MEETING OF THE BOARD OF DIRECTORS OF THE
MUNICIPAL WATER DISTRICT OF ORANGE COUNTY
Jointly with the
PLANNING & OPERATIONS COMMITTEE
June 6, 2022, 8:30 a.m.

Due to the current state of emergency related to the spread of COVID-19 and pursuant to Government Code Section 54953(e), MWDOC will be holding this Board and Committee meeting by Zoom Webinar and will be available by either computer or telephone audio as follows:

Computer Audio: You can join the Zoom meeting by clicking on the following link:
https://zoom.us/j/8828665300

Telephone Audio:	**(669) 900 9128 fees may apply**
	(877) 853 5247 Toll-free
Webinar ID:	**882 866 5300#**

P&O Committee:
Director Tamaribuchi, Chair
Director McVicker
Director Nederhood

Staff: R. Hunter, J. Berg, V. Osborn, H. De La Torre, T. Dubuque, D. Micalizzi, H. Baez, T. Baca

Ex Officio Member: Director Yoo Schneider

MWDOC Committee meetings are noticed and held as joint meetings of the Committee and the entire Board of Directors and all members of the Board of Directors may attend and participate in the discussion. Each Committee has designated Committee members, and other members of the Board are designated alternate committee members. If less than a quorum of the full Board is in attendance, the Board meeting will be adjourned for lack of a quorum and the meeting will proceed as a meeting of the Committee with those Committee members and alternate members in attendance acting as the Committee.

ROLL CALL

PUBLIC COMMENTS - Public comments on agenda items and items under the jurisdiction of the Committee should be made at this time.

ITEMS RECEIVED TOO LATE TO BE AGENDIZED - Determine there is a need to take immediate action on item(s) and that the need for action came to the attention of the District subsequent to the posting of the Agenda. (Requires a unanimous vote of the Committee)

ITEMS DISTRIBUTED TO THE BOARD LESS THAN 72 HOURS PRIOR TO MEETING -- Pursuant to Government Code section 54957.5, non-exempt public records that relate to open session agenda items and are distributed to a majority of the Board less than seventy-two (72) hours prior to the meeting will be available for public inspection in the lobby of the District's business office located at 18700 Ward Street, Fountain Valley, California 92708, during regular business hours. When practical, these public records will also be made available on the District's Internet Web site, accessible at http://www.mwdoc.com.

ACTION ITEM

1. EXTENSION OF CONSULTING CONTRACT WITH ACKERMAN CONSULTING

DISCUSSION ITEMS

2. STATUS UPDATE REGARDING THE OC RELIABILITY STUDY

3. PRESENTATION REGARDING THE ECONOMIC BENEFITS STUDY

INFORMATION ITEMS (The following items are for informational purposes only – background information is included in the packet. Discussion is not necessary unless requested by a Director.)

4. UPDATE REGARDING MWDOC MEMBER AGENCY FACILITATED DISCUSSIONS

5. 2022 OC WATER SUMMIT UPDATE

6. STATUS REPORTS
   a. Ongoing MWDOC Reliability and Engineering/Planning Projects
   b. WEROC
   c. Water Use Efficiency Projects
   d. Public and Government Affairs

7. REVIEW OF ISSUES RELATED TO PLANNING OR ENGINEERING PROJECTS, WEROC, WATER USE EFFICIENCY, FACILITY AND EQUIPMENT MAINTENANCE, WATER STORAGE, WATER QUALITY, CONJUNCTIVE USE PROGRAMS, EDUCATION, PUBLIC AFFAIRS PROGRAMS AND EVENTS, PUBLIC INFORMATION PROJECTS, PUBLIC INFORMATION CONSULTANTS, DISTRICT FACILITIES, and MEMBER-AGENCY RELATIONS

ADJOURNMENT

NOTE: At the discretion of the Committee, all items appearing on this agenda, whether or not expressly listed for action, may be deliberated, and may be subject to action by the Committee. On those items designated for Board action, the Committee reviews the items and makes a recommendation for final action to the full Board of Directors; final action will be taken by the Board of Directors. Agendas for Committee and Board meetings may be obtained from the District Secretary. Members of the public are advised that the Board consideration process includes consideration of each agenda item by one or more Committees indicated on the Board Action Sheet. Attendance at Committee meetings and the Board meeting considering an item consequently is advised.

Accommodations for the Disabled. Any person may make a request for a disability-related modification or accommodation needed for that person to be able to participate in the public meeting by telephoning Maribeth Goldsby, District Secretary, at (714) 963-3058, or writing to Municipal Water District of Orange County at P.O. Box 20895, Fountain Valley, CA 92728. Requests must specify the nature of the disability and the type of accommodation requested. A telephone number or other contact information should be included so that District staff may discuss appropriate arrangements. Persons requesting a disability-related accommodation should make the request with adequate time before the meeting for the District to provide the requested accommodation.

Item No. 1

ACTION ITEM
June 15, 2022

TO: Board of Directors

FROM: **Public Affairs & Legislation Committee**
(Directors Tamaribuchi, McVicker and Nederhood)

Robert Hunter
General Manager

Staff Contact: Heather Baez

SUBJECT: **EXTENSION OF CONTRACT WITH ACKERMAN CONSULTING**

STAFF RECOMMENDATION

Staff recommends the Board of Directors to consider extending the contract for one-year with Ackerman Consulting for specialized services.

COMMITTEE RECOMMENDATION

Committee recommends (To be determined at Committee Meeting)

REPORT

Ackerman Consulting has provided legal and regulatory consulting services to the Municipal Water District of Orange County (MWDOC) since 2009. This contract was sent out for competitive bid in 2018 for a one-year contract beginning in fiscal year (FY) 2018-2019, with the option to renew annually for four additional years. This is the final year of the new contract.

Due to the retirement of MWDOC's county advocate, John Lewis, the Ackerman Consulting scope has been expanded to include additional duties at the county level. Anticipating the additional duties, staff recommends a contract increase from $36,000/year to $42,000/year (the same amount as Mr. Lewis), which was approved by the Board of Directors in the FY 2022-2023 annual budget.

Below is Ackerman's proposed scope of services for your review, input, and approval.

Budgeted (Y/N): Y	Budgeted amount: $42,000	Core X	Choice __
Action item amount: $42,000	Line item: 31-7040		
Fiscal Impact (explain if unbudgeted):			

Scope of Work for FY 2022-2023:

- Represent MWDOC's interests with the Orange County Board of Supervisors and staff, OC LAFCO, and other local groups as requested;
- Promote MWDOC projects and initiatives with local government agencies as requested;
- Monitor, track, and analyze local issues that relate to MWDOC and its member agencies;
- Advise MWDOC on current legal, regulatory, and other events bearing on water issues;
- Monitor and advise MWDOC on issues of concern to its member agencies;
- Work with Orange County cities, the Association of California Cities-Orange County, and the Orange County League of Cities in association with MWDOC and its priorities and principles;
- Work with the Board of Directors, staff, and member agencies on regional efforts in Orange County;
- Assist in developing strategies and policies to raise awareness and support of issues relating to MWDOC and its member agencies; and
- Monitor and keep MWDOC informed on opportunities to participate in various groups related to water, CEQA reform, and public works initiatives

Mr. Ackerman will continue working within the scope of services helping MWDOC identify priorities and opportunities in the outlined areas as needed.

BOARD OPTIONS

Option #1

- Approve contract extension for one year with Ackerman Consulting.

Fiscal Impact: $42,000 for FY 2021-2022 (approved in the budget)
Business Analysis: Mr. Ackerman's background, legal/regulatory expertise, and community/industry relations provide MWDOC directors and staff with assistance and additional advocacy at the local, county, and statewide level. In addition, Mr. Ackerman provides strategic advice on a number of initiatives, such as CEQA reform, public works projects, and regulatory efforts as they related to MWDOC and its member agencies, as needed.

Option #2

- Do not approve contract extension with Ackerman Consulting.

Fiscal Impact: Reduced costs of $42,000
Business Analysis: MWDOC will see a decrease in legal/regulatory information, advocacy at the local and county level, along with a decrease in access to a specialized consultant with years of institutional knowledge and beneficial relationships.

Staff Recommendation

Option #1

Item No. 2

COMMITTEE DISCUSSION ITEM
June 6, 2022

TO: **Planning & Operations Committee**
(Directors Tamaribuchi, McVicker, Nederhood)

FROM: **Robert Hunter, General Manager**

Staff Contact: Charles Busslinger

SUBJECT: STATUS UPDATE REGARDING THE OC RELIABILITY STUDY

STAFF RECOMMENDATION

Staff recommends the Planning & Operations Committee view the presentation and provide feedback on desired modifications to the update study.

COMMITTEE RECOMMENDATION

Committee recommends (To be determined at Committee Meeting)

DETAILED REPORT

Staff and consultant CDM Smith have been working on an update to the 2018 OC Reliability Study. The team has reviewed a significant amount of information and worked with MET staff to understand in detail the assumptions and inputs to the 2020 MET Integrated Resources Plan (IRP). As has been communicated previously, MET has split the 2020 IRP into two phases:

1. Needs Assessment - looking and demands, supplies, and impacts of Climate Change, and
2. Implementation - looking at the actions needed to close any identified supply & demand gaps.

MET has completed Phase 1 and is beginning Phase 2 later this summer. This Reliability Study update is intended to provide information on potential future reliability situations in preparation for Phase 2 of the IRP, and thereby help inform our staff, agencies, Directors and MET Directors as they engage in decisions on how to address water reliability.

Budgeted (Y/N):	Budgeted amount: n/a	Core	
Action item amount: n/a	Line item:		
Fiscal Impact (explain if unbudgeted):			

Staff and CDM Smith have assessed potential future conditions in regard to water supplies & demands, as well as recent information on climate change impacts. These conditions have been combined into a set of recommended scenarios of plausible future conditions for further analysis. These scenarios constitute various inputs to a regional Water Evaluation And Planning (WEAP) model to obtain indications of the likelihood (or probability) that regional water shortages would occur under various scenarios; as well as the magnitude of the likely water shortages.

For this update we are recommending analyzing somewhat more severe scenarios than in the 2018 Study as several conditions have changed. We are also recommending analysis of a "Black Swan" (or low probability-high consequence case) scenario as future water supply and demand actions and climate impacts continue to contain significant uncertainty. This recommendation follows similar planning guidance from the State of California regarding uncertainty in planning for sea-level rise; where the current State guidance asserts that consideration of an extreme (H++) scenario in planning projections given the uncertainty of climate change impacts "is important, particularly for high-stakes, long term decisions." (*State of California Sea-Level Rise Guidance 2018 page 12*).

This presentation is designed to provide the agencies, the Board and our MET Directors an opportunity to review the recommended scenarios prior to running the model. A similar presentation was made at the MWDOC Agencies Managers meeting on May 19, 2022 and feedback was solicited for modifications to the proposed update. Feedback was received from Irvine Ranch WD, Orange County WD, and Santa Margarita WD:

IRWD staff comments:

1) MWDOC should consider holding a Workshop with its customer agencies to focus on assembling water supply projects into portfolios to be assessed against each of the scenarios.
2) A separate workshop with the customer agencies should also be considered to focus on how the Economics Study could be used to estimate the economic benefits of potential water supply projects.
3) MWDOC should coordinate all modeling of the OC Basin with OCWD. This will help avoid disagreements between MWDOC and OCWD over future Basin conditions.
4) MWDOC should incorporate a Delta Levee Failure event into one of the scenarios. Such an event has a very high probability of occurrence and would have serious impacts on Orange County water supplies.
5) The "Black Swan" scenario should include "increased" water use efficiency targets rather than "current" targets. This would be the likely occurrence if the Delta Conveyance Project does not occur along with significant climate change impacts in a Hotter/Drier scenario.

OCWD staff comments:

> MWDOC should not provide any test portfolios of OC supply projects and conservation to meet potential water shortages and should not evaluate or rank individual projects.

SMWD staff comments:

> MWDOC should meet with agencies to make sure that the latest information on local supply projects are included.

Additional Study updates will include current information and cost estimates for various potential supply projects that may have impact on MET and Orange County, as they become available. Staff recommends that based upon prior agency feedback, that unlike the 2018 Study, the update not rank local projects. Instead, staff recommends including test portfolios of OC supply projects and conservation to meet potential water shortages.

A final note - The Reliability Study update looks at the likelihood or probability of future reliability gaps and the magnitude of the likely water shortages. The Economic Benefits Study, the next Committee discussion item, looks at the costs of those reliability gaps from an economic perspective. These two studies work together to provide increased understanding of water supply reliability.

Attachment: CDM Presentation




OC Water Reliability Study 2022 Update

MWDOC Board
P&O Committee
June 6, 2022

1

Purpose of 2022 Update

1) Estimate range of potential water supply gaps for OC Basin, South County and Brea/La Habra areas based on latest demand and supply forecasts
2) Demonstrate how portfolios of new OC water supply projects and conservation can meet water supply gaps
3) Offer framework for OC water agencies to estimate the economic benefits of water supply projects

2

Why the Update?

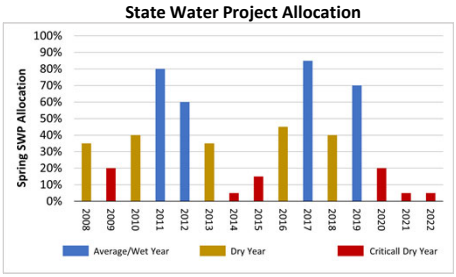
Since 2018 Study, the following has occurred:

1) Worsening imported water supply conditions
2) Lower MET regional water demands
3) Delays in Delta Conveyance Project
4) MET completes its 2020 IRP Phase 1 Assessment

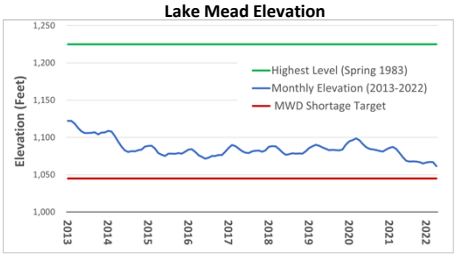
3

Worsening Imported Water Supply Conditions

- Snowpack in SWP system well below normal for last 3 years. Spring precipitation (Feb-Apr) in 2022 lowest in record. In the last 15 years, 11 were considered drought or critical drought.



- Lake Mead elevation, now lowest in record, only 16 feet away from MWD DCP shortage cutbacks. MWD estimates a 94% chance of CRA shortage in 2023.



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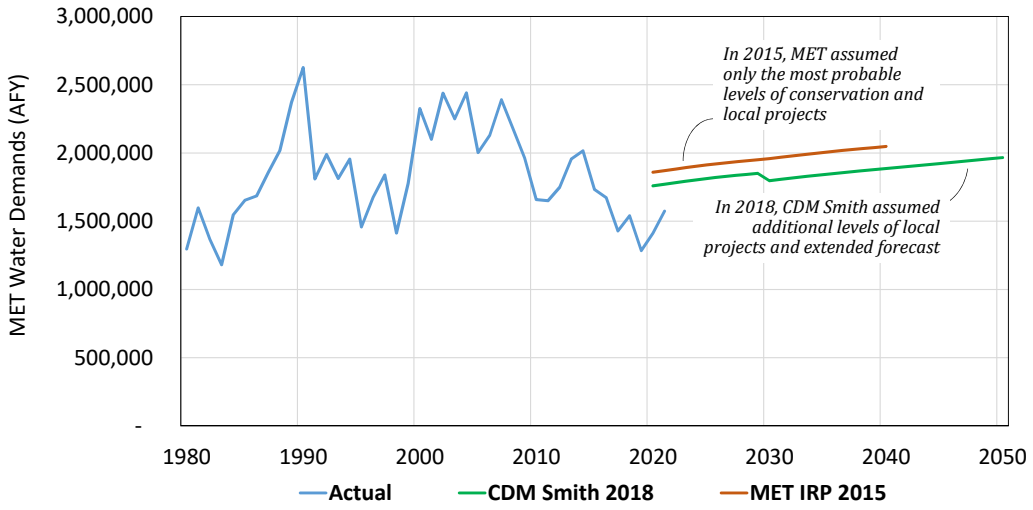
Lower MET Regional Water Demands



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MET 2020 IRP vs OC Study 2022 Update

Planning Approach	MET 2020 IRP Phase 1	OC Study 2022 Update
Demands on MET	Assumes much lower retail demands and much greater local water supplies than MET 2015 IRP, which were provided by member agencies.	Used MET 2020 IRP average of Scenarios A & B for retail demand, with more gradual local supply ramp up by 2040. Apply CDM Smith estimated impacts of climate change.
Planning Scenarios	Four scenarios: A – low demands, min. climate change B – high demands, min. climate change C – low demands, sig. climate change D – high demands, sig. climate change	Four baseline scenarios, with one "Black Swan" scenario, made up from: -three climate change futures -two levels of water use efficiency -various levels of new MET supplies
New MET Water Supplies	Not included in Phase 1, but will be analyzed in Phase 2.	Various levels of new MET supplies included in planning scenarios (e.g., DCP, transfers/storage, and RRWP).

6

MET IRP Phase 1 Supply Gap Results for 2045

A – Low Demands, Min. Climate Change

Max Shortage = 0.0 MAF

Probability of Any Shortage = 0%

B – High Demands, Min. Climate Change

Max Shortage = 0.3 MAF

Probability of Any Shortage = 5%

C – Low Demands, Sig. Climate Change

Max Shortage = 0.2 MAF

Probability of Any Shortage = 5%

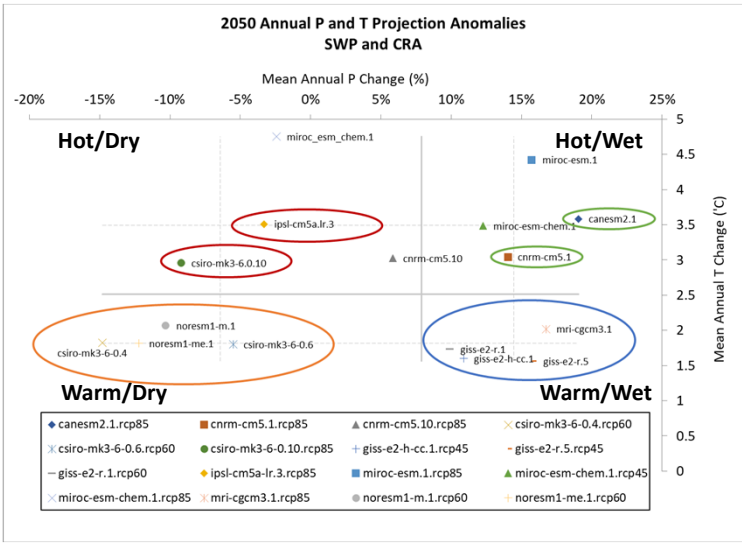
D – High Demands, Sig. Climate Change

Max Shortage = 1.2 MAF

Probability of Any Shortage = 66%

7

CDM Smith Climate Change Approach



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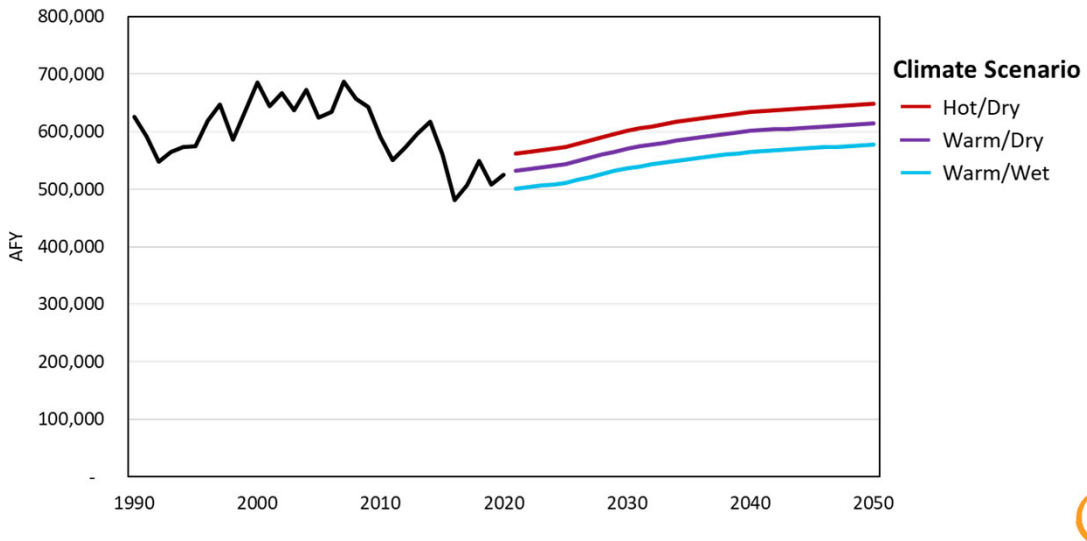
CDM Smith Forecast of OC Water Demand



