUD and RMWD) would be in a situation where they have to pay MWD's allocation surcharge.

Some Limits to EMWD's Analysis

EMWD's technical analysis is thoughtful and painstaking. It is certainly to be commended.

However, there is one important issue.

In an email dated October 15, 2021, responding to some questions I had emailed the day before, Nick Kanetis forwarded to me comments made in response by EMWD's Gordon Ng. Gordon Ng indicated that, while he couldn't be absolutely sure, he guessed that the cutback in MWD supplies imposed on EMWD during an allocation would likely be around the middle of the range – i.e., an 18% cutback in the case of a Tier 3 Shortage. Extrapolating, this implies a 6% cutback in the case of a Tier 1 Shortage, and a 30% cutback in the case of a Tier 5 Shortage.

Combining those percentage cutbacks with the resulting MWD allocations as projected by EMWD for the current day conditions scenario in Tables 5, 6 and 7 allows me to back out the implied allocation of water by MWD to EMWD in the absence of a shortage. This comes out to around 124,000 AF.

As reported by MWD, the amount of water actually delivered by MWD to EMWD in 2019 was about 84,000 AF. That figure is also consistent with the data in the first two columns of Tables 5, 6 and 7 in EMWD's Technical Memorandum. Those columns show EMWD's projected total

potable demand in 2019 and EMWD's local potable supply in 2019. The difference between the two numbers is what EMWD would have obtained from MWD, and that amounts almost exactly to 84,000 AF.

Thus, the current day conditions scenario in EMWD's Technical Memorandum has MWD allocating 124,000 AF for EMWD under non-shortage conditions, and then reducing that by 6%, 18% or 30% depending on whether there was a Tier 1 Shortage, a Tier 3 Shortage or a Tier 5 Shortage. But, EMWD actually needed only 84,000 AF from MWD in 2019. This difference is why EMWD turns out to have more than enough water for its member agencies (including FPUD and RMWD) in the face of a Tier 1, Tier 3 or Tier 5 shortage: MWD was basing the cutback on a presumed demand from EMWD for MWD water of 124,00 AF, which is about 47% larger than the actual demand from EMWD.

Some discrepancy between MWD's projection of a member agency's demand for MWD water in the absence of shortage and the agency's actual demand in a shortage year is inevitable for two reasons:

(1) Under the WSAP protocol, MWD is basing its projection of demand for MWD water on updates of information from a previous base period, and the updating can introduce some error.
(2) Because it is a shortage year, the demand for water in the member agency will be depressed by drought restrictions on water use and conservation requirements whether at the local or state levels.

In this case, however, drought restrictions *alone* are unlikely to explain a 47% gap between the actual member agency demand for MWD water in a shortage year and the non-shortage member agency demand from which MWD thought it was cutting back its delivery.

Implications

MWD and its member agencies are much better prepared for drought today than they were in 1990. MWD has vastly more reserves in storage today than it did in 1990. MWD's WSAP protocol is, in my view, a superior approach to handling scarcity than what MWD did before WSAP was introduced. However, it is also true that in past droughts MWD and Southern California were shielded from the effects more than Northern California because of their access to water from the Colorado River – in all of California's droughts up to now, including 2012-2016, Colorado River water was Southern California's bulwark.

As of this year, that has changed. The vulnerability of the Colorado River to climate change is being dramatically re-assessed, as reflected in the Bureau of Reclamation's new supply projection methodology introduced in the last month or two.

We know how painful a 30% cut in MWD deliveries was back in 1990. Therefore, the notion that EMWD could today absorb a 30% cut (Tier 5) in MWD deliveries with no ill-effect is quite striking. The technical analysis in EMWD's memorandum is impressive. But, I do not consider it conclusive proof that EMWD could not be significantly affected in the future by reduced MWD deliveries on the scale of a Tier 5 Shortage, or even a Tier 3 Shortage.