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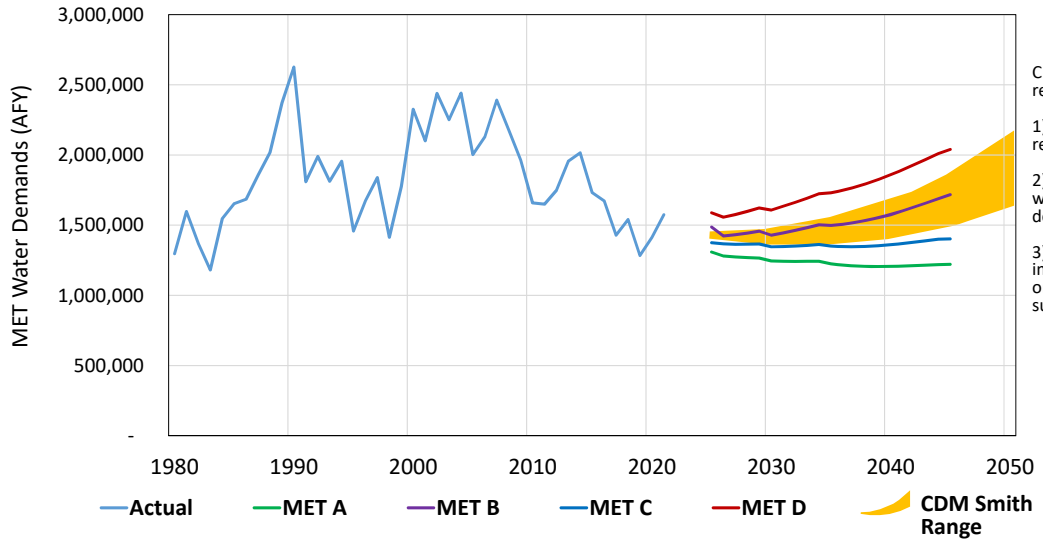
MET Water Demand Forecasts



CDM Smith forecast represents:

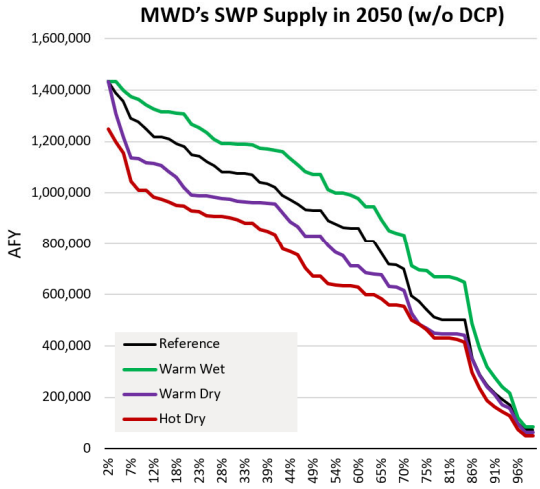
1) Average of MET A & B retail demands

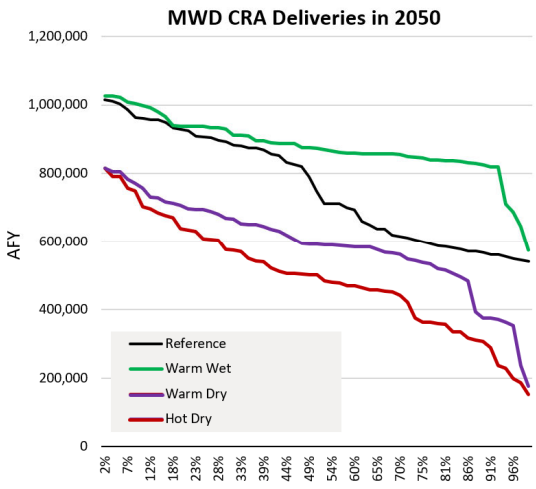
2) Slower ramp up of local water supplies, but with no desal in OC

3) CDM Smith estimated impacts of climate change on retail demands and local supplies

10

MET Imported Water Supplies in 2050





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Proposed OC Study 2022 Update Planning Scenarios

Scenario Name	Climate Change Future	MET & OC Water Demands	New MET Water Transfers and Storage	MET Regional Recycled Water Program	Delta Conveyance Project (DCP)	OC Basin BPP% with Med SAR Baseflow
1. Low Stress without Delta Conveyance	Warmer/Wetter climate	Lower baseline with current water use efficiency targets	• 100 TAF CRA Transfers (2030)	102 TAF (2033)	Not implemented	Target of 82%
2. Moderate Stress with Delta Conveyance	Warmer/Drier climate	Lower baseline with current water use efficiency targets	• 100 TAF CRA Transfers (2030)	102 TAF (2033)	Implemented (2038)	Target of 82%, less impact of climate change
3. Moderate Stress without Delta Conveyance	Warmer/Drier climate	Lower baseline with increased water use efficiency targets	• 100 TAF CRA Transfers (2030) • 100 TAF Storage (2035)	168 TAF (2033)	Not implemented	Target of 82%, less impact of climate change
4. Significant Stress with Delta Conveyance	Hotter/Drier climate	Lower baseline with increased water use efficiency targets	• 100 TAF CRA Transfers (2030) • 200 TAF Storage (2035)	168 TAF (2033)	Implemented (2038)	Target of 82%, less impact of climate change
Black Swan Event: Significant Stress without Delta Conveyance	Hotter/Drier climate	Lower baseline with increased water use efficiency targets	• 100 TAF CRA Transfers (2030) • 250 TAF Storage (2035)	168 TAF (2033)	Not implemented	Target of 82%, less impact of climate change

Best Condition Good Condition Moderately Bad Condition Significantly Bad Condition

12

OC Study 2022 Update Schedule

Task	June 1	June 2	June 3	June 4	July 1	July 2	July 3	July 4	August 1	August 2	August 3	August 4	September 1	September 2	September 3	September 4
Finalize Scenarios																
Estimate Water Supply Gaps for OC																
Incorporate Changes in OC Projects (Yield, Cost, Timing)																
Demonstrate How Portfolios of OC Projects Meet Gaps																
Economic Benefits of New Water Supplies																
Draft Executive Report																
Final Executive Report												Review Period				

○ Draft

△ Final

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Item No. 3

COMMITTEE DISCUSSION ITEM
June 6, 2022

TO: **Planning & Operations Committee**
(Directors Tamaribuchi, McVicker, Nederhood)

FROM: **Robert Hunter, General Manager**

Staff Contact: Charles Busslinger

SUBJECT: PRESENTATION REGARDING THE ECONOMIC BENEFITS STUDY

STAFF RECOMMENDATION

Staff recommends the Planning & Operations Committee view the presentation and receive and file the draft report.

COMMITTEE RECOMMENDATION

Committee recommends (To be determined at Committee Meeting)

DETAILED REPORT

Study Background

Orange County (OC) faces two different kinds of potential water supply disruptions; periodic drought accompanied by water allocations, and larger, potentially catastrophic disruptions in water availability from earthquakes. These two types of water supply disruptions are quite different in the timing of the way they occur. In both circumstances residents and businesses can experience a reduction in available water supply; emergencies would happen quite quickly, whereas water allocations are typically made on an annual basis. Efforts to mitigate those reductions require a credible estimate of the value of water supply reliability to support adequate levels of investment in water supply projects. Information on potential impacts to the OC economy is useful both at the local level as well as the Metropolitan Water District (MET) level as decisionmakers work through future investment decisions. How much residents and businesses would be willing to pay to avoid reductions or interruptions in water supply, and how this compares to mitigation costs to avoid shortages are key questions for decisionmakers. Opinion and satisfaction surveys which are

Budgeted (Y/N):	Budgeted amount: n/a	Core	
Action item amount: n/a	Line item:		
Fiscal Impact (explain if unbudgeted):			

conducted periodically do not provide insight into how residents or businesses value a reliable water supply, nor can they provide a quantified estimate of the value of a secure water supply. Additionally, a previous study to quantify the value of water supply reliability in Orange County is nearly two decades old (OC Business Council, 2003) [and the data supporting the 2003 findings is even older]. Therefore new information is needed to update those findings.

To provide updated information to address decisionmaker questions of how much residents and businesses would be willing to pay to avoid reductions or interruptions in water supply, staff recommended the completion of an economic benefits study. After considerable discussion with member agencies, the Board awarded a modified scope of work to the Brattle Group. The scope included separate analyses to evaluate the impacts to residential customers and businesses in OC. The business impact scope was limited to directly surveying OC businesses to determine how they might be impacted by emergency water shortages or longer term shortages caused by droughts. Quantification of the value OC residents place on reductions in water supply was determined using updated residential water demand curves based on information from the 2020 Urban Water Management Plans, water rate information obtained from agency websites, and prior work the Brattle Group completed for MET and the State; rather than by direct survey. Additionally, revenue losses for municipal water retailers in OC were also estimated based on the average rates and demand levels in each district.

Summary of Business Impact Findings

Three agencies; Irvine Ranch WD, Moulton Niguel WD, and Yorba Linda WD asked that business surveys not be conducted in their service areas citing the business surveys would cause confusion with their agencies' reliability messaging, and would result in numerous phone calls. To address these concerns, MWDOC did not conduct the survey in these three service areas; and MWDOC provided staff contact information so all agencies could refer any questions on the survey to an appropriate contact. MWDOC staff contact information was made available to all agencies for posting on their agency website, and was also provided to all Cal State Fullerton staff involved in conducting the business surveys. No phone calls on the survey were received by MWDOC staff during or since the conclusion of the business survey.

The business survey asked firms to quantify how water supply reductions, of 15% and 30% for one year, would lead to changes in business output or employment. Based on the responses to these questions, estimates of the direct impacts of water shortages on OC businesses were determined. In addition to estimating the direct impacts, indirect and induced impacts were also estimated using IMPLAN, an input-output planning model that is widely used for economic analysis throughout the U.S. Eliminating the three retail agencies' service areas from the business survey limited the number of business responses. This prohibited the ability to separate the business impacts into the three study areas of Brea/La Habra, OC Basin, and South OC. Therefore only countywide results were calculated.

Based on survey responses, the Brattle Group calculated the following estimates for a 15% and 30% reduction in water supply to businesses in OC for a period of one year:

Economic Impacts to Businesses Associated with a 15% and 30% Reduction in Water
(See Tables 5 & 6 for additional details)

	Total Business Output Impacts*	% of County Output Total	Total Employment Impacts*	% of County Employment Total
15% Reduction	$5.1 Billion	2.0%	29,700	1.9%
30% Reduction	$10.9 Billion	4.3%	65,400	4.2%
* Includes Direct, Indirect, and Induced Impacts				

These results need to be reviewed and used in the proper context. As has been mentioned in the previous Agenda Item write-up on the OC Reliability Study Update; the Economic Benefits Study looks at the cost of water supply reduction situations (15% or 30%) for both the residential and business sectors; while the Reliability Study looks at the likelihood (or probability) that these situations may occur and the magnitude of the shortage. These calculated business impacts are for a 15% or 30% reduction in water supplies for one year to businesses, not simply an across the board reduction in water supplies as has been seen in recent droughts. Said another way, these results represent the costs to OC "If these business water supply reductions were to occur". In OC, the OC Basin area has typically had the resources to respond to both droughts and emergencies and so this portion of OC would be somewhat insulated from the impacts whereas this may not be true in other portions of OC. In addition, it is important to note that a 15% (or 30%) reduction in total water supply is usually not shared equally between residential and business sectors; as the economic impacts of water reductions to businesses are known to be large, and the residential sector is generally better able to withstand water shortages (usually through curtailment of outdoor irrigation). Therefore these business impact estimates have extremely low probabilities of occurrence but still represent plausible catastrophes where residential curtailment becomes insufficient, such as a major San Andreas earthquake. In other words, the above business impacts need to be multiplied by their probability of occurrence. This level of wide scale disruption has not occurred in California (at least not in recent memory), but seismic studies of the San Andreas fault indicate the probabilities of occurrence of a large San Andreas fault rupture to be in the range of 0.23% to 0.38% per year[1].

Summary of Residential Impact Findings

For the residential sector, the Brattle Group analyzed the impacts of water supply reductions on residential water customers in OC by calculating what is known as "Welfare Losses". Welfare losses measure how much each customer would have been willing to pay (WTP) in excess of the cost of the water for each unit of water that they did not receive due to water reductions. Said another way, the full value of each unit of water to the customer is more than just the cost of the water. Residential water customers are typically willing to pay

[1] Shinji Toda, Ross S. Stein; Long- and Short-Term Stress Interaction of the 2019 Ridgecrest Sequence and Coulomb-Based Earthquake Forecasts. *Bulletin of the Seismological Society of America* 2020;; 110 (4): 1765–1780. doi: https://doi.org/10.1785/0120200169

the most for the first units of water that they consume, which are generally used for necessary health and sanitation purposes. However, customers are less willing to pay for each subsequent unit of water which they put to increasingly lower value uses, such as the value of water running down the drain if a faucet is left running. Residential customer welfare losses were estimated using an economic model for OC water utilities that has been published in peer-reviewed academic literature. The same hypothetical shortage used for the business sector (survey) was also used for the residential sector analysis (both single- and multi-family), in which customers in the service area are required to reduce their water use by either 15% or 30% for the period of one year. Results of the residential analysis include:

Economic Impact of Water Supply Reductions on Residential Customers

(See Table 8 for more details)

[Annual and (Monthly)]

	Brea/ La Habra	**OC Basin**	**South OC**
To Avoid a 15% Reduction			
Household Willingness to Pay – annual (monthly)	$427 ($35.58)	$222 ($18.50)	$238 ($19.83)
To Avoid a 30% Reduction			
Household Willingness to Pay – annual (monthly)	$1,486 ($123.83)	$744 ($62.00)	$829 ($69.08)

Summary of Retail Water Agency Impact Findings

The Brattle Group also calculated the revenue lost by retail water districts in OC associated with 15% and 30% water supply reductions. This was calculated by multiplying overall demand, times the percent shortage, times the water rate for each member district for the residential, commercial, industrial, and institutional (CII) sectors, then summing the individual districts into the three study areas (i.e. Demand × Shortage × Water Rate). To avoid water use distortions caused by the pandemic, total demand by sector was estimated in each region for the year 2019. The calculations assume that districts do not impose a drought surcharge or other fees to recover these losses, in which case the losses or portion of the losses would instead be imposed on customers:

ORANGE COUNTY WATER RETAILERS ANNUAL REVENUE LOSS ($ MILLIONS)

(See Table 9 for more details)

Water Supply Reduction	**Brea & La Habra**	**OC Basin**	**South OC**	**Total**
Commercial, Industrial, & Institutional				
15% Reduction	$1.6	$32.4	$3.6	$37.6
30% Reduction	$3.1	$64.9	$7.1	$75.1
Residential				
15% Reduction	$3.3	$41.1	$13.6	$58.0
30% Reduction	$6.5	$82.2	$27.3	$116.0

Importance of the Study

The Economic Benefits Study provides important updated information on the potential costs that would be incurred by the business and residential sectors; as well as to retail water agencies in OC from two hypothetical water curtailment scenarios. Another way to view the results is that the values reported are what is being protected by future investments in water supply reliability projects, both at the local level and by way of rate payments supporting regional investments at the MET level. The results demonstrate the importance of having sufficient supplies and making the necessary investments. They also provide guidance to decisionmakers on what residents are willing to pay for local projects by answering the question “how much is an average household in OC willing to pay to avoid a 15% or 30% reduction in water supply?” These results also illustrate the cost to residents and water agencies when water rationing is used to decrease demands (as businesses are usually insulated from drought restrictions). This information also supports investment decisions at MET as MET continues to make investment decisions to bolster reliability.

How this information can be utilized

Staff envisions the information being used in outreach efforts to communicate the importance of making additional future investments in water reliability at both the local and regional levels, and to help explain why water rate increases will continue to occur over the long run. Also as previously mentioned, staff anticipates using the information in the on-going water supply reliability analysis modeling being conducted. Staff believes that MET and other entities such as the Southern California Water Coalition would be interested in the information presented herein. Furthermore, as MET continues consideration of its Integrated Resources Plan, its Long-Range Financial Plan, its Long-Range Rate Plan and how it will address both long-term investments in Water Use Efficiency and Local Projects, this information will prove useful both within OC and at MET. This information also clearly demonstrates that “water rationing” does not occur without cost impacts.

One last issue that exists is that of “affordability” of water rates. It is not clear how this issue will be addressed in the future, but the issue of reliability and additional investments must be considered in the context of affordability. The State is currently working on this issue and the importance of water supply reliability must be considered. The information presented herein will help to inform the issue of future costs.

Attachments: Brattle Group Presentation
Draft Report - Economic Impacts of Water Shortages in Orange County

The Economic Impacts of Water Shortages in Orange County

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NOTICE

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Executive Summary

Estimating the economic impacts of water shortages is a critical step in identifying the potential benefits of investments that improve the reliability of water supply. As part of its reliability planning process, the Municipal Water District of Orange County (MWDOC) asked the authors of this report to estimate the economic impacts of hypothetical year-long 15% and 30% water supply reductions on each of three interested groups in Orange County: 1) Commercial and industrial businesses, 2) Residential water users, and 3) Retail water suppliers.[1] Our approach to estimating the economic impacts differs for each group depending on what method is most appropriate.

First, a survey was conducted to estimate the economic impacts of water supply reductions on businesses in Orange County. This survey asked firms to quantify how water supply reductions, of 15% and 30% for 1 year, would lead to changes in business output or employment. Based on the responses to these questions, we estimate the direct impacts of water shortages on Orange County businesses. In addition to estimating the direct impacts, we also estimate indirect and induced impacts using IMPLAN, an input-output planning model.

Based on survey responses, we estimate that a 15% reduction in water supply to businesses in Orange County would lead to a $3 billion direct reduction in business output and 19,000 lost jobs. These direct business impacts would lead to further indirect impacts amounting to output losses of $2.1 billion and indirect employment losses of over 10,700. In total, a 15% reduction in water supply to businesses would lead to a 1.9% reduction in total employment and 2% reduction in total economic output within Orange County.

A 30% reduction in water supply to businesses in Orange County would lead to a $6.5 billion reduction in business output and 43,000 lost jobs. These direct business impacts would lead to further indirect losses amounting to a reduction of $4.3 billion in business output and 22,400 lost jobs. In total, a 30% reduction in water supply to businesses would lead to a 4.2% reduction in total employment and a 4.3% reduction in output within Orange County.

[1] This report considers separately the economic consequences two distinct water shortages: First, a 15% or 30% reduction in water supply to Orange County businesses (commercial and industrial customers) and, second, a 15% or 30% reduction in water supply to residential customers in Orange County.

Second, welfare losses to residential water customers are estimated using an economic model based on demand elasticities for Orange County water utilities that have been published in peer-reviewed academic literature. Welfare losses measure how much each customer would have been willing to pay in excess of their water rates for each unit of water that they did not receive due to shortage. We estimate that on average each household of Orange County is willing to pay between $222 and $427 to avoid a 15% supply shortage for one year. This amounts to a 15% supply shortage causing a total residential welfare loss of $241 million among Orange County households. For a supply shortage of 30%, we estimate that Orange County households are willing to each pay between $744 and $1,486 to avoid a demand shortage. In total, this amounts to a residential welfare loss of $818 million for a 30% supply shortage.

Third, we calculate the revenue losses for municipal water retailers in Orange County, based on the average rates and demand levels in each district. Across all retailers in Orange County, we estimate that reductions in supply to each districts' commercial and industrial customers of 15% or 30% for a period of one year would lead to a reduction in revenues worth $37.6 million or $58.0 million respectively. A reduction in supply to each districts' single-family and multi-family residential customers of 15% or 30% for a period of one year would lead to revenue reductions of $75.1 million or $116.0 million respectively. Note that these calculations assume that districts do not impose a drought surcharge or other fees to recover these losses, in which case the losses would instead be passed onto customers in each district.

The results in this report reflect point estimates of the economic impacts of a specific level of shortage for a specific duration of time. A couple of points of caution are required in interpreting these results. First, to calculate the expected costs of a water shortage, one must multiply the cost of that shortage by the probability of such a shortage. To the extent that investments in water supply reliability can reduce the forecast probability of water shortages, the economic impacts of such reliability improvements can be calculated for each level of shortage by multiplying the estimates in this report by the expected reduction in the probability of shortage.

Second, this report describes two distinct scenarios for the residential and business sectors respectively. It is important to note that a 15% (or 30%) reduction in total water supply will not necessarily be shared equally between these two sectors. How shortages are shared among different types of customers depends on district specific policies, and will significantly influence the total economic impacts of a water shortage.

I. Introduction and Background

The Municipal Water District of Orange County (MWDOC) is a special district that acts as a wholesale water supplier and resource-planning agency in Orange County. MWDOC purchases approximately 70.2 billion gallons of imported water per year – from northern California and the Colorado River – through the Metropolitan Water District of Southern California (Metropolitan). MWDOC delivers this water to 27 member agencies who, in turn, provide retail water services to the public including 3.2 million Orange County residents. MWDOC's service area covers all of Orange County with the exception of the cities of Anaheim, Fullerton and Santa Ana, who independently purchase water from Metropolitan.[2]

Water use in Orange County is approximately evenly split between local water supplies and imported water supplies, such as those purchased from Metropolitan. Local water supplies include the Orange County Groundwater Basin, other smaller local aquifers and recycled wastewater.

Reliability planning is one of MWDOC's key roles. MWDOC must plan to have sufficient supplies to meet the needs of the county's growing population. The district must also plan for contingencies that may disrupt the county's imported and local water supplies such as droughts and earthquakes. Droughts and dry periods are frequent in the climate of Orange County and in the regions from which it imports water. A significant earthquake could potentially cut off the county from some or all of its imported water supplies and disrupt infrastructure for local distribution of water supplies. MWDOC extensively studies potential new projects to improve the reliability of water supplies. These projects can be major undertakings that require significant capital investment.

Disruptions in water supply can reduce economic activity and employment within the county, lead to hardship for local residents and pose significant economic challenges for local water agencies. Estimating the economic impacts of water shortages is a critical step in identifying the potential benefits of investments that improve the reliability of water supply. Accurately estimating the benefits of reliability helps ensure that the County does not over-invest or

[2] Note that this report estimates the economic impacts of water shortages on all Orange County residents, including those in Anaheim, Fullerton and Santa Ana, who do not purchase water through MWDOC.

under-invest in projects to ensure a reliable supply of water. Understanding the economic impacts of water shortages helps MWDOC make decisions about investments pertaining to the reliability of water supply.

Commercial, Industrial and Institutional water use in Orange County amounted about 101,400 acre-feet per year, or around 19% of all water consumed in 2020. This water is a critical input for the region's thriving economy. The economy of Orange County is worth over $255 billion, larger than either the State of Oregon or the country of New Zealand. Orange County also employs over 1.57 million full-time equivalent workers.[3] Consequently, interruptions in water supply can cause significant economic disruptions within the county. In Section II of this report, we quantify these impacts using a survey of businesses to estimate the direct impacts of water shortages on individual businesses and an economic impact model to estimate indirect spillover effects of business shortages on the wider economy.

Residential water users account for the majority of water use in Orange County. In 2020, single-family residential customers and multifamily residential customers respectively consumed around 215,900 AF and 86,600 AF of water, or around 41% and 16% of all water in Orange County. Because a substantial fraction of total residential water use is for outdoor irrigation[4], many households can modestly reduce their water use at a relatively low-cost by reducing outdoor irrigation. However, as the size of water shortages increase, households must adopt increasingly costly approaches to reducing water use, leading to increasing losses in consumer welfare. This relationship between the size of a waters shortage and the increasing cost of behaviors to curtail water use is captured in demand relationships that we estimate for each water district. In Section III, we use this approach to estimate the welfare losses to residential water customers in Orange County that would result from residential water shortages.

Retail water districts acquire water from MWDOC or other sources, which they then sell to business and residential customers in Orange County. Most of the revenue that retail water districts generate come from volumetric rates that they charge customers, however most of each district's costs do not vary significantly with the volume of water produced. During water shortages, this can lead to financial strife due to revenue shortfalls from reduced sales. In

[3] Based on numbers from Emsi (https://www.economicmodeling.com/).

[4] Outdoor irrigation accounts for around 41% of all water use in single-family residential units and 16% of water use for multifamily residential units. The remaining water use (59% and 84% respectively) is indoors.

Section IV, we estimate the revenue shortfalls to retail water districts in Orange County as a result of water shortages to both residential and business customers.[5]

Although this report considers separately 15% and 30% water shortages in each of the business (commercial and industrial) and residential sectors, it is important to note that these scenarios are distinct scenarios. A 15% or 30% reduction in total water supply will not necessarily be split equally between the residential and business sectors. Water districts in Orange County are required to produce drought management plans which describe how water shortages could be shared among different types of customers in each district. For example, because water demand is typically more elastic in the residential sector than in the business sector, a 15% reduction in total water supply will likely lead to a greater than 15% reduction in water supply among residential customers and a less than 15% reduction in water supply among business customer.[6] If shortages are distributed in this manner, it will significantly reduce the total economic impacts relative to supply reductions that are uniform across customer types.

II. Impacts of Shortages on Orange County Businesses

A. Overview of Approach

In this section, we analyze the direct and indirect economic impacts of water shortages on business output and employment in Orange County. Our approach to quantifying the business impacts of water supply reductions involves two steps. First, a survey of businesses is used to quantity the direct effects on businesses, in terms of how they would reduce output or employment in the context of water supply reductions. Those estimates are then used as an input into IMPLAN, a widely-used economic impact model to estimate the indirect impacts of the reduction in business activity on the broader economy. This approach is typical of that

[5] Note that districts sometimes choose to enact emergency drought rates or other fees during shortages in order to cover revenue losses, however these can be unpopular with customers who feel they are being punished for conserving water. In our calculations, we assume that districts do not impose a drought surcharge or other fees to recover these losses. If surcharges were imposed, then the losses estimated in this section would instead be passed onto customers in each district.

[6] A similar pattern of conservation might be expected for a 30% reduction in water supply. This memo does not address exactly how a 15% or 30% reduction in water supply might be split between these sectors.

described in academic literature[7] and has been previously used to estimate the value of reliability in other parts of California.[8]

Yet the business surveys that typically drive these economic analyses are almost thirty years old. CIC Research surveyed 619 businesses for the San Diego County Water Authority in 1993, querying firms about the impact of hypothetical water reductions ranging from 20% to 60% for two to six months.[9] MHB Consultants (1994) surveyed San Francisco Public Utilities Commission customers, querying businesses about the impact of 15% and 30% reductions in water supply.[10] Due to the age of the existing surveys, the raw data were impossible to locate and would have needed updating even if they were found. We conducted an original survey of businesses – the first on this topic in California in almost three decades – modeled on the 1994 MHB Consultants survey.

The business survey for this study asked firms to quantify how water supply reductions, of 15% and 30% for 1 year, would lead to changes in business output or employment. The survey responses were used to estimate direct impacts for firms and that direct effect was combined with an Input-Output model to calculate indirect and induced effects. The direct effect is the amount by which firms would change output or employment as a result of water supply reductions. If a firm reduces output (a direct effect), the indirect effect is the impact on that firm's suppliers, who might also reduce output due to lower demand. The induced effect includes the impact of lower employee wages or lower firm profits, which will lead to reduced demand elsewhere in the economy. We used IMPLAN, a state-of-the-art input-output model, to calculate indirect and induced impacts from the direct effects that were estimated via the business survey.

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7 See Chapter 7 of Young, R. A., & Loomis, J. B. (2014), *Determining the economic value of water: concepts and methods*, Routledge.

8 For example, see Sunding, D. and Browne, O. (2022), *Economic Impacts of Water Shortages in the EBMUD Service Area,* produced by The Brattle Group for East Bay Municipal Utility District, or,
Sunding, D. (2007), *Economic Impacts of Drought-Induced Water Shortage in the San Francisco Bay Area,* produced by The Brattle Group for San Francisco Public Utilities Commission.

9 CIC Research, Inc. (1999), *The Economic Impact on San Diego County of Three Levels of Water Delivery: 80, 60, or 40 Percent Occurring for Two Months or Six Months,* San Diego, California: San Diego County Water Authority. (December, 28, 1993, revised December 21, 1993 and updated October 19, 1999)

10 MHB Consultants, Inc. (1994), "The Economic Impact of Water Delivery Reductions on the San Francisco Water Department's Commercial and Manufacturing Customers," Tables 13 and 14 (pp. 48, 50).

B. Survey of Businesses

1. Survey Instrument and Sample Frame

We surveyed 401 businesses in Orange County between September 2 and November 3, 2021. The survey instrument, shown in Appendix B, was modeled on the MHB Consultants survey. During spring and summer of 2021, the research team consulted with MWDOC staff and member agencies to develop and refine survey questions. Businesses were surveyed using a stratified random sampling approach within 15 industry categories, which we aggregate into eight categories. A breakdown of the number of businesses surveyed by industry and a mapping from the 15 industry to the eight industry categorization is shown in Appendix C.[11] All businesses surveyed were in Orange County, omitting firms in the Yorba Linda, Moulton Niguel, and the Irvine Ranch Water Districts at the request of those MWDOC member agencies.

The Social Science Research Center of California State University, Fullerton conducted the survey using computer assisted telephone interviewing (CATI), sampling firms within the 15 industries with a targeted balance of respondents from small firms (< 50 employees) and medium-sized firms (from 50 to 249 employees). Surveys with larger firms (>= 250 employees) were completed as possible.

The responses to questions 11b and 11c and the companion questions 12b and 12c of the survey drove the economic impact analysis. Firms were prompted at the beginning of question 11:

> *Following a hypothetical event, your business will experience recurrent shortages for a one-year period. While there is some advance notice within the first quarter, this would require you to cutback your water use to 15% less water than normal for the year.*

[11] Note that the agriculture, mining, and utilities NAICS industries were excluded due to low business presence in Orange County and that public administration was excluded in order to limit the sample to private businesses. The exclusion of these sectors is conservative, and in our analysis may lead to an underestimation of total employment impacts

> *To adjust to this need to reduce your water use, we would like to evaluate what the impact to your operations/business might be. Would you…*

For 11b, the question asked whether firms would reduce output. For 11c, the question asked whether firms would reduce employment. If firms answered yes to either question (output or employment reductions), in both cases they were then asked to quantify the magnitude of reductions in 10 percentage point ranges from "1-10%" to "larger than 50%." A companion set of questions, questions 12b and 12c, asked the same queries for 30% water reductions for one year.

2. Analysis of Survey Data

We implement the following steps to clean the raw data. First, any firm that answered they would see an output or employment impact for a 15% water reduction but not a 30% water reduction is excluded from the analysis. We also exclude firms who answered that they would have a larger effect for a 15% water reduction than a 30% water reduction. For the question regarding output impacts, 24 firms provided inconsistent answers regarding output impacts, and 6 firms provided inconsistent answers regarding employment impacts. Three firms provided inconsistent responses for both questions. The total number of firm responses excluded from the analysis is 27, resulting in a final sample size of 374.

Second, firms that responded that they would experience an output or employment impact but answered "don't know" or "refused" when queried about the magnitude of the impact are assigned to the smallest category of that impact, "1-10%." Lastly, all impacts are converted to the mid-point of ranges (i.e. 5.5% for the "1-10%" reduction, and so on). No firms chose the open-ended "larger than 50%" response for either the 15 % or the 30 % water reduction. The results for the number of firms who answered "yes" when queried whether they would reduce output or employment, as well as the average magnitude of reduction, are shown in Table 1 and Table 2 below.

TABLE 1: NUMBER OF RESPONDENTS AND AVERAGE MAGNITUDE OF OUTPUT IMPACTS BY INDUSTRY IN ORANGE COUNTY

Industry	15% Water Supply Reduction				30% Water Supply Reduction			
	Total Respondents	Total Yes	% Yes	Average Magnitude	Total Respondents	Total Yes	% Yes	Average Magnitude
Construction	26	1	4%	1.0%	26	2	8%	1.2%
Manufacturing	71	12	17%	2.1%	71	19	27%	7.0%
Logistics, Transportation, and Warehousing	43	4	9%	1.7%	43	6	14%	2.6%
Retail and Other Services	45	3	7%	0.8%	45	10	22%	4.6%
FIRE	24	2	8%	1.7%	24	3	13%	2.4%
Professional Services, Information, and Administration	47	3	6%	1.2%	47	3	6%	1.6%
Education and Health Care	46	4	9%	0.7%	46	5	11%	1.3%
Entertainment and Tourism	72	16	22%	2.6%	72	24	33%	6.6%

Notes: Responses are aggregated by midpoint, i.e. 1%-10% is 5.5%. "Don't know" and "refused" are assumed to be the lowest impact, or 1%-10%. FIRE includes Finance, Insurance, and Real Estate. This table estimates the output impacts of a water supply reduction that requires all customers to reduce water use by 15% or 30% for one year.

TABLE 2: NUMBER OF RESPONDENTS AND AVERAGE MAGNITUDE OF EMPLOYMENT IMPACTS BY INDUSTRY IN ORANGE COUNTY

Industry	15% Water Supply Reduction				30% Water Supply Reduction			
	Total Respondents	Total Yes	% Yes	Average Magnitude	Total Respondents	Total Yes	% Yes	Average Magnitude
Construction	26	3	12%	1.4%	26	3	12%	3.7%
Manufacturing	71	12	17%	2.3%	70	18	26%	8.1%
Logistics, Transportation, and Warehousing	43	3	7%	1.5%	43	7	16%	3.5%
Retail and Other Services	45	4	9%	1.2%	45	6	13%	2.5%
FIRE	24	0	0%	0.0%	24	0	0%	0.0%
Professional Services, Information, and Administration	47	2	4%	1.7%	47	3	6%	2.1%
Education and Health Care	46	2	4%	0.7%	46	7	15%	1.9%
Entertainment and Tourism	72	12	17%	2.2%	72	22	31%	4.9%

Notes: Responses are aggregated by midpoint, i.e. 1%-10% is 5.5%. "Don't know" and "refused" are assumed to be the lowest impact, or 1%-10%. FIRE includes Finance, Insurance, and Real Estate. This table estimates the employment impacts of a water supply reduction that requires all customers to reduce water use by 15% or 30% for one year.

C. Economic Impact Calculation

The percentage changes in output and employment are used to calculate total changes in dollars for output and number of jobs for employment by multiplying the percentage impacts by industry and county totals for Orange County. We use data from Economic Modeling Specialists International (Emsi), a leader in economic and labor market information, to

determine total economic output and total employment by NAICS-coded industries in Orange County in 2020, the latest year for which data was available. Table 3 and Table 4 show direct output and employment impacts respectively.

TABLE 3: DIRECT IMPACTS TO OUTPUT BY INDUSTRY FOR 15% AND 30% WATER REDUCTIONS

Industry	Total Output ($ millions)	15% Reduction		30% Reduction	
		Direct Impact (%)	Direct Impact ($ millions)	Direct Impact (%)	Direct Impact ($ millions)
	[1]	[2]	[3]	[4]	[5]
Construction	$13,896	1.0%	$136	1.2%	$166
Manufacturing	$31,687	2.1%	$652	7.0%	$2,207
Logistics, Transportation, and Warehousing	$24,623	1.7%	$412	2.6%	$647
Retail and Other Services	$18,680	0.8%	$152	4.6%	$851
FIRE	$39,132	1.7%	$669	2.4%	$921
Professional Services, Information, and Administration	$48,508	1.2%	$583	1.6%	$790
Education and Health Care	$19,455	0.7%	$135	1.3%	$243
Entertainment and Tourism	$10,356	2.6%	$270	6.6%	$679
Total	$206,338		$3,009		$6,504

Sources and Notes:
[1]: From Emsi.
[2],[4]: From survey results. See Table 1.
[3] = [1] x [2].
[5] = [1] x [4].
This table estimates the output impacts of a water supply reduction that requires all customers to reduce water use by 15% or 30% for one year.

TABLE 4: DIRECT IMPACTS TO EMPLOYMENT BY INDUSTRY FOR 15% AND 30% WATER REDUCTIONS

Industry	Total Employed ('000s)	15% Reduction		30% Reduction	
		Direct Impact (%)	Direct Impact ('000s)	Direct Impact (%)	Direct Impact ('000s)
	[1]	[2]	[3]	[4]	[5]
Construction	103.7	1.4%	1.5	3.7%	3.9
Manufacturing	148.8	2.3%	3.5	8.1%	12.1
Logistics, Transportation, and Warehousing	100.9	1.5%	1.6	3.5%	3.5
Retail and Other Services	204.6	1.2%	2.4	2.5%	5.1
FIRE	122.8	0.0%	0.0	0.0%	0.0
Professional Services, Information, and Administration	294.8	1.7%	5.1	2.1%	6.1
Education and Health Care	227.0	0.7%	1.5	1.9%	4.4
Entertainment and Tourism	163.2	2.2%	3.5	4.9%	8.1
Total	1,365.8		19.0		43.0

Sources and Notes:
[1]: From Emsi.
[2],[4]: From survey results. See Table 2.
[3] = [1] x [2].
[5] = [1] x [4].
This table estimates the employment impacts of a water supply reduction that requires all customers to reduce water use by 15% or 30% for one year.

The data in the tables above are inputs into the IMPLAN model. We use the data, aggregated into eight industries, as inputs into IMPLAN, which calculated indirect and induced effects. We use IMPLAN's 2020 data year with the dollar year at 2022. We allow IMPLAN to populate estimates of employee compensation, proprietor income, and output when appropriate yet zero out employment when only output is affected.

IMPLAN is a highly refined data-modeling platform which builds upon the traditional input-output (I-O) modeling system and through extensive databases, economic factors, industry multipliers, and demographic statistics, provides insight into how various shocks or disruptions of earnings, employment or output in one or more industries can ripple through a local, regional, or even national economy. Effectively, the IMPLAN model measures and calculates inter-industry relationships to determine how one change in a certain industry will impact all other sectors as well as the broader local and regional economies.

These impacts are communicated as direct, indirect, and induced impacts. Direct impacts or effects are the initial estimated impacts being studied in the region – such as a large car

manufacturer opening a new plant with 500 workers in Los Angeles County. Indirect impacts are the impacts associated with business-to-business transactions indirectly caused by the direct impact or effect – such as a new car manufacturer purchasing raw materials and other inputs necessary for them to produce new vehicles. Finally, Induced impacts are economic effects stemming from household spending of labor income – such as the new 500 workers from the car manufacturing plant spending their wages and salaries on local goods and services, from local restaurants to furniture and clothing stores.

For this study, the IMPLAN model used to understand the wide-ranging effects a 15% and 30% water reduction would have on the economy in Orange County. Using the estimated direct impacts based on respondent answers by industry from the survey conducted, the average direct, indirect, induced, and total overall economic impacts for both the 15% and 30% water reduction scenarios are provided below in Table 5 and Table 6 respectively. In addition to the central estimates of economic impacts, we also provide a low and high estimates. These low and high estimates are calculated based on variation in our survey sample, as described in Appendix E, and represent roughly the 15th and 85th percentile of expected outcomes. Because the Emsi data includes industries not surveyed, such as agriculture and public administration, the impact estimates are conservative because they do not account for the effects of a water shortage on the non-surveyed industries.

TABLE 5: TOTAL ECONOMIC IMPACTS ASSOCIATED WITH A 15% REDUCTION IN WATER

Impact		Employment ('000s)	Labor Income ($ millions)	Value Added ($ millions)	Output ($ millions)
1 - Direct Impacts	[1]	19.0 [15.0 - 23.1]	$1,042 [$830 - $1,254]	$1,754 [$1,392 - $2,115]	$3,009 [$2,407 - $3,611]
2 - Indirect Impacts	[2]	5.2 [4.1 - 6.3]	$431 [$343 - $519]	$718 [$570 - $867]	$1,152 [$914 - $1,390]
3 - Induced Impacts	[3]	5.5 [4.4 - 6.7]	$364 [$290 - $438]	$595 [$474 - $717]	$947 [$753 - $1,140]
Total	[4]	29.7 [23.5 - 36.0]	$1,837 [$1,463 - $2,212]	$3,068 [$2,436 - $3,699]	$5,108 [$4,074 - $6,142]
% of County Total	[5]	1.9% [1.5% - 2.3%]			2.0% [1.6% - 2.4%]

Sources and Notes:
Low and high IMPLAN estimates in brackets.
[1]: Employment and output are calculated from survey results. See Table 4 and Table 3 respectively. Labor Income and Value Added are from IMPLAN.
[2],[3]: From IMPLAN.

[4] = [1] + [2] + [3].
[5] = [4] / county total.

TABLE 6: TOTAL ECONOMIC IMPACTS ASSOCIATED WITH A 30% REDUCTION IN WATER

Impact		Employment ('000s)	Labor Income ($ millions)	Value Added ($ millions)	Output ($ millions)
1 - Direct Impacts	[1]	43.0	$2,265	$3,667	$6,504
		[36.3 - 49.8]	[$1,913 - $2,618]	[$3,095 - $4,239]	[$5,529 - $7,478]
2 - Indirect Impacts	[2]	10.5	$886	$1,460	$2,342
		[8.8 - 12.1]	[$749 - $1,023]	[$1,231 - $1,688]	[$1,976 - $2,709]
3 - Induced Impacts	[3]	11.9	$778	$1,272	$2,022
		[10.0 - 13.7]	[$656 - $899]	[$1,073 - $1,470]	[$1,706 - $2,338]
Total	[4]	65.4	$3,929	$6,399	$10,868
		[55.1 - 75.6]	[$3,318 - $4,541]	[$5,399 - $7,398]	[$9,211 - $12,525]
% of County Total	[5]	4.2%			4.3%
		[3.5% - 4.8%]			[3.6% - 4.9%]

Sources and Notes:
Low and high IMPLAN estimates in brackets.
[1]: Employment and output are calculated from survey results. See Table 4 and Table 3 respectively. Labor Income and Value Added are from IMPLAN.
[2],[3]: From IMPLAN.
[4] = [1] + [2] + [3].
[5] = [4] / county total.

III. Impacts of Shortages on Residential Water Users

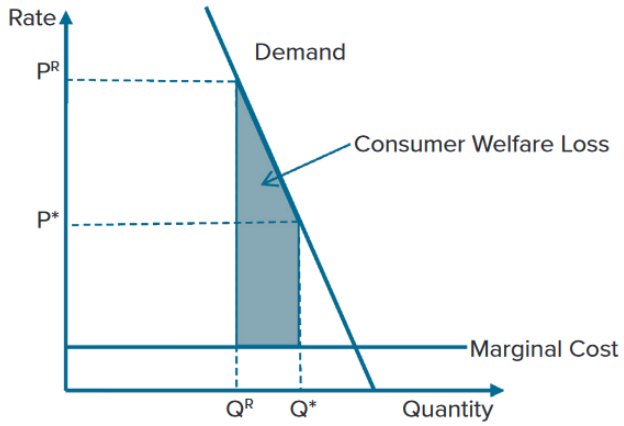
A. Overview of Approach

In this section, we analyze the welfare impacts of water supply reductions on residential water customers in Orange County. As in the previous section, this analysis considers a hypothetical shortage in which customers in the service area are required to reduce their water use by either 15% or 30% for the period of one year. However, in this section we consider residential customers (both single- and multi-family) rather than businesses (commercial and industrial customers).

Welfare losses measure how much each customer would have been willing to pay (WTP) in excess of their water rates for each unit of water that they did not receive due to water reductions. Residential water customers are typically willing to pay the most for the first units of water that they consumer, which may be used for necessary health and sanitation purposes. However, customers are willing to pay increasingly less for each subsequent unit of water which they put to increasingly lower value uses, such as longer periods of turf irrigation. To estimate the welfare losses associated with water supply reductions, The Brattle Group adopted a well-established methodology that is published in peer-reviewed journals, which uses a measure of consumers' willingness to pay to avoid water supply restriction.[12]

For each study area, we calibrate a demand curve that specifies the relationship between customers' rates and the quantity of water demanded. During a water reduction, we can estimate the customer welfare losses by calculating the area between this demand curve and the utility's cost curve. This area is illustrated in Figure 1.

FIGURE 1: DEPICTION OF WELFARE LOSSES UNDER LINEAR DEMAND, NON-MARGINAL PRICING, AND A FLAT MARGINAL COST CURVE



Source: Nemati, M., Buck, S., & Sunding, D. (2018), "Cost of California's 2015 drought water conservation mandate," *ARE Update*, *21*(4), 9-11.

To simplify the interpretation of our results, we have aggregated residential water suppliers in Orange County into three study areas based on their primary water sources: Brea and La Habra,

[12] Brozović, N., Sunding, D. L., & Zilberman, D. (2007), "Estimating business and residential water supply interruption losses from catastrophic events," *Water resources research*, *43*(8).

Buck, S., Auffhammer, M., Hamilton, S., & Sunding, D. (2016), "Measuring welfare losses from urban water supply disruptions," *Journal of the Association of Environmental and Resource Economists*, *3*(3), 743-778.

Buck, S., Nemati, M., & Sunding, D. (2021), "Consumer welfare consequences of the California drought conservation mandate," *Applied Economic Perspectives and Policy*.

Orange County Basin, and South Orange County.[13] The boundary of these three regions are shown in Figure 2. For each of these study areas, we calibrate an iso-elastic demand curve. Iso-elastic demand curves are commonly used in the economic literature, and are based on the assumption that at any level of demand, a one percentage reduction in the quantity of water available will always lead to the same percentage increase in the willingness to pay for water. We collected data to calibrate a separate demand curves for each study area. Three pieces of information are required to calibrate these demand curves: total residential water demand, average residential water rates, and the price elasticity of demand for water.[14] The assumptions that we adopt are summarized in Table 7 and are described below:

1. Total residential water demand is estimated in each region for the year 2019 by adding up the residential water consumption that each utility is required to report to the Department of Water Resources (DWR).[15]
2. Average residential water rates are calculated on a population-weighted average basis using the median rate tier for single-family household customers.[16] Where rate data from 2019 is not available, rate data from the closest available year are used and adjusted for inflation.
3. Price Elasticity of Demand estimates are taken from Table 5 of Buck et. al. (2016).[17] This paper reports price elasticity estimates for water utilities throughout California, including Anaheim, Fullerton, Santa Ana and MWDOC. We calculate a demand-weighted average

[13] The cities of Brea and La Habra primarily rely on source water from the Main San Gabriel Groundwater Basin, supplemented by imported water from MWDOC; the OC Basin Agencies primarily rely on source water from the Orange County Groundwater Basin, and supplemented by imported water from MWDOC; and the South Orange County Agencies rely almost entirely on imported water from MWDOC. Irvine Ranch Water District's (IRWD) service area includes portions of the South Orange County and OC Basin study areas. MWDOC assumes 30% of IRWD lies in the South Orange County study area. Likewise, we apportion 30% of IRWD's residential water demand and welfare loss to South Orange County.

[14] Demand curves are calibrated using equation 10 from Buck et al. (2016): $A_i = P_i / Q_i^{\frac{1}{\varepsilon_i}}$

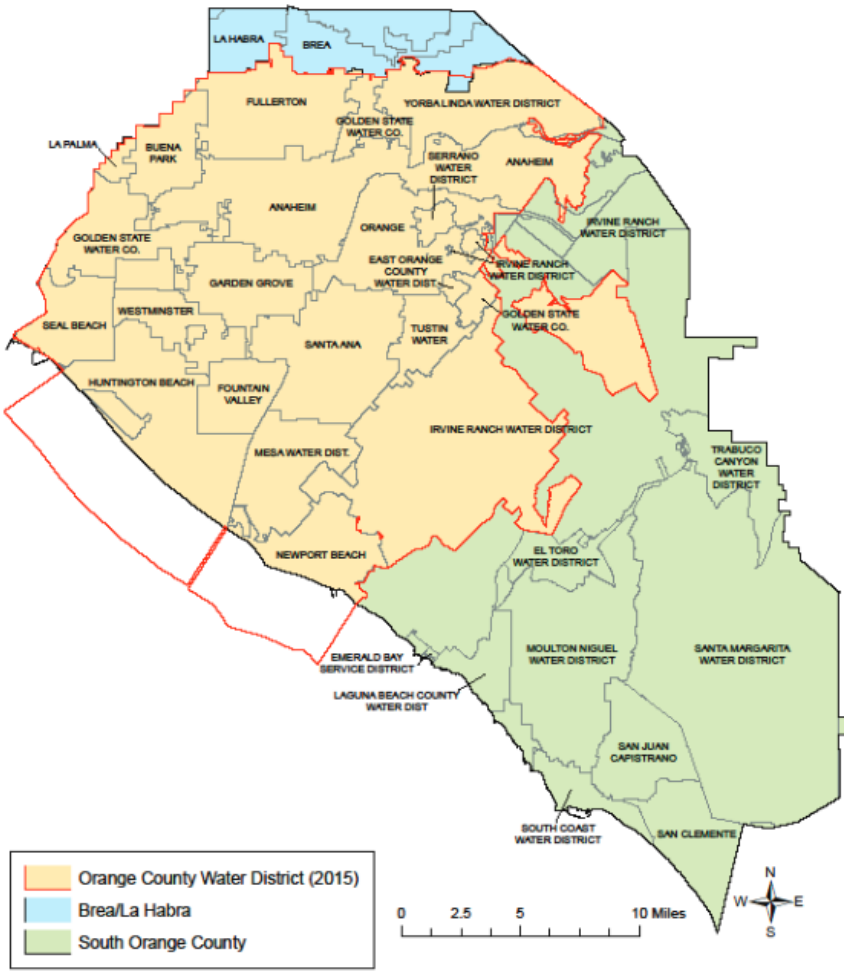
[15] Note that we chose to rely on demand data from 2019 rather than 2020 or 2021 to avoid complications caused by the impact of the COVID-19 pandemic on residential water demand. For some districts where 2019 data is not available, we rely instead on data from 2018 or 2020. Data for Emerald Bay Service District and Serrano Water district were obtained from their websites as they did not report data to the DWR.

[16] We obtain rate data from the websites of each water utility.

[17] Buck et.al. (2016).

elasticity for each study area based on these estimates. An elasticity of -0.162 indicates that a 10% increase in rates would result in a 1.62% reduction in water usage.[18,19]

FIGURE 2: THREE STUDY REGIONS IN ORANGE COUNTY BASED ON MIX OF LOCAL AND IMPORTED WATER SOURCES



Source: Figure 1 from "Orange County Water Reliability Study," MWDOC (2016).

[18] Buck et.al. (2016) estimate that the average elasticities for San Francisco Bay Area Utilities and Southern California Utilities (which includes MWDOC, Anaheim, Fullerton, and Santa Ana) are -0.158 and -0.193 respectively. San Francisco households are more inelastic, or price insensitive, while Southern California households are relatively more elastic, or sensitive to changes in prices. At average elasticities ranging from -0.162 to -0.172, MWDOC households are somewhere in between, but could be characterized as relatively inelastic compared to the Southern California average.

[19] Note that these elasticities were estimated based on data from 1996 to 2009. It is widely expected that demand will become increasingly inelastic as the penetration of water efficient appliances, irrigation, and other water conservation technologies increases among residential households. Once water efficient technologies are adopted, then households will find it increasingly costly to generate additional savings to respond to future shortage. This would lead the residential welfare losses associated with shortages to be even larger than those estimated in this report.

TABLE 7: KEY ASSUMPTIONS FOR ECONOMIC IMPACT ANALYSIS

		Brea and La Habra	Orange County Basin	South Orange County	Total
Total Residential Population	[1]	106,446	2,423,159	636,082	3,165,687
Total Residential Water Demand (mgd)	[2]	10	193	47	250
Average Persons per Household	[3]	3.0	3.2	2.7	
Average Residential Water Rates ($ / mgd)	[4]	$6,033	$3,787	$4,718	
Price Elasticity of Demand	[5]	-0.16	-0.17	-0.16	

Sources and Notes:
[1],[2]: From Residential Water Suppliers in Orange County. When 2019 data was not available, values from 2020 or 2018 were substituted.
[3]: Center for Demographic Research, January 2020.
[4]: From Residential Water Suppliers in Orange County. When 2019 data was not available, inflation-adjusted values from 2020 or 2021 were substituted.
[5]: Table 5 of Buck et. al. (2016). The MWDOC elasticity is used for Brea and La Habra and South Orange County. A residential demand-weighted average elasticity is calculated for Orange County Basin using the elasticities for Anaheim, Fullerton, Santa Ana, and MWDOC.

B. Results

We calculate the average welfare loss (in $ / million gallons) and total annual welfare loss (in $ millions) for each service area.[20] Table 8 summarizes the per-household welfare loss and the total welfare loss for the 15% shortage and 30% water supply reduction scenarios. Figure 3 shows how estimated welfare losses increase as the extent of demand rationing increases from 0% to 50%.

We estimate that a shortage that requires all residential customers to reduce water use by 15% for one year causes average welfare losses of 2,413 - 4,215 $ / million gallons.[21] Across all three regions, we estimate total residential welfare losses from a 15% water shortage to be $241 million per year. The per household WTP ranges from $222 to $427 per household-year, meaning a household of approximately three people would be willing to pay $222-$427 per year to avoid reducing their water consumption by 15%.

[20] The average welfare loss is calculated using equation 13 from Buck et al. (2016): $\frac{L_i}{Q_i^* r_{it}} = \frac{\varepsilon_i}{1+\varepsilon_i} P_i^* \frac{1-(1-r_{it})^{\frac{1+\varepsilon_i}{\varepsilon_i}}}{r_{it}} - c_i$. Where $r_{it} = \frac{Q^* - Q^R}{Q^*}$. The total welfare loss is calculated by multiplying the average welfare loss by total daily residential water demand and by 365 days per year.

[21] This corresponds to an average welfare loss of $786 – 1,373 per acre-foot.

A shortage that requires all residential customers to reduce water use by 30% for one year causes average welfare losses of 8,080 - 14,682 $ / million gallons.[22] Across all three regions, we estimate the total residential welfare losses from a 30% water shortage to be $818 million per year. The average WTP is $744 to $1,486, meaning a household would be willing to pay between $744 and $1,486 per year to avoid reducing their water consumption by 30%.

The differences in per-household welfare losses between the three basins reflect differences in the value of water to households, their willingness-to-pay, and not the differences in the costs of providing wholesale water supply to the different basins. The differences in these estimates between basins arise from differences between basins in the average residential rates and the price elasticities of demand.

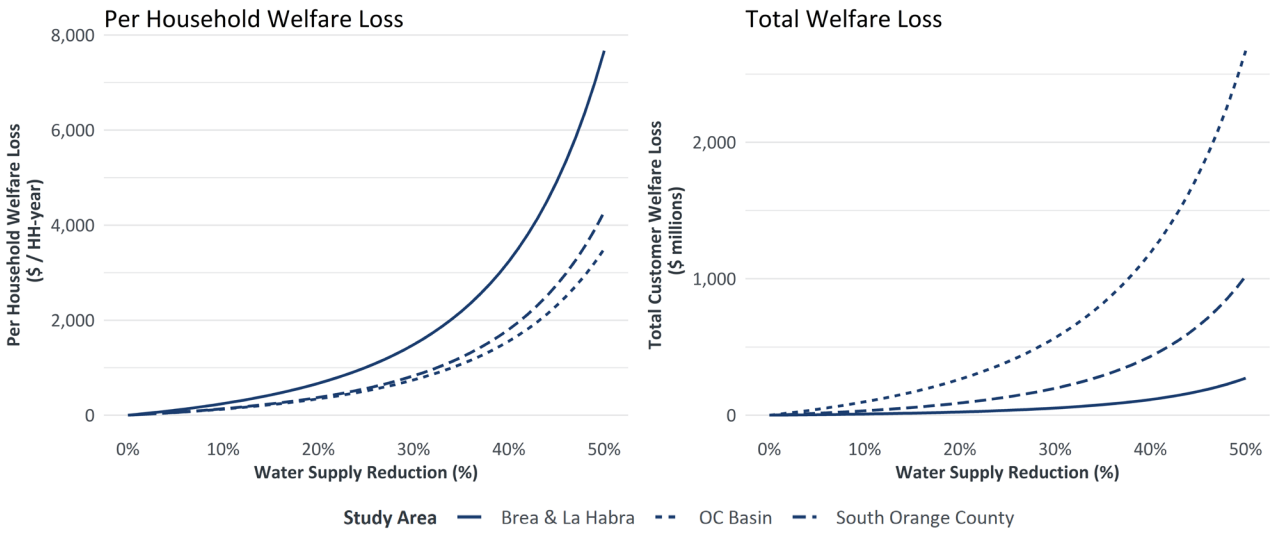
TABLE 8. ECONOMIC IMPACT OF WATER SUPPLY REDUCTIONS ON RESIDENTIAL CUSTOMER WELFARE

		Brea and La Habra	Orange County Basin	South Orange County	Total
			15% Reduction		
Per Household Welfare Loss ($ / HH-year)	[1]	$427	$222	$238	
Total Welfare Loss ($ millions / year)	[2]	$15	$170	$57	$241
			30% Reduction		
Per Household Welfare Loss ($ / HH-year)	[3]	$1,486	$744	$829	
Total Welfare Loss ($ millions / year)	[4]	$53	$568	$198	$818

Notes:
This table estimates the economic impacts of a shortage that requires all customers to reduce water use by 15% or 30%.
[1],[3]: Total Welfare Loss / Population x Persons per Household.
[2],[4]: Average Welfare Loss x Total Daily Residential Water Demand / 365 days per year. Average Welfare Loss is calculated using equation 13 from Buck et.al. (2016).

[22] This corresponds to an average welfare loss of $2,633 – 4,784 per acre-foot.

FIGURE 3. PER HOUSEHOLD AND TOTAL RESIDENTIAL CUSTOMER WELFARE LOSSES UNDER WATER SUPPLY REDUCTIONS



Source: Brattle Calculations.

IV. Impact of Water Shortages on the Water District Revenues

In this section, we calculate the revenue lost to retail water districts in Orange County that would be associated with 15% and 30% water supply reductions. Note that retail water districts sometimes choose to enact emergency drought rates or other fees during shortages in order to cover revenue losses. However, these can be unpopular with customers who feel they are being punished for conserving water. In our calculations, we assume that districts do not impose a drought surcharge or other fees to recover these losses. If surcharges were imposed, then the losses estimated in this section would instead be passed onto customers in each district.

To calculate revenue loss, we multiply overall demand times the percent shortage times the water rate by member district for the residential and commercial, industrial, and institutional (CII) sectors, then sum by study area. Total demand by sector is estimated in each region for the year 2019 by adding up the water consumption that each utility is required to report to the Department of Water Resources (DWR).[23] Residential water rates are calculated using the

[23] Note that we chose to rely on demand data from 2019 rather than 2020 or 2021 to avoid complications caused by the impact of the COVID-19 pandemic on residential water demand. For some districts where 2019 data is

median rate tier for single-family household customers.[24] CII water rates are calculated using the median rate tier for CII customers. In instances where the sector is not specified, the residential and CII rates are the same. Where rate data from 2019 is not available, rate data from the closest available year are used and adjusted for inflation. These calculations assume that districts do not impose a drought surcharge or other fees to recover these losses, in which case the losses would instead be imposed on customers.

Table 9 shows the total revenue loss for the CII and residential sectors that MWDOC member agencies would face given the 15% and 30% water supply reduction scenarios. Across all three regions, we estimate that revenue losses are $37.6 million from CII customers and $58.0 million from residential customers for a total of $95.6 million given a 15% reduction in water consumption. For a 30% reduction in water consumption, we estimate revenue losses of $75.1 million from CII and $116.0 million from residential customers, for a total of $191.1 million.

Note that the revenue losses reported in Table 9 are substantially smaller than the welfare losses reported in Table 8. Each additional unit of shortage leads to a similar revenue loss for water retailers (depending on their specific rate and cost structure), whilst for households, each additional unit of shortage is increasingly costly, as households must take increasingly extreme measures to reduce water use.

TABLE 9: ORANGE COUNTY WATER RETAILERS ANNUAL REVENUE LOSS ($ MILLIONS)

Water Supply Reduction		Brea and La Habra	Orange County Basin	South Orange County	Total
		Commercial, Industrial, and Institutional			
15% Reduction	[1]	$1.6	$32.4	$3.6	$37.6
30% Reduction	[2]	$3.1	$64.9	$7.1	$75.1
		Residential			
15% Reduction	[3]	$3.3	$41.1	$13.6	$58.0
30% Reduction	[4]	$6.5	$82.2	$27.3	$116.0

Sources and Notes:
This table estimates the economic impacts of a shortage that requires all customers to reduce water use by 15% or 30%.
Revenue loss is calculated by agency as demand x shortage x water rate.

not available, we rely instead on data from 2018 or 2020. Data for Emerald Bay Service District and Serrano Water district were obtained from their websites as they did not report data to the DWR.

[24] We obtain rate data from the websites of each water utility.

CII demand data is from residential water suppliers in Orange County. When 2019 data was not available, values from the closest year were substituted.
Commercial and industrial water rate data is from residential water suppliers in Orange County. When 2019 data was not available, inflation-adjusted values from 2020 or 2021 were substituted. When CII-specific water rates were not available, residential rates were substituted.

Appendix A: Business Water Reliability Survey Technical Report

SOCIAL SCIENCE RESEARCH CENTER
CALIFORNIA STATE UNIVERSITY
FULLERTON™

Municipal Water District of Orange County
Business Water Reliability Survey
Technical Report

~~**Submitted To:**~~

~~**Wallace Walrod, Ph.D.**~~
~~*Chief Economic Adviser*~~
~~*Orange County Business Council*~~

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SSRC
Social Science Research Center

INTRODUCTION

Orange County faces two vastly different kinds of potential water disruptions – periodic drought, typical of the region's climate, and larger, potentially catastrophic disruptions in water availability. A drought scenario is better understood as it is experienced more frequently. In dry periods, residents may face voluntary water use reductions, price increases, and, in more extreme circumstances, water rationing that in the past have yielded reductions in water use from 10 to 35 percent. Businesses, being high-value water users responsible for the local job base, are often shielded from water rationing efforts. A more extreme event could require reductions in water supply of 50 percent or more, for possibly weeks or months, and it would likely not be possible to shield businesses from supply reductions in the case of a catastrophic event. The most commonly discussed source of extreme interruptions would be earthquake damage to water treatment or major distribution systems, such as the potential for an earthquake to damage the Robert B. Diemer water treatment plant in North Orange County.

In both circumstances – whether a drought or a catastrophic disruption – residents and businesses could experience a reduction in available water supply. Efforts to mitigate those reductions require the County have a credible estimate of the value of water supply reliability to ensure the avoidance of over-investing or under-investing in water supply projects. How much would residents and businesses be willing to pay to avoid reductions or interruptions in water supply? How would this compare to mitigation costs to avoid shortages?

The most recent study to quantify the value of water supply reliability in Orange County was conducted almost two decades ago (Orange County Business Council, 2003). Since then, little work has been done to illuminate how residents and businesses would be economically harmed if water supply is reduced or interrupted. Water agencies occasionally conduct customer surveys or opinion polls, and those surveys are useful for assessing customer satisfaction in qualitative terms. But opinion and satisfaction surveys cannot give insight into how residents and businesses value a reliable water supply, nor can satisfaction or opinion surveys give a quantified estimate of the value of a secure water supply. Similarly, satisfaction or opinion surveys cannot illuminate how persons and firms would be willing to pay for investments to increase the reliability of water supply.

The Municipal Water District of Orange County (MWDOC) detailed an economic study to quantify how the Orange County community values water supply reliability. The purpose of this study is to quantify measures of benefits that would accrue to the County from reducing small (e.g. drought) and large (e.g. catastrophic event) reductions in water availability. To this end, MWDOC, through Tech Coast Consulting Group, LLC, contracted with the Social Science Research Center (SSRC) at California State University, Fullerton to administer a telephone survey to a sample of businesses operating in Orange County, California. The purpose of this study was to measure the value businesses place on various water-related aspects, the extent to which they had ever been impacted by previous droughts and would be impacted by future calls for water conservation, as well as how their business practices might be impacted by a hypothetical water shortage requiring them to cutback on their water consumption.

Between September 2 and November 3, 2021, the SSRC completed a total of 401 surveys with representatives of businesses operating in Orange County. Importantly, businesses serviced by the Irvine Ranch, Moulton Niguel, and Yorba Linda Water Districts were omitted from the current study, as these districts did not want their constituents surveyed. Although surveys were available in Spanish, all surveys were conducted in English. The overall margin of error for the total survey sample is plus or minus 4.89 percentage points with a confidence level of 95%. [1]

The instrument for the administration of this survey was comprised of approximately 46 items, used to document the impact of a hypothetical water shortage on the business practices of those operating in Orange County. The survey instrument was drafted by MWDOC staff and later refined by the SSRC to improve flow, clarity, and ease of administration. The survey instrument is reproduced in Appendix A.

Once a final survey instrument has been agreed upon, the SSRC must obtain approval from California State University's Institutional Review Board (IRB), a university committee appointed by the CSUF President to protect the rights and welfare of human subjects recruited to participate in research activities. IRBs help mitigate potential risks to participants, including risks to their physical and psychological well-being, confidentiality and privacy, and autonomy, among others. The process to request approval entails completing an application, having that application reviewed by an IRB committee, and receiving a formal approval notice. Research cannot begin until the IRB has reviewed and approved research undertakings. The study protocol received approval from CSUF IRB on August 18, 2021. Surveys were only administered to individuals who provided verbal consent to participate in the current study.

A training/pilot study was conducted on September 1, prior to full-scale survey administration. During this pilot training, staff were familiarized with the background of the study, read through the survey instrument, engaged in roleplaying with other interviewers, and practiced with the CATI software before administering surveys to live respondents. The purpose of the pilot study was to provide telephone interviewers with project information and familiarity and to determine whether full-scale data collection could be initiated. A limited number of surveys were collected during the pilot to identify potential problems or difficulties with the survey or the data collection process.

On the evening of the pilot, after data collection concluded, a debriefing session was conducted in which call center staff and management discussed any issues experienced, as well as solutions to the those issues. All issues were compiled and brought to the attention of the Tech Coast Consulting Group, along with recommendation for edits to the survey.

Midway through data collection, the SSRC made the survey available online for business

[1] Margin of error calculated based on population of total employer establishments from the 2018 American Community Survey (ACS) 1-year estimate (99,577 employer establishments).

representatives resistant to completing the survey by phone but willing to complete the survey online.

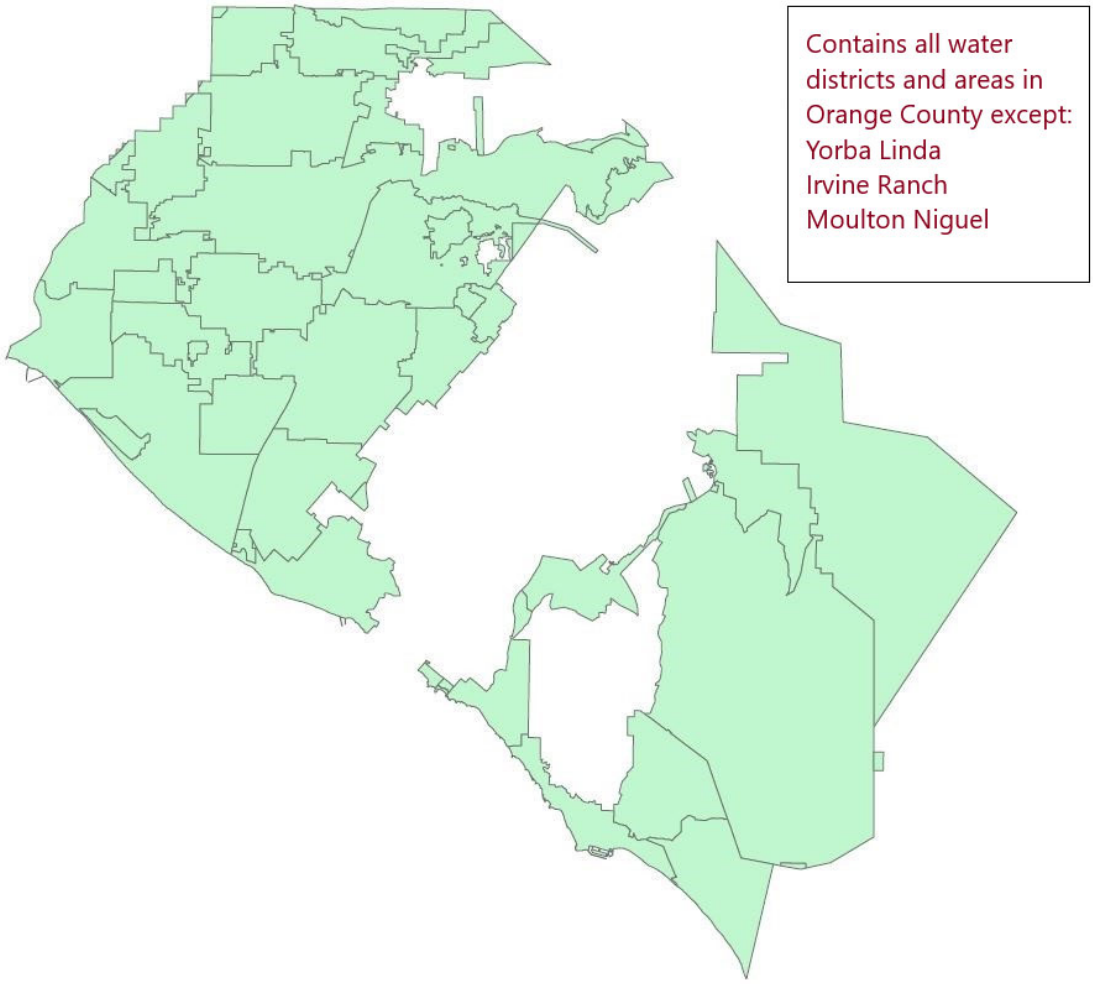
Interviews were conducted between 9:00 AM and 5:00 PM, Monday through Friday. The length of time required to complete each telephone interview ranged from 9 minutes (*n* = 2; 0.50%) to 77 minutes (*n* = 1; 0.25%). The mean survey administration time was 23 minutes and 47 seconds, and the median time was 22 minutes.

SAMPLE SELECTION

The population of inference for the current study is all businesses operating in Orange County, omitting those serviced by Yorba Linda, Moulton Niguel, and the Irvine Ranch Water districts. A map depicting the geographic area of study is presented in Figure 1. The SSRC contracted with Scientific Telephone Samples (STS), one of the premier vendors of statistically sound telephone samples, to obtain a list of businesses operating in Orange County, along with corresponding telephone numbers. To improve the efficiency of the sample, businesses were originally included in the sampling frame if located in a census block containing 90% or more of its landmass in the sampling area. Over time, however, this strategy was relaxed as the 90% criteria did not produce an adequate number of records in the sampling frame to reach the target number of survey completions. To achieve the 401 survey completions, the final sampling frame utilized contained businesses operating in census blocks with 30% or more of their land mass within the sampling area.

STS provided the SSRC with a list of 5,011 telephone numbers. In order to ensure representation of business size, quotas were originally set to ensure a third of surveys were completed with "small" businesses (less than 50 employees on site), another third with "medium" ones (50 to 249 employees on site), and a final third were completed with "large-sized" businesses (250 or more employees on site). However, as only 41 (<1%) records in the sampling frame were designated as large businesses, study quotas were reconfigured such that half of survey completions came from small businesses and the other half from medium businesses. Surveys were completed with large businesses as possible.

Figure 1. Geographic Area of Study



TECHNICAL APPROACH TO DATA COLLECTION

The SSRC implements Computer Assisted Telephone Interviewing (CATI) through WinCATI® software to facilitate the control of the sample, track scheduled call-backs, and monitor progress regarding the completion of sample design quotas. Programming is carried out using Sensus software, which allows for the randomization of questions and question sets within a survey to eliminate response order biases, response range limits to reduce recording errors, and complex interview navigation commands to ensure the proper administration of survey items.

Survey questions and response options appear on a computer screen while the interviewer is speaking to the respondent. Data are entered directly into the system to reduce coding or keying errors. SSRC supervisors are present during all interviewing shifts, and call-monitoring is routinely performed to verify the accuracy of the data. All SSRC supervisors previously worked as a telephone interviewer, and receive extensive training in telephone interviewing techniques and methodological considerations.

The CATI system includes a sophisticated call tracking and call-back scheduling procedure. This system assigns sample records to interviewing stations based on user configurable rules, which include a randomization element and also consider call history and interviewer capability/training. An attempt history is maintained for each sample record, which can be used to calculate productivity and other process-related statistics. If no contact is made, the call record will note the time of day and the interviewer who attempted the call. The call will then be automatically reassigned at a later time based upon an algorithm that reduces the probability the call will come up again on the same day and time. When a contact is made but the interview is not completed, call information is recorded that includes whether a call-back has been scheduled, who the interviewer spoke with, who they should talk to if the eligible respondent is not present, and the current disposition of the call (for example, immediate refusal, answering machine, mid- interview termination, etc.). In addition, the time of each call, the number of times the record has been called, and any interviewer-generated notes are recorded.

The CATI system allows the researcher to set the number of times a sample record is to be called before it is retired. SSRC standard operating procedure dictates 21 attempts per record. If contact is not established after 21 calls, the number is transferred to a holding queue. Exceptions are made to this procedure in two cases. First, if the 21st call attempt yields a scheduled callback, then a 22nd call attempt will be made as scheduled. Second, when a respondent begins a survey and cannot complete it at that time but indicates they will complete the survey at a later date, an indefinite number of call attempts are made to complete with that individual.

The survey was also programmed into Qualtrics, a widely used and sophisticated software package for constructing web-based surveys. SSRC staff extensively tested the survey for errors before emailing the survey link to a business representative who requested a link to the survey instrument while on the phone with a telephone interviewer. Utilization of the online survey began halfway through the data collection period, when it was realized making the survey available online might increase the survey response rate. This approach ensured representation of all types of businesses, regardless of an inability to complete by phone due to busy schedules or other barriers.

A total of 14,351 call attempts were made to complete 401 surveys, with an average of 3.29 calls per completed survey.

DATA COLLECTION OUTCOMES

Overall, 381 (95.01%) of the 401 total surveys were conducted by phone, while the remaining 4.98% (*n* = 20) were completed online. Of the 401 completed interviews, the largest proportion (*n* = 68; 17.00%) were conducted by businesses located in the area serviced by the Anaheim Water District and the Santa Ana Water District (*n* = 53; 13.21%). The service areas of the remaining 280 businesses in the survey sample are depicted in Table 1. As shown in Table 2, the largest proportion of survey completers represented businesses in the manufacturing sector (*n* = 76; 19.00%), followed by accommodation and food services (*n* = 71; 17.71%), and some "other" industry (*n* = 35; 8.7%). Examples of "other" industries reported by survey respondents include "diagnostics software," "biotech," "aerospace software and engineering," and "exporting of recyclables." The remainder of the distribution is shown in Table 2.

Looking at the number of employees at the location of the business surveyed, 253 (63.10%) surveys were conducted with small businesses, 145 (36.20%) were completed with medium-sized businesses, and three (0.75%) were done with large businesses. This is true despite the fact survey quotas initially designated 50% of completions should come from both small- and medium-sized businesses. That survey quotas were not met is indicative of the level of difficulty experienced in obtaining cooperation from medium-sized businesses.

Table 1. Service Area of Businesses Contained in Study Sample

Area	Count	%
Anaheim	68	17.00
Brea	12	3.00
Buena Park	12	3.00
El Toro Water District	12	3.00
Fountain Valley	19	4.74
Fullerton	23	5.74
Garden Grove	12	3.00
Golden State Water	18	4.49
Huntington Beach	28	6.98
La Habra	10	2.49
Laguna Beach County Water District	5	1.25
Mesa Water District	34	8.48
Newport Beach	14	3.50
Orange	37	9.23
San Clemente	8	2.00
San Juan Capistrano	7	1.75
Santa Ana	53	13.22
Santa Margarita Water District	10	2.50
Tustin	6	1.50
Westminster	12	3.00
Total	**401**	**100.00**

Table 2. Industries of Businesses Represented in the Survey Sample

Industry	Count	%
Manufacturing	76	18.95
Accommodations and Food Service	71	17.71
Other	35	8.73
Retail	34	8.48
Construction	31	7.73
Medical	31	7.73
Service (Other)	24	5.99
Finance/Real Estate	17	4.24
Arts, Entertainment, and Recreation	17	4.24
Distributor	12	3.00
Agriculture	9	2.24
Nonprofit	8	2.00
Residential	8	2.00
Tourism	7	1.75
Transportation	5	1.25
Total	**401**	**100.00**

Table 3 presents the number of attempts required to complete each interview. As the table shows, approximately two thirds of the surveys (*n* = 268, 66.83%) were completed in the first three call attempts. The SSRC calculates survey response rates using the American Association for Public Opinion Research (AAPOR) Response Rate Calculation Method 3 (RR3), which includes an estimate of eligibility among unscreened sample records based on the eligibility rate among respondents for whom a final determination could be made.

Table 3. Number of Attempts per Completed Interview

Number of Attempts	Completed Interviews	% of all Completes
1	73	18.20
2	99	24.69
3	96	23.94
4	51	12.72
5	34	08.48
More than 5	48	11.97
Total	**401**	**100.00**

The RR3 formula is:

$$Rate = \frac{C}{(C+I)+(R+N)+eU}$$

Where *C*= complete interviews, *I*= incomplete interviews, *R*= eligible refusals, *N*= other eligible non-complete records, *e*= estimate of eligibility, and *U*= records with unknown eligibility.

In addition to the Response Rate, a Cooperation Rate was also calculated for the study. This rate is the proportion of interviews completed of all eligible units. The SSRC uses Cooperation Rate Method 3 (COOP3), which counts completed interviews, partial interviews, and refusals as eligible units.

The Response Rate for the sample was 10.40%, but the Cooperation Rate was 33.20%. In all, completed surveys comprised 8.24% (*n* = 401) of all records attempted (*N* = 4,869). The largest proportion of all records attempted were answering machines (*n* = 1,828, 37.54%). Table 5 depicts the outcomes of all 4,869 attempted records.

Table 5. Disposition of All Attempted Records

Disposition	Count	%
Answering Machine	1,828	37.54
Call Blocking/Technical Barrier	305	6.26
Hang Up	269	5.53
Soft Refusal	423	8.69
Non-Working/Disconnected	448	9.20
Busy Signal	93	1.91
Complete	401	8.24
Online Link Requested	152	3.12
No Answer	351	7.21
Callback	221	4.54
Temporarily Out of Service	33	<0.10
Final Refusal	102	2.10
Number Changed	36	<0.10
Not a Business	69	1.42
Language Problem	6	<0.10
Partial	13	<0.10
Fax/Data Line	13	<0.10
Ineligible	100	2.10
Incoherent / Lost Connection	6	<0.10
Total	**4,869**	**100%**

Appendix B: Business Water Reliability Survey Instrument

MWDOC Value of Water Supply Reliability Business/Industry Survey Instrument

INTRO Hi, my name is _____, and I'm calling from the Social Science Research Center at Cal State University on behalf of the Municipal Water District of Orange County (MWDOC). We are conducting a survey of Orange County businesses. This brief survey, which will take about five minutes to complete, addresses how potential water supply interruptions might affect your business practices. The data collected through this survey will help inform decision makers plan for and invest in long term water reliability for Orange County - and are in no way indicative of future restrictions, shortages, or disruptions.

Are you the person at your business who would have details on the company's water usage, or is that someone else?

1. CORRECT PERSON [SKIP TO START]
2. SOMEONE ELSE

OTHP Is the person who would have information on water usage available now?

1. YES [SKIP TO INTROA]
2. NO

OTHW When can I call back to reach them?
[RECORD TIME AND DATE; END]

INTROA Hi, my name is _____, and I'm calling from the Social Science Research Center at Cal State University on behalf of the Municipal Water District of Orange County (MWDOC). We are conducting a survey of Orange County businesses. This brief survey, which will take about five minutes to complete, addresses how potential water supply interruptions might affect your business practices. The data collected through this survey will help inform decision makers plan for and invest in additional long term water reliability for Orange County - and are in no way indicative of future restrictions, shortages, or disruptions.

START Is it okay to ask you these questions now?

1. CONTINUE
2. CALLBACK
3. REFUSED

ELIG First, to make sure you are eligible to participate in the following study, which water district services your businesses? [INTERVIEWER, CODE CORRECT RESPONSE. ONLY READ OPTIONS IF RESPONDENT DOES NOT KNOW]

1. YORBA LINDA WATER DISTRICT [SKIP TO INELGIBLE]
2. MOULTON NIGUEL WATER DISTRICT [SKIP TO INELGIBLE]
3. IRVINE RANCH WATER DISTRICT [SKIP TO INELGIBLE]
4. CITY OF ANAHEIM
5. CITY OF FULLERTON
6. CITY OF HUNTINGTON BEACH
7. CITY OF SANTA ANA
8. EAST ORANGE COUNTY WATER
9. El TORO WATER
10. EMERALD BAY SERVICE DISTRICT
11. GOLDEN STATE WATER CO
12. LAGUNA BEACH COUNTY WATER
13. LAGUNA BEACH WATER
14. MESA WATER DISTRICT
15. SANTA MARGARITA WATER DISTRICT
16. SERRANO WATER
17. SOUTH COAST WATER DISTRICT
18. TRABUCO CANYON WATER
19. TUSTIN WATER
20. OTHER SPECIFY>

ICONSENT Before we continue, I need to read you some information about your rights as a research participant. Participation in this study is completely voluntary, and you are free to decline to answer any survey question, to decline to participate entirely, or to stop participating at any time. Your identity and your responses will remain confidential to the extent permitted by law. None of our staff have any financial interest in the results of this study.

These data are being collected to inform local decision-making and will not be sold to a third party. Nor will these data be used at a later date to sell you something. Lastly, this call will be recorded for quality control and to ensure fair treatment of all participants. If you have questions about your rights as a research participant or general questions about the study, I have some numbers I can provide you. [IF REQUESTED]: You may contact the California State University, Fullerton Institutional Review Board at (657) 278-7719. For any other questions about the study, contact Laura Gil-Trejo at 657-278-7691.

Now that you have this information, are you willing to participate in the study?

1. YES
2. NO [END]

INTRO To help us understand how important a reliable water supply is for your business, please answer the following questions to the best of your ability.

Q1. What industry sector would you classify your business as?

1. Agriculture (NAICS 11)
2. Manufacturing (NAICS 31)
3. Arts, Entertainment & Recreation (NAICS 71)
4. Accommodations & Food Services (NAICS 72)
5. Tourism (NAICS NN002)
6. Some other Industry, SPECIFY>
7. DON'T KNOW
9. REFUSED

Q2. How long has your business been located in Orange County?

1. SPECIFY IN YEARS> _____
2. SPECIFY IN MONTHS
7. DON'T KNOW
9. REFUSED

Q3. Is your business based/headquartered in Orange County?

1. YES [SKIP TO Q4]
2. NO
7. Don't know
9. REFUSED

Q3a. Where is your business headquartered?

1. SPECIFY CITY> _____
   SPECIFY STATE> _____
7. DON'T KNOW
9. REFUSED

Q4. Does your business have multiple locations within Orange County?

1. YES
2. NO [SKIP TO Q5]
7. DON'T KNOW [SKIP TO Q5]
9. REFUSED [SKIP TO Q5]

Q4a. How many locations are within Orange County?

1. SPECIFY NUMBER> _____
7. DON'T KNOW
9. REFUSED

Q4b. How many total locations are there (including those within and outside Orange County)?

1. SPECIFY NUMBER> _____
7. DON'T KNOW
9. REFUSED

TRANS2 The next few questions are about your business and its interaction with water use.

Q5. Where would you say water is used **most** within your business?

1. Operations/Manufacturing (including sterilization, operation related rising, boilers/chillers)
2. Cleaning/Sanitation
3. Building Cooling/HVAC
4. Landscape
5. OTHER, SPECIFY> _____
7. DON'T KNOW
9. REFUSED

Q6. Does your business location or campus have a sizable landscape area (such as lawns, or gardens areas beyond parking strips)?

1. YES
2. NO
7. DON'T KNOW
9. REFUSED

Q7. Rate the importance of the following water related aspects to your business or operations:

a. The **amount** of water your business uses.
b. The overall **cost** of water.
c. Water use **efficiency**.
d. The reliability of water **quality**.

[IF 4 OR 5: "What aspect(s) of operations is it "important/very important" to?"
SPECIFY RESPONSE>]

1. Very unimportant
2. Unimportant
3. Neither important nor unimportant
4. Important
5. Very important
7. DON'T KNOW
9. REFUSED

TRANS3 Note: The general approach to water management planning is to minimize impacts to businesses to the greatest extent possible in support of the economy.

The following questions refer to <u>previous or hypothetical cases</u> and are aimed at quantifying potential impacts of various levels of water supply shortages. Please note, these questions **<u>DO NOT</u>** imply that water shortages are pending **<u>and DO NOT imply</u>** that any changes to current water management strategies are being contemplated.

Q8. Was your operations/business impacted during the last **<u>major drought</u>** (2014 to 2016, which included the Governor's 2015 call for water use reduction)?

1. YES
2. NO [SKIP TO Q9]
7. DON'T KNOW [SKIP TO Q9]
9. REFUSED [SKIP TO Q9]

Q8a. Describe the impact this had on your business.

1. SPECIFY> _____
7. DON'T KNOW
9. REFUSED

Q8b. Did this impact result in revenue reduction?

1. YES
2. NO [SKIP TO Q9]
7. DON'T KNOW [SKIP TO Q9]
9. REFUSED [SKIP TO Q9]

Q8c_1. As a result, did you make any changes to reduce your water use?

1. YES
2. NO [SKIP TO Q9]
7. DON'T KNOW [SKIP TO Q9]
9. REFUSED [SKIP TO Q9]

Q8c_2 Were these changes short- or long-term?

1. SHORT-TERM
2. LONG-TERM
7. DON'T KNOW
9. REFUSED

Q9. Thinking about a hypothetical future drought, would a drought related call for water use reductions (conservation) have an impact to your operations/business?

1. YES
2. NO
7. DON'T KNOW
9. REFUSED

Q10. Has your business ever been impacted by water supply disruptions in the past?

1. YES
2. NO [SKIP TO TRANS4]
7. DON'T KNOW [SKIP TO TRANS4]
9. REFUSED [SKIP TO TRANS4]

Q10b. Describe the impact these disruptions had on your business.

1. SPECIFY> _____
7. DON'T KNOW
9. REFUSED

Q10c. And how long did this water supply disruption last?

1. SPECIFY IN DAYS>
2. SPECIFY IN WEEKS>
3. SPECIFY IN MONTHS>
7. DON'T KNOW
9. REFUSED

Q10d. Did the impact of these disruptions result in revenue reduction?

1. YES
2. NO
7. DON'T KNOW
9. REFUSED

Q10e_1. As a result, did you make any changes to reduce your water use?

1. YES
2. NO [SKIP TO TRANS4]
7. DON'T KNOW [SKIP TO TRANS4]
9. REFUSED [SKIP TO TRANS4]

Q10e_2 Were these changes short- or long-term?

1. SHORT-TERM
2. LONG-TERM
7. DON'T KNOW
9. REFUSED]

TRANS4 The following questions will ask how likely it is that your operation/business might be impacted as a result of <u>hypothetical</u> examples.

Q11. Following a hypothetical event, your business will experience recurrent shortages **<u>for a one-year period</u>**. While there is some advance notice within the first quarter, this would require you to cutback your water use to **<u>15% less water than normal for the year</u>**.

To adjust to this need to reduce your water use, we would like to evaluate what the **<u>impact to your operations/business</u>** might be. Would you…

[NOTE TO INTERVIEWER: IF YES, PROBE TO DESCRIBE WHAT KIND OF CHANGES]

Q11a. Make **<u>changes</u>** to operational practices? (Such as implement new technology or practices; see note above)

1. YES, please explain>_____
2. NO
7. DON'T KNOW
9. REFUSED

Q11b. **<u>Decrease</u>** production output?

1. YES, please explain>_____
2. NO [SKIP TO Q11c]
7. DON'T KNOW [SKIP TO Q11c]
9. REFUSED [SKIP TO Q11c]

Q11b.1. By what estimated percentage range?

1. 1-10%
2. 11-20%
3. 21-30%
4. 31-40%
5. 41-50%
6. More than 50%
7. DON'T KNOW
9. REFUSED

Q11c. Lower employment?

1. YES, please explain>_____
2. NO [SKIP TO Q11d]
7. DON'T KNOW [SKIP TO Q11d]
9. REFUSED [SKIP TO Q11d]

Q11c.1. By what estimated percentage range?

1. 1-10%
2. 11-20%
3. 21-30%
4. 31-40%
5. 41-50%
6. More than 50%
7. DON'T KNOW
9. REFUSED

Q11d. Experience income and cash flow reductions?

1. YES, please explain>_____
2. NO [SKIP TO Q11e]
7. DON'T KNOW [SKIP TO Q11e]
9. REFUSED [SKIP TO Q11e]

Q11d.1. By what estimated percentage range?

1. 1-10%
2. 11-20%
3. 21-30%
4. 31-40%
5. 41-50%
6. More than 50%
7. DON'T KNOW
9. REFUSED

Q11e. If this resulted in an increased cost, would you **pass increased costs through** to your customers?

1. YES, please explain>_____
2. NO
7. DON'T KNOW
9. REFUSED

Q11f. Begin to consider relocation?

1. YES, please explain>_____
2. NO
7. DON'T KNOW
9. REFUSED

Q12. Following a hypothetical event, your business will experience recurrent shortages **for a one-year period**. While there is some advance notice within the first quarter, this would require you to cutback your water use to **30% less water than normal for the year**.

To adjust to this need to reduce your water use, we would like to evaluate what the **impact to your operations/business might be**.

[Note to interviewer: if yes, probe to describe what kind of changes]

Q12a. Make **changes** to operational practices? (Such as implement new technology or practices; see note above)

1. YES, please explain>_____
2. NO
7. DON'T KNOW
9. REFUSED

Q12b. **Decrease** production output?

1. YES, please explain>_____
2. NO [SKIP TO Q12c]
7. DON'T KNOW [SKIP TO Q12c]
9. REFUSED [SKIP TO Q12c]

Q12b.1. By what estimated percentage range?

1. 1-10%
2. 11-20%
3. 21-30%
4. 31-40%
5. 41-50%
6. More than 50%
7. DON'T KNOW
9. REFUSED

Q12c. Lower employment?

1. YES, please explain>_____
2. NO [SKIP TO Q12d]
7. DON'T KNOW [SKIP TO Q12d]
9. REFUSED [SKIP TO Q12d]

Q12c.1. By what estimated percentage range?

1. 1-10%
2. 11-20%
3. 21-30%
4. 31-40%
5. 41-50%
6. More than 50%
7. DON'T KNOW
9. REFUSED

Q12d. Experience income and cash flow reductions?

1. YES, please explain>_____
2. NO [SKIP TO Q12e]
7. DON'T KNOW [SKIP TO Q12e]
9. REFUSED [SKIP TO Q12e]

Q12d.1. By what estimated percentage range?

1. 1-10%
2. 11-20%
3. 21-30%
4. 31-40%
5. 41-50%
6. More than 50%
7. DON'T KNOW
9. REFUSED

Q12e. If this resulted in an increased cost, would you **pass increased costs through** to your customers?

1. YES, please explain>_____
2. NO
7. DON'T KNOW
9. REFUSED

Q12f. Begin to consider relocation?

1. YES, please explain>_____
2. NO
7. DON'T KNOW
9. REFUSED

TRANS5 The following questions will focus on your business's considerations for location and/or expansion of your business within Orange County.

Q13. What are the top three reasons your business is based here (meaning reasons you would **not** consider relocation)?

1. Geographic location
2. You have invested too much capital
3. Local skilled workforce
4. Complementary industry access
5. Regulations in the area
6. Other, SPECIFY>_____
7. DON'T KNOW
9. REFUSED

Q14. What are the top three reasons your business might consider not expanding in Orange County?

1. SPECIFY #1>_____
   SPECIFY #2>_____
   SPECIFY #3>_____
7. DON' KNOW
9. REFUSED

Q15. Rate the likelihood that any of the following water related reasons could result in consideration for future expansions decisions:

a. Intermittent calls for small reductions in water use.
b. Less often, but greater reduction amounts when calls for water use reduction occur.
c. Intermittent small changes to water quality (yet still meeting all drinking water standards)
d. Albeit less often, greater water quality changes (yet still meeting all drinking water standards)
e. Increased water cost
f. Any other water related reasons, SPECIFY>_____

1. Very unlikely
2. Unlikely
3. Neither likely nor unlikely
4. Likely
5. Very likely
7. DON'T KNOW
9. REFUSED

Q16. Rate the importance of the following to future expansion decisions:

a. Water reliability
b. Water quality
c. Water cost
d. Any other water related reasons, SPECIFY>_____

1. Not at all Important
2. Unimportant
3. Neither important nor unimportant
4. Important
5. Very important
7. DON'T KNOW
9. REFUSED

Q17. Do you have additional water related comments you would like to share?

1. YES, SPECIFY>_____
2. NO
7. DON'T KNOW
9. REFUSED

INELIGIBLE **I am sorry, you are ineligible to participate in this survey. Thank you for your time.**

CONCL **Thank you for your feedback!**

This information will only be used to help inform decision makers as they continue to plan for and invest in long term water reliability for Orange County and are in NO WAY indicative of future restrictions, shortages, or disruptions.

Appendix C: Survey Respondents by Industry and Aggregation Method

We surveyed 401 businesses in Orange County using a stratified random sampling approach within 15 industry categories categorized by the North American Industry Classification System (NAICS). Table C1 shows the number and share of businesses surveyed by 15-industry categorization. In order to improve the quality of the survey analysis, survey results in peer or similar industry sectors were aggregated together to form eight broader industry categories. Table C1 also highlights which of the 15 industry categories are included in the eight categories analyzed.

TABLE C1: EIGHT-CATEGORY INDUSTRY BREAKDOWN AND COUNT OF SURVEY RESPONDENTS

NAICS Code	15-Industry Category	8-Industry Category	Count	Percent of Total
31-33	Manufacturing	Manufacturing	73	18%
72	Accomodation and Food Services	Entertainment and Tourism	61	15%
44-45	Retail Trade	Retail and Other Services	43	11%
62	Health Care and Social Assistance	Education and Health Care	39	10%
42	Wholesale Trade	Logistics, Transportation, Warehousing	30	7%
23	Construction	Construction	28	7%
54	Professional, Scientific, and Technical Services	Professional Services, Information, and Administration	26	6%
53	Real Estate Rental and Leasing	Finance, Insurance, and Real Estate (FIRE)	17	4%
56	Administrative and Support and Waste Management and Remediation Services	Professional Services, Information, and Administration	15	4%
71	Arts, Entertainment, and Recreation	Entertainment and Tourism	15	4%
48-49	Transportation and Warehousing	Logistics, Transportation, Warehousing	14	3%
52	Finance and Insurance	Finance, Insurance, and Real Estate (FIRE)	11	3%
61	Eduational Services	Education and Health Care	11	3%
51	Information	Professional Services, Information, and Administration	10	2%
81	Other Services	Retail and Other Services	8	2%
Total			401	100%

Sources and Notes:
Includes responses that were dropped in analysis due to inconsistencies.

Appendix D: Eight-Category Economic Impacts

D.1 Economic Impacts for a 15% Water Reduction Scenario

Table D1 shows the economic impacts from IMPLAN for each of the eight industry categories for a 15% water reduction scenario, as well as the total impact's share of the Orange County employment and output for that industry. The Orange County employment and output data come from Emsi.

TABLE D1: ECONOMIC IMPACTS OF A 15% WATER REDUCTION SCENARIO BY INDUSTRY
PANEL A: CONSTRUCTION

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	1,456	$60,023,396	$81,592,762	$136,287,747
2 - Indirect	187	$13,534,177	$21,807,195	$34,989,082
3 - Induced	280	$18,365,319	$30,044,450	$47,764,864
Total	1,924	$91,922,891	$133,444,408	$219,041,692
% County Total	1.9%			1.6%

PANEL B: MANUFACTURING

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	3,479	$161,145,936	$288,236,431	$651,584,966
2 - Indirect	802	$73,932,346	$114,570,105	$185,233,073
3 - Induced	867	$56,902,552	$93,057,228	$147,939,701
Total	5,148	$291,980,834	$495,863,765	$984,757,740
% County Total	3.5%			3.1%

PANEL C: LOGISTICS, TRANSPORTATION, AND WAREHOUSING

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	1,561	$133,998,046	$253,558,110	$412,293,122
2 - Indirect	787	$67,694,104	$108,697,973	$172,551,547
3 - Induced	755	$49,524,087	$81,007,416	$128,785,004
Total	3,103	$251,216,237	$443,263,499	$713,629,673
% County Total	3.1%			2.9%

PANEL D: RETAIL AND OTHER SERVICES

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	2,364	$77,422,897	$100,229,130	$151,516,763
2 - Indirect	239	$19,839,754	$33,703,016	$53,948,219
3 - Induced	374	$24,561,601	$40,185,286	$63,887,262
Total	2,977	$121,824,251	$174,117,433	$269,352,244
% County Total	1.5%			1.4%

PANEL E: FIRE

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	0	$142,622,842	$409,899,808	$668,505,788
2 - Indirect	1,296	$103,387,613	$199,783,803	$322,256,544
3 - Induced	946	$62,075,126	$101,558,769	$161,459,627
Total	2,243	$308,085,581	$711,242,380	$1,152,221,960
% County Total	1.8%			2.9%

PANEL F: PROFESSIONAL, INFORMATION, AND ADMINISTRATIVE SERVICES

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	5,080	$268,229,699	$369,097,340	$583,133,989
2 - Indirect	1,188	$96,409,245	$148,624,916	$237,090,012
3 - Induced	1,383	$90,704,720	$148,365,355	$235,869,968
Total	7,651	$455,343,664	$666,087,611	$1,056,093,970
% County Total	2.6%			2.2%

PANEL G: EDUCATION AND HEALTHCARE SERVICES

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	1,529	$80,258,171	$90,110,374	$135,342,410
2 - Indirect	214	$16,901,249	$28,722,860	$46,081,840
3 - Induced	360	$23,648,195	$38,678,324	$61,490,162
Total	2,104	$120,807,616	$157,511,559	$242,914,413
% County Total	0.9%			1.2%

PANEL H: ENTERTAINMENT AND TOURISM

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	3,536	$118,543,497	$161,057,138	$270,401,574
2 - Indirect	467	$39,162,410	$62,535,865	$99,806,050
3 - Induced	583	$38,223,882	$62,519,814	$99,393,167
Total	4,586	$195,929,789	$286,112,817	$469,600,791
% County Total	2.8%			4.5%

D.2 Economic Impacts for a 30% Water Reduction Scenario

Table D2 shows the economic impacts from IMPLAN for each of the eight industry categories for a 30% water reduction scenario, as well as the total impact's share of the Orange County employment and output for that industry. The Orange County employment and output data come from Emsi.

TABLE D2: ECONOMIC IMPACTS OF A 30% WATER REDUCTION SCENARIO BY INDUSTRY

PANEL A: CONSTRUCTION

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	3,851	$72,969,618	$99,191,201	$165,683,143
2 - Indirect	228	$16,453,313	$26,510,708	$42,535,746
3 - Induced	340	$22,326,466	$36,524,625	$58,067,089
Total	4,419	$111,749,397	$162,226,535	$266,285,979
% County Total	4.3%			1.9%

PANEL B: MANUFACTURING

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	12,095	$545,799,079	$976,252,844	$2,206,909,355
2 - Indirect	2,715	$250,407,843	$388,047,378	$627,381,881
3 - Induced	2,938	$192,728,164	$315,183,556	$501,069,741
Total	17,748	$988,935,086	$1,679,483,778	$3,335,360,976
% County Total	11.9%			10.5%

PANEL C: LOGISTICS, TRANSPORTATION, AND WAREHOUSING

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	3,486	$210,302,489	$397,945,368	$647,071,149
2 - Indirect	1,236	$106,242,135	$170,595,429	$270,810,067
3 - Induced	1,185	$77,725,303	$127,136,638	$202,120,910
Total	5,906	$394,269,927	$695,677,435	$1,120,002,126
% County Total	5.9%			4.5%

PANEL D: RETAIL AND OTHER SERVICES

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	5,137	$434,840,928	$562,930,731	$850,984,560
2 - Indirect	1,342	$111,428,755	$189,290,914	$302,996,846
3 - Induced	2,103	$137,948,715	$225,698,184	$358,818,870
Total	8,582	$684,218,398	$977,919,829	$1,512,800,277
% County Total	4.2%			8.1%

PANEL E: FIRE

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	0	$196,541,234	$564,861,930	$921,233,587
2 - Indirect	1,787	$142,473,174	$275,311,826	$444,085,238
3 - Induced	1,304	$85,542,551	$139,952,938	$222,499,242
Total	3,091	$424,556,960	$980,126,694	$1,587,818,066
% County Total	2.5%			4.1%

PANEL F: PROFESSIONAL, INFORMATION, AND ADMINISTRATIVE SERVICES

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	6,053	$363,178,264	$499,751,265	$789,553,101
2 - Indirect	1,609	$130,536,412	$201,235,505	$321,015,680
3 - Induced	1,872	$122,812,586	$200,884,065	$319,363,763
Total	9,533	$616,527,262	$901,870,836	$1,429,932,543
% County Total	3.2%			2.9%

PANEL G: EDUCATION AND HEALTHCARE SERVICES

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	4,366	$144,213,902	$161,917,079	$243,193,393
2 - Indirect	385	$30,369,432	$51,611,389	$82,803,307
3 - Induced	648	$42,492,851	$69,500,114	$110,490,135
Total	5,399	$217,076,184	$283,028,582	$436,486,835
% County Total	2.4%			2.2%

PANEL H: ENTERTAINMENT AND TOURISM

Impact	Employment	Labor Income	Value Added	Output
1 - Direct	8,057	$297,619,845	$404,356,219	$678,880,547
2 - Indirect	1,173	$98,322,647	$157,004,938	$250,576,890
3 - Induced	1,463	$95,966,341	$156,964,638	$249,540,292
Total	10,694	$491,908,833	$718,325,796	$1,178,997,729
% County Total	6.6%			11.4%

Appendix E: Calculation of Low and High Impact Estimates

Business impact analyses sometimes give one estimate. We go beyond that. The business survey was high quality, with 374 firm respondents, giving the best information on business impacts in almost three decades and providing the only survey results drawn completely from businesses operating in Orange County. The results reported in Table 5 and Table 6 and in the body of the report are the central tendency, which are the most likely impacts. Below the most likely impacts, in brackets, are low and high estimates. Here we describe the method for obtaining those low and high estimates based on an analysis of survey sampling error ranges.

We account for survey sampling error by calculating survey sample errors and using those to quantify low and high direct impacts. Those low and high direct impacts were then input into IMPLAN to obtain low and high indirect, induced, and total impacts. (Recall that the total impact is the sum of direct, indirect, and induced impacts.) Due to the sample size, the low/high analysis was only conducted for the full Orange County economy and not disaggregated by industry.

We use the same eight categories described in the body of the report. Standard errors for the sample mean impact in each of the eight categories were calculated as

$$se_{\mu} = \frac{se}{\sqrt{n}}$$

Where se_{μ} = standard error of the sample mean impact in the category

se = standard error of the mean impact in the category

n = valid survey respondents within the category

We take the low/high impact values to be one standard error of the sample mean below and above the mean impact in each category. Individually, each category would experience impacts outside the +/- one standard error value with probabilities approximately equal to 0.33. (In other words, in each of the eight categories, the likelihood that an impact would be outside the low/high range would be approximately 0.33, or one-third.) Yet each category will not move identically due to sampling error. It is highly unlikely that sampling error would cause each category to have only low or high values. We assume that the sampling error across the categories are independent – a very reasonable assumption. Note that we are not assuming that impacts within industries are independent across categories, rather we are assuming that the survey sampling error is independent across industry categories.

Given that assumption, the economy wide sampling error would be the sum of $\frac{1}{\sqrt{8}}$ multiplied by each of the eight values for se_{μ}. A short illustration is provided below.

For the eight industry sectors, let the variance of the sample mean = var(x_i) and the variance of the economy-wide sample mean = var(x). (Note we are using "i" to index the eight industry categories.) If cov(x_i,x_j) for any two sectors "i" and "j" = 0, the variance of the economy-wide sample mean is:

$$var(x) = \sum_{i=1}^{8} var(x_i)$$

Implying:

$$se(x)^2 = \sum_{i=1}^{8} se(x_i)^2$$

Normalize var(x) = 1 and assume for simplicity that each se(x_i) has the same value. Then

$$se(x_i) = \frac{1}{\sqrt{8}}$$

We use $\frac{1}{\sqrt{8}}$ of each of the eight industry sample standard errors to calculate low and high values for impacts from the 15 percent and 30 percent water reductions. Each of the eight-industry sector's output and employment reductions are moved to $\frac{1}{\sqrt{8}}$ of the sector's sampling standard error above the sample mean for high impacts and $\frac{1}{\sqrt{8}}$ of the sector's sampling standard error below the mean for low impacts. The resulting values are input into IMPLAN to calculate high and low total impacts. This adjusts for the inherent uncertainty in the survey results. The likelihood that a realized impact would be lower than the low values due to survey sampling error would be approximately 16 percent, and similarly the likelihood that an impact would be larger than the high value would be approximately 16 percent.

Within each of those eight categories, we report below in Table E1 the number of valid respondents (firms replying to the yes/no question about whether they would experience output impacts), the standard error of the mean impact within each category, and the industry sample standard error. Table E2 shows the same for the employment impact question.

TABLE E1: OUTPUT IMPACT SAMPLING STANDARD ERRORS FOR EIGHT INDUSTRY CATEGORIES

Industry	15% Reduction			30% Reduction		
	Total Respondents	Standard Error of the Mean	Economy-Wide Standard Error	Total Respondents	Standard Error of the Mean	Economy-Wide Standard Error
	[1]	[2]	[3]	[4]	[5]	[6]
Construction	26	0.98	0.35	26	1.00	0.35
Manufacturing	71	0.66	0.23	71	1.90	0.67
Logistics, Transportation, and Warehousing	43	0.96	0.34	43	1.28	0.45
Retail and Other Services	45	0.49	0.17	45	1.97	0.70
FIRE	24	1.22	0.43	24	1.34	0.48
Professional Services, Information, and Administration	47	0.82	0.29	47	1.06	0.37
Education and Health Care	46	0.39	0.14	46	0.66	0.23
Entertainment and Tourism	72	0.78	0.28	72	1.58	0.56

Sources and Notes:
[1],[4]: Excludes respondents with inconsistent responses for output and employment questions.
[2] = sample standard deviation / sqrt([1]).
[3] = [2] / sqrt(8).
[5] = sample standard deviation / sqrt([4]).
[6] = [5] / sqrt(8).

TABLE E2: EMPLOYMENT IMPACT SAMPLING STANDARD ERRORS FOR EIGHT INDUSTRY CATEGORIES

Industry	15% Reduction			30% Reduction		
	Total Respondents	Standard Error of the Mean	Economy-Wide Standard Error	Total Respondents	Standard Error of the Mean	Economy-Wide Standard Error
	[1]	[2]	[3]	[4]	[5]	[6]
Construction	26	0.84	0.30	26	2.94	1.04
Manufacturing	71	0.73	0.26	70	2.13	0.75
Logistics, Transportation, and Warehousing	43	0.95	0.34	43	1.41	0.50
Retail and Other Services	45	0.67	0.24	45	1.27	0.45
FIRE	24	0.00	0.00	24	0.00	0.00
Professional Services, Information, and Administration	47	1.61	0.57	47	1.63	0.58
Education and Health Care	46	0.56	0.20	46	0.96	0.34
Entertainment and Tourism	72	0.70	0.25	72	1.16	0.41

Sources and Notes:
[1],[4]: Excludes respondents with inconsistent responses for output and employment questions.
[2] = sample standard deviation / sqrt([1]).
[3] = [2] / sqrt(8).
[5] = sample standard deviation / sqrt([4]).
[6] = [5] / sqrt(8).

The Economic Impacts of Water Shortages in Orange County

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PREPARED FOR
MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

JUNE 6, 2022

Brattle

Economic Impacts of Water Shortages in OC

Outline:

1. Motivation
2. Impacts of Shortages on OC Businesses
3. Impacts of Shortages on Residential Customers
4. Impacts of Shortages on Retailer Revenue

Motivation

- Reliability planning is a key role of MWDOC
  - But, most recent study on value of reliability in OC is 19 years old
- Disruptions in water supply:
  1. Reduce economic activity and employment
  2. Impose welfare losses on local residents
  3. Reduce revenues to water districts (and impose other costs)
- Estimating the impacts of water supply disruption values the critical benefit of reliability investments:
  - *Expected Cost of Disruption = Probability x Cost*
    - OC Reliability Update Study: Estimates probability of disruption
    - This Study: Estimates costs of disruption
- Understanding benefits ensures MWDOC neither over- nor underinvests in reliability

Impacts of Shortages on Orange County Businesses

BUSINESS IMPACTS

Business Impacts – Overview

3 Steps:

1. Commission survey of businesses responses to hypothetical drought
2. Aggregate survey responses to estimate county-wide direct business impacts
3. Use IMPLAN, an Economics Impact Model, to calculate spillover effects on broader economy

BUSINESS IMPACTS

Survey Overview

- Phone survey conducted by CSU-Fullerton
  - between Sept 2 and Nov 3, 2021
  - 401 Survey Respondents from a statistical sampling frame
- Summarize responses in 8 categories based on NAICS code
- Key survey questions related to the impact of a hypothetical drought on:
  - Production of Output
  - Employment
- Other survey questions asked responses relating to:
  - How firms uses water and most important aspects of water supply
  - Firm responses to 2014-15 drought
  - Firm considerations when locating or expanding in Orange County

BUSINESS IMPACTS

Survey Instrument

*Following a hypothetical event, your business will experience recurrent shortages **for a one-year period**.*

*While there is some advance notice within the first quarter, this would require you to cutback your water use to **15% (or 30%) less water than normal for the year**.*

To adjust to this need to reduce your water use, we would like to evaluate what the impact to your operations/business might be. Would you…

- Decrease production output?
- By what estimated percentage range?
- Lower employment?
- By what estimated percentage range?

BUSINESS IMPACTS

Survey Results – Output Reduction

TABLE 1: NUMBER OF RESPONDENTS AND AVERAGE MAGNITUDE OF OUTPUT IMPACTS BY INDUSTRY IN ORANGE COUNTY

Industry	15% Water Supply Reduction				30% Water Supply Reduction			
	Total Respondents	Total Yes	% Yes	Average Magnitude	Total Respondents	Total Yes	% Yes	Average Magnitude
Construction	26	1	4%	1.0%	26	2	8%	1.2%
Manufacturing	71	12	17%	2.1%	71	19	27%	7.0%
Logistics, Transportation, and Warehousing	43	4	9%	1.7%	43	6	14%	2.6%
Retail and Other Services	45	3	7%	0.8%	45	10	22%	4.6%
FIRE	24	2	8%	1.7%	24	3	13%	2.4%
Professional Services, Information, and Administration	47	3	6%	1.2%	47	3	6%	1.6%
Education and Health Care	46	4	9%	0.7%	46	5	11%	1.3%
Entertainment and Tourism	72	16	22%	2.6%	72	24	33%	6.6%

Notes: Responses are aggregated by midpoint, i.e. 1%-10% is 5.5%. "Don't know" and "refused" are assumed to be the lowest impact, or 1%-10%. FIRE includes Finance, Insurance, and Real Estate. This table estimates the output impacts of a water supply reduction that requires all customers to reduce water use by 15% or 30% for one year.

BUSINESS IMPACTS

Survey Results – Employment Reduction

TABLE 2: NUMBER OF RESPONDENTS AND AVERAGE MAGNITUDE OF EMPLOYMENT IMPACTS BY INDUSTRY IN ORANGE COUNTY

Industry	15% Water Supply Reduction				30% Water Supply Reduction			
	Total Respondents	Total Yes	% Yes	Average Magnitude	Total Respondents	Total Yes	% Yes	Average Magnitude
Construction	26	3	12%	1.4%	26	3	12%	3.7%
Manufacturing	71	12	17%	2.3%	70	18	26%	8.1%
Logistics, Transportation, and Warehousing	43	3	7%	1.5%	43	7	16%	3.5%
Retail and Other Services	45	4	9%	1.2%	45	6	13%	2.5%
FIRE	24	0	0%	0.0%	24	0	0%	0.0%
Professional Services, Information, and Administration	47	2	4%	1.7%	47	3	6%	2.1%
Education and Health Care	46	2	4%	0.7%	46	7	15%	1.9%
Entertainment and Tourism	72	12	17%	2.2%	72	22	31%	4.9%

Notes: Responses are aggregated by midpoint, i.e. 1%-10% is 5.5%. "Don't know" and "refused" are assumed to be the lowest impact, or 1%-10%. FIRE includes Finance, Insurance, and Real Estate. This table estimates the employment impacts of a water supply reduction that requires all customers to reduce water use by 15% or 30% for one year.

BUSINESS IMPACTS

Direct Impacts

Total Direct Impacts

- Calculated for production output and employment
- Based on average responses to survey by industry
- Aggregate responses to calculate total direct impact
  - Based on Emsi data on County output and employment by industry

BUSINESS IMPACTS

Direct Impacts – Output Reduction

TABLE 3: DIRECT IMPACTS TO OUTPUT BY INDUSTRY FOR 15% AND 30% WATER REDUCTIONS

Industry	Total Output ($ millions)	15% Reduction Direct Impact (%)	15% Reduction Direct Impact ($ millions)	30% Reduction Direct Impact (%)	30% Reduction Direct Impact ($ millions)
	[1]	[2]	[3]	[4]	[5]
Construction	$13,896	1.0%	$136	1.2%	$166
Manufacturing	$31,687	2.1%	$652	7.0%	$2,207
Logistics, Transportation, and Warehousing	$24,623	1.7%	$412	2.6%	$647
Retail and Other Services	$18,680	0.8%	$152	4.6%	$851
FIRE	$39,132	1.7%	$669	2.4%	$921
Professional Services, Information, and Administration	$48,508	1.2%	$583	1.6%	$790
Education and Health Care	$19,455	0.7%	$135	1.3%	$243
Entertainment and Tourism	$10,356	2.6%	$270	6.6%	$679
Total	$206,338		$3,009		$6,504

BUSINESS IMPACTS

Direct Impacts – Employment Reduction

TABLE 4: DIRECT IMPACTS TO EMPLOYMENT BY INDUSTRY FOR 15% AND 30% WATER REDUCTIONS

Industry	Total Employed ('000s)	15% Reduction Direct Impact (%)	15% Reduction Direct Impact ('000s)	30% Reduction Direct Impact (%)	30% Reduction Direct Impact ('000s)
	[1]	[2]	[3]	[4]	[5]
Construction	103.7	1.4%	1.5	3.7%	3.9
Manufacturing	148.8	2.3%	3.5	8.1%	12.1
Logistics, Transportation, and Warehousing	100.9	1.5%	1.6	3.5%	3.5
Retail and Other Services	204.6	1.2%	2.4	2.5%	5.1
FIRE	122.8	0.0%	0.0	0.0%	0.0
Professional Services, Information, and Administration	294.8	1.7%	5.1	2.1%	6.1
Education and Health Care	227.0	0.7%	1.5	1.9%	4.4
Entertainment and Tourism	163.2	2.2%	3.5	4.9%	8.1
Total	1,365.8		19.0		43.0

BUSINESS IMPACTS

Economic Impact Analysis

- Estimate impacts of shortages on wider economy using IMPLAN
  - Commonly used Input-Output Model
- Based on employment and direct output impacts, IMPLAN estimates:
  - Reduced Labor Income
  - Reduced Value Added
  - Indirect Impacts – Reduced B2B transactions
  - Induced Impacts – Reduced spending from reduced labor income
- Robustness check:
  - In square brackets we estimate 'low' and 'high' scenarios, based on survey sampling error
  - 2-in-3 Probability that true estimate within low-high range

BUSINESS IMPACTS

Economic Impact Analysis – 15% Reduction

TABLE 5: TOTAL ECONOMIC IMPACTS ASSOCIATED WITH A 15% REDUCTION IN WATER

Impact		Employment ('000s)	Labor Income ($ millions)	Value Added ($ millions)	Output ($ millions)
1 - Direct Impacts	[1]	19.0 [15.0 - 23.1]	$1,042 [$830 - $1,254]	$1,754 [$1,392 - $2,115]	$3,009 [$2,407 - $3,611]
2 - Indirect Impacts	[2]	5.2 [4.1 - 6.3]	$431 [$343 - $519]	$718 [$570 - $867]	$1,152 [$914 - $1,390]
3 - Induced Impacts	[3]	5.5 [4.4 - 6.7]	$364 [$290 - $438]	$595 [$474 - $717]	$947 [$753 - $1,140]
Total	[4]	29.7 [23.5 - 36.0]	$1,837 [$1,463 - $2,212]	$3,068 [$2,436 - $3,699]	$5,108 [$4,074 - $6,142]
% of County Total	[5]	1.9% [1.5% - 2.3%]			2.0% [1.6% - 2.4%]

Sources and Notes:
Low and high IMPLAN estimates in brackets.

BUSINESS IMPACTS

Economic Impact Analysis – 30% Scenario

TABLE 6: TOTAL ECONOMIC IMPACTS ASSOCIATED WITH A 30% REDUCTION IN WATER

Impact		Employment ('000s)	Labor Income ($ millions)	Value Added ($ millions)	Output ($ millions)
1 - Direct Impacts	[1]	43.0 [36.3 - 49.8]	$2,265 [$1,913 - $2,618]	$3,667 [$3,095 - $4,239]	$6,504 [$5,529 - $7,478]
2 - Indirect Impacts	[2]	10.5 [8.8 - 12.1]	$886 [$749 - $1,023]	$1,460 [$1,231 - $1,688]	$2,342 [$1,976 - $2,709]
3 - Induced Impacts	[3]	11.9 [10.0 - 13.7]	$778 [$656 - $899]	$1,272 [$1,073 - $1,470]	$2,022 [$1,706 - $2,338]
Total	[4]	65.4 [55.1 - 75.6]	$3,929 [$3,318 - $4,541]	$6,399 [$5,399 - $7,398]	$10,868 [$9,211 - $12,525]
% of County Total	[5]	4.2% [3.5% - 4.8%]			4.3% [3.6% - 4.9%]

Sources and Notes:
Low and high IMPLAN estimates in brackets.

Impacts of Shortages on Residential Water Users

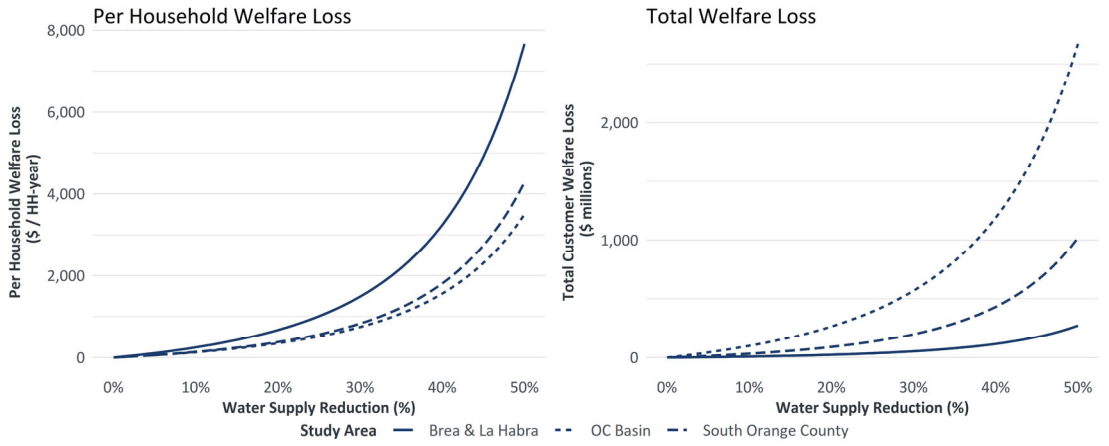
RESIDENTIAL IMPACTS

Approach

- We use extensively developed and used economic theory to estimate value of reliability
  - (Unlike C&I Sector where we rely upon customer survey)
  - '*Demand curves*' measure the prices households are '*willing-to-pay*' for each unit of water
- We calibrate *'demand curves'* for each district in OC based on:
  - Estimates of Demand Elasticity
  - Median Residential Water Rates Tiers
  - Total Residential Water Demand
- Calculate total welfare loss by add up willingness-to-pay for each unit of water not received
- Households cut low-value water uses (outdoor irrigation) before higher value uses (indoor use)
  - So, as shortages increase, household welfare losses grow at an increasing rate

RESIDENTIAL IMPACTS

Relationship between Shortage and Welfare Loss



RESIDENTIAL IMPACTS

Results

TABLE 8. ECONOMIC IMPACT OF WATER SUPPLY REDUCTIONS ON RESIDENTIAL CUSTOMER WELFARE

		Brea and La Habra	Orange County Basin	South Orange County	Total
			15% Reduction		
Per Household Welfare Loss ($ / HH-year)	[1]	$427	$222	$238	
Total Welfare Loss ($ millions / year)	[2]	$15	$170	$57	$241
			30% Reduction		
Per Household Welfare Loss ($ / HH-year)	[3]	$1,486	$744	$829	
Total Welfare Loss ($ millions / year)	[4]	$53	$568	$198	$818

Notes:
This table estimates the economic impacts of a shortage that requires all customers to reduce water use by 15% or 30%.
[1],[3]: Total Welfare Loss / Population x Persons per Household.
[2],[4]: Average Welfare Loss x Total Daily Residential Water Demand / 365 days per year. Average Welfare Loss is calculated using equation 13 from Buck et.al. (2016).

Impact of Shortages on Water District Revenues

WATER DISTRICT REVENUES

OC Water Retailer Annual Revenue Loss ($ Millions)

Water Supply Reduction		Brea and La Habra	Orange County Basin	South Orange County	Total
		Commercial, Industrial, and Institutional			
15% Reduction	[1]	$1.6	$32.4	$3.6	$37.6
30% Reduction	[2]	$3.1	$64.9	$7.1	$75.1
		Residential			
15% Reduction	[3]	$3.3	$41.1	$13.6	$58.0
~~30% Reduction~~	~~[4]~~	~~$6.5~~	~~$82.2~~	~~$27.3~~	~~$116.0~~

Notes: Estimates based on median rate tier and 2019 levels of demand.
Calculation assumes that districts do not impose drought surcharge or other fees to recover costs.
Estimates in 2019 Dollars.

Questions / Comments?

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Item No. 4

INFORMATION ITEM
June 6, 2022

TO: **Planning & Operations Committee**
(Directors Tamaribuchi, McVicker, Nederhood)

FROM: **Robert Hunter, General Manager**

Staff Contact: Harvey De La Torre, Assistant General Manager

SUBJECT: **UPDATE REGARDING MWDOC MEMBER AGENCY FACILITATED DISCUSSIONS**

STAFF RECOMMENDATION

Staff recommends the Planning & Operations Committee receive and file this report.

COMMITTEE RECOMMENDATION

Committee recommends (To be determined at Committee Meeting)

REPORT

At the April 4, 2022 MWDOC Planning & Operations Committee meeting, Paul Brown of Paul Redvers Brown Inc. presented the key findings of his report on the facilitated discussions with MWDOC's member agencies. This report summarized the outcome of 37 interviews with water managers and elected officials in the MWDOC's service area.

The purpose of these interviews were to determine an overall assessment of MWDOC's performance and services to its member agencies. In addition, provide an opportunity for the member agencies to share their views and opinions of MWDOC. Attached is Mr. Brown's report, which includes key responses and common themes from the interviews.

As was mentioned at the April P&O Committee, these interviews and report was only phase one of this process. The second phase moves the discussion to identify ways to improve MWDOC's services and advocacy, as well as further define MWDOC's role and responsibility in Orange County and among the member agencies.

Budgeted (Y/N):	Budgeted amount:	Core __	Choice __
Action item amount:	Line item:		
Fiscal Impact (explain if unbudgeted):			

However, before we initiate Phase 2 of the facilitated discussion, MWDOC staff and Mr. Paul Brown plan to deliberate with the MWDOC member agencies managers on June 16 as to the approach, workgroup structure, core topics, goals/objectives and schedule for phase 2. Based on the feedback from the member agencies, staff plans to present the proposed structure and approach of Phase 2 to the Planning and Operations Committee in July.

Attachment: ***Report on Facilitated Discussion with MWDOC Member Agencies***, Paul Redvers Brown Inc., *February 2022*

Report on Facilitated Discussions with MWDOC Member Agencies

ANALYSIS OF QUALITATIVE RESPONSES TO OPEN-ENDED INTERVIEW QUESTIONS

PAUL R. BROWN, AICP

February 2022

(Version 2.3)

PAUL REDVERS BROWN INC.

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Report on Facilitated Discussions with MWDOC Member Agencies

Introduction

The following report summarizes the findings of thirty-seven interviews conducted with the leadership of member agencies comprising the Municipal Water District of Orange County (MWDOC). The interviews were commissioned by MWDOC for the following purpose:

> *To provide MWDOC's member agencies an opportunity to share their views with MWDOC and the other member agencies regarding their future needs and expectations, as well as an assessment of past performance.*

The interviews reveal that opinions on MWDOC's performance and effectiveness vary considerably and are influenced by member agency's views regarding:

- The appropriate scope of MWDOC's role and functions within its service area;
- Whether member agencies feel as if they are treated like customers, whose views are listened to and acted upon;
- The extent to which MWDOC is delivering services that member agencies are not providing for themselves; and
- Differences between MWDOC and member agencies regarding preferred investments in new water supply development activities.

All of these perspectives are complicated by decades-old institutional and jurisdictional complexity.

- MWDOC's elected board members represent seven geographic divisions that cross the legal jurisdictions and service area boundaries of the member agencies that MWDOC serves.
- The agencies overseeing imported supplies (MWDOC) and local groundwater water supplies (OCWD) have broadly overlapping, but noncontiguous, service areas. Further OCWD is simultaneously a MWDOC member agency.
- There are many competing voices speaking on water policy in Orange County. While public understanding would likely benefit from consistent messaging, coordinated communications among the many cities and special districts, with varied interests, is difficult and often impractical — except in emergency situations and extreme events.

These factors were reflected in the comments of respondents to this survey. Their views cover a wide spectrum of opinions. The differences among agencies preclude defining any "average" or "typical" MWDOC member agency. Member agencies include both cities and special districts, with service area populations ranging from several thousand to over 400,000. Their reliance on imported water ranges from an average annual demand of less than 200 acre-feet (AF) to 35,000 AF. Some member agencies have access to groundwater (with the largest average annual demand at nearly 43,000 AF), while others have no access to groundwater at all. Understanding the results of this survey depends on an appreciation for the unique circumstances and resources of each city and district that participated. No two agencies are alike.

Common denominators among most respondents include an acknowledgment of MWDOC's foundational role as a Metropolitan member agency, an appreciation of the dedication and accessibility of MWDOC's staff (frequently mentioned), and praise for MWDOC's effectiveness in implementing demand management and public education programs.

At the same time, many respondents believe MWDOC can improve responsiveness to its member agencies' needs and clarify the boundaries of its influence over decisions made by its member agencies. All of these topics were addressed during the interviews and are summarized in this report.

How to Use Results

The open-ended questions were intended to solicit the full range of opinions held by participants. They were not used as a quantitative scoring device to rank conflicting opinions or count "votes" for alternative viewpoints. The quantitative charts included in the report are simply indicators of the sources and frequency of alternative views — not a comparative measure of whether any opinion is more valid or important than another.

The usefulness of the results should derive from an improved understanding of the diversity of perspectives. They can serve as a means of informing dialogue and communications among MWDOC and its member agencies. Every voice in this process is important, and every opinion should be taken seriously — given the unique circumstances of each member agency. Each participant focused on those topics they felt were most important. In many cases, others shared their opinions. In the end, however, all voices count.

The facilitated discussions documented in this report are intended to serve as the first phase of a three-phase process. Phase 2 is planned as a face-to-face workshop to consider the Phase 1 results, followed by a Phase 3 implementation process where improvements can be addressed.

Background

During the period from 13 October 2021 to 2 February 2022, thirty-seven (37) Zoom meeting interviews (45-60 minutes) were completed with fifty-two (52) respondents (17 in governance roles and 35 in management). The interviews represented all twenty-seven (27) of the Municipal Water District of Orange County's (MWDOC) member agencies. Individual participants and member agencies are listed in Appendix A.

*Table 1: Participating Member Agencies**

Participating Member Agencies by Type	
Cities	**Districts**
1. City of Brea 2. City of Buena Park 3. City of Fountain Valley 4. City of Garden Grove 5. City of Huntington Beach 6. City of La Habra 7. City of La Palma 8. City of Newport Beach 9. City of Orange 10. City of San Clemente 11. City of Seal Beach 12. City of Tustin 13. City of Westminster	1. East Orange Water District 2. El Toro Water District 3. Emerald Bay Service District 4. Golden State Water Company 5. Irvine Ranch Water District 6. Laguna Beach County Water District 7. Mesa Water District 8. Moulton Niguel Water District 9. Orange County Water District 10. Santa Margarita Water District 11. Serrano Water District 12. South Coast Water District 13. Trabuco Canyon Water District 14. Yorba Linda Water District

* On November 15, 2021, the City of San Juan Capistrano joined the Santa Margarita Water District, reducing the number of MWDOC member agencies from 28 to 27.

While the initial intent of the survey was to invite one governance and one management representative from each member agency to participate in separate interviews, practical considerations and member agency preferences resulted in some interviews that were comprised of a small group of respondents. Figure 1 illustrates the type and number of both individual and group interviews.

Figure 1: Breakdown and Structure of Interviews

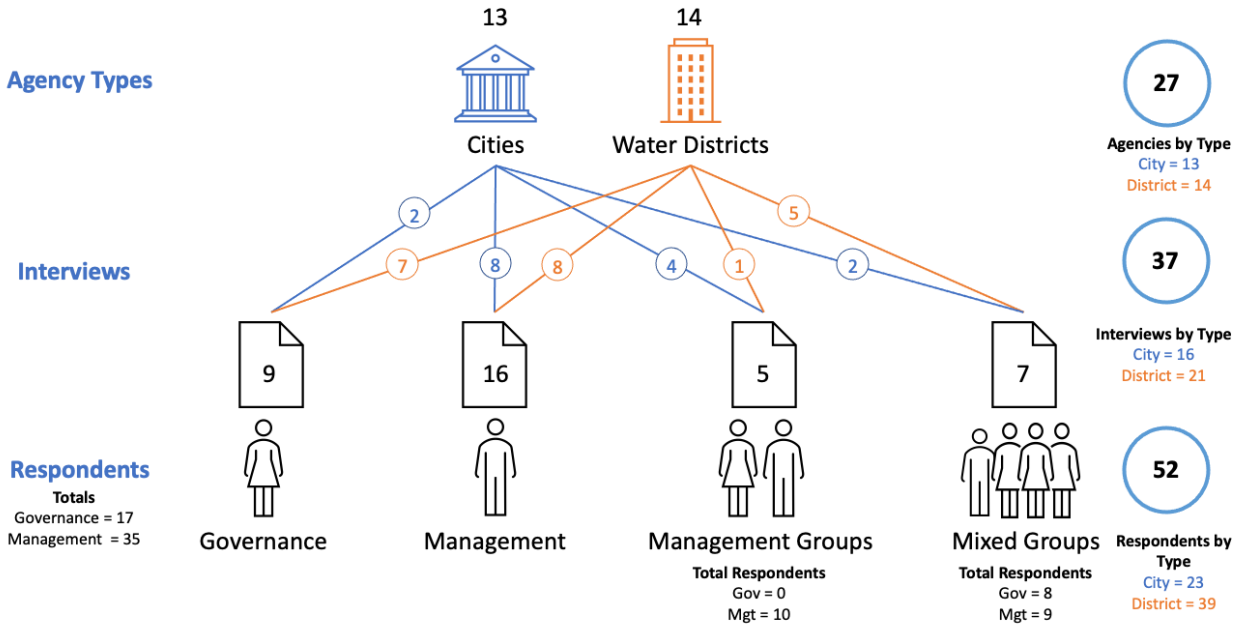


Table 2: Breakdown of Interviews and Respondents by Type and Roles

Breakdown of Respondents and Interviews by Agency Type and Roles									
Agency Type	Cities (13)			Districts (14)			Totals		
Respondent Roles	Governance	Management	Total	Governance	Management	Total	Governance	Management	Total
Respondents	4	19	23	13	16	39	17	35	52
Interviews			16			21			37

Methodology

Interviews were scheduled with each member agency for individuals and, in some cases, small groups of 2-4 respondents. Where individuals were interviewed alone, the respondents are designated as either management or governance. The group interviews fell into two categories: a small group of 2-3 managers only, or a mixed group comprised of 1-2 governance and 1-2 management respondents. Comments made in mixed group interviews were coded by respondent where possible.

The 45 minute interviews were structured around five broad topic areas. The topics covered in each interview include:

1. Governance
2. Policies
3. Process
4. Role and Responsibilities
5. Interagency Relationships
6. Other Topics and Issues (open ended)

Each topic area discussion was introduced with two or three open ended questions (OEQ) that respondents had been provided in advance. The interviewer continued the topic discussions with follow-up questions and clarifications. An opportunity was provided at the end of the interview for any additional input respondents wished to provide. While each interview covered all five topics, participants were given ample time to explain their opinions. Generally, they focused on those topics where they had strong opinions, with less to say on other topics. No participant was forced to evaluate MWDOC's performance in areas where they showed no interest or lacked knowledge of a topic.

During the interviews, the interviewer and a notetaker manually recorded responses. Based on the handwritten notes, a paraphrased summary, including short verbatim quotes, was prepared in MS Word. The Word documents were then coded and analyzed using MAXQDA, a research tool designed to evaluate qualitative data collected from OEQ surveys. Based on that analysis, the report provides both qualitative and quantitative data (mixed method approach). Any of the following excerpts in "quotes" reflect either verbatim statements noted during the interview or written responses provided by respondents.

The report is organized by the questions presented in the survey document. Each question was preceded by a brief statement of context, which are also included below. For each question, interview excerpts, from both positive 👍 and critical 👎 responses, are included to clarify specific input. Some excerpts providing either insights or constructive recommendations are indicated with a 💡 light bulb.

1. Governance

Context Statement

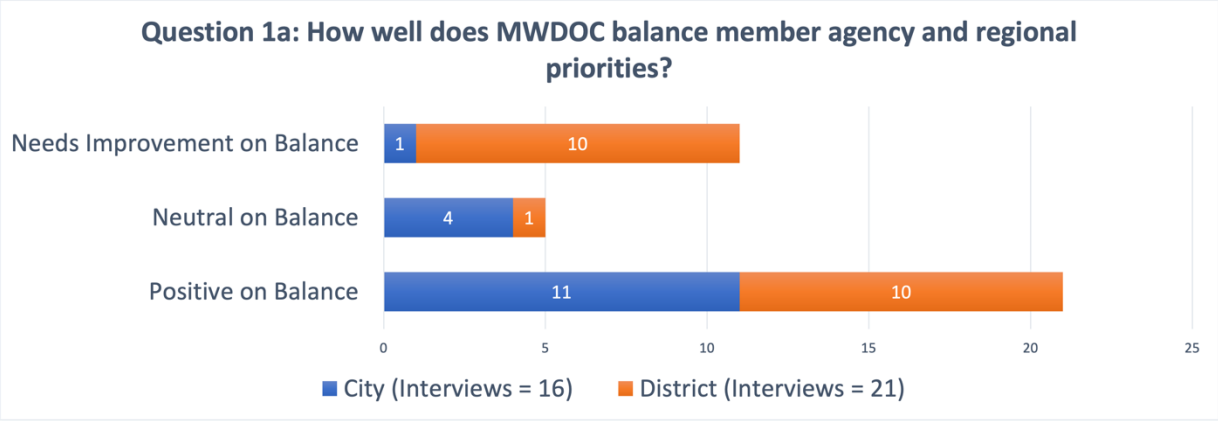
MWDOC is governed by a seven-member Board of Directors. Each director is elected to a four-year term by Orange County voters who reside within one of the seven divisions in the MWDOC service area. At the same time, MWDOC's twenty-eight [now twenty-seven] member agencies have their own individual priorities and needs.

Question 1a

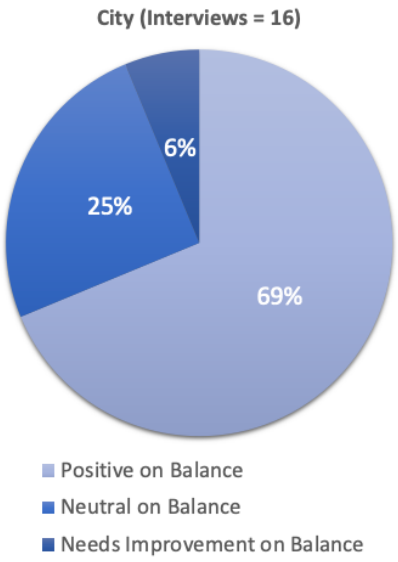
How well does MWDOC balance the priorities of its member agencies with the broader regional needs of the service area as a whole?

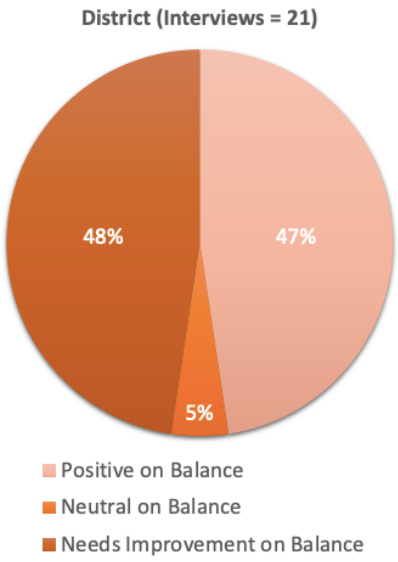
Responses: Most interviews were positive, with Cities significantly more so than Districts

Asked, "how well does MWDOC balance priorities?" Most interviews (57%) expressed positive views regarding MWDOC's ability to balance their priorities and those of the region. Cities (69% positive) were more pleased with MWDOC's performance on meeting their needs or priorities than Districts, however. Slightly less than half of the district (48%) interviews were positive in their responses.



(Note: The values above reflect individual interviews. Some member agencies participated in more than one interview and not all participants responded to each question.)





Responses: Some member agencies see local and regional priorities aligned

For the twenty (20) interviews where respondents were positive regarding MWDOC's ability to balance their priorities with the region's, some saw no difference between their needs and those of the region, where MWDOC is concerned. For cities with limited staff spread over utility and public works activities, MWDOCs services were deemed essential.

Related Interview Excerpts

Sees no issues between member agency needs and regional needs.

Management | City | North County

Does not see the regional versus member agency priorities as "competing" with one another.

Governance |District | South County

"Nothing but positive."

Management |City | North County

"MWDOC is doing a great job. The job I need them to do."

Management | District | South County

"First and foremost, MWDOC does a good job." With less dependable imported water from the Delta, a bigger push from MWDOC on local supply development is justified. "Pretty good job."

Management |District | North County

Thinks that MWDOC does a good job in managing both its regional and member agency responsibilities.

Governance | District | South County

Input is heard, but the Directors are responsible to the voters. MWDOC makes an effort.

Management | District | South County

Responses: Others say MWDOC is not interested in member agency priorities

For the ten (10) Districts and one (1) City that felt MWDOC was not performing well, there were a number of respondents who expressed the belief that MWDOC simply doesn't care about their needs or concerns. They suggest that MWDOC makes no attempt to "balance" their priorities – not listening to their input at all.

Related Interview Excerpts

👎 *MWDOC tends to ignore the priorities of its member agencies.*

Management | District | North County

👎 *MWDOC shows apparent disregard for what's being said by member agencies. No accountability to the people who write the checks.*

Management | District | South County

👎 *MWDOC has not listened to their customer agencies. We struggled with this for years as South County agencies. MWDOC works against us. May be different for municipalities. I don't even care if they oppose what we're doing, but we shouldn't be "surprised" by their decisions where they intend to work against us. "We're not in a happy place."*

Management | District | South County

👎 *The real issue is that MWDOC will say it listens . . . and is transparent, but the fact of the matter is, it does not.*

Governance | District | North County

👎 *On the core versus choice issue, if we don't benefit, we shouldn't pay. Are they really listening to us when we don't believe that we need a proposed project?*

Management | City | North County

👎 *"I'm not sure they care what we think."*

Governance | District | North County

Responses: We are "customers" not member agencies

A reoccurring theme among several participants asserted that it would be more accurate to refer to their agencies as "customers" rather "member agencies." They point out that unlike Metropolitan's member agencies, they do not select MWDOC's board members. For some, the designation "customer" (or in one case "stakeholder") was deemed a more accurate reflection of the member agencies' relationship to MWDOC.

Related Interview Excerpts

MWDOC doesn't really have member agencies. It has customers.

Governance | District | South County

"Member agencies" is a bad term. "Customers" is more appropriate.

Management | District | South County

Recognize that the retail agencies are "customers" not "members."

Management |District | South County

Board should focus more on its 28 customers and less on the 3-million people of OC.

Management | District | South County

Follow-up Questions - Governance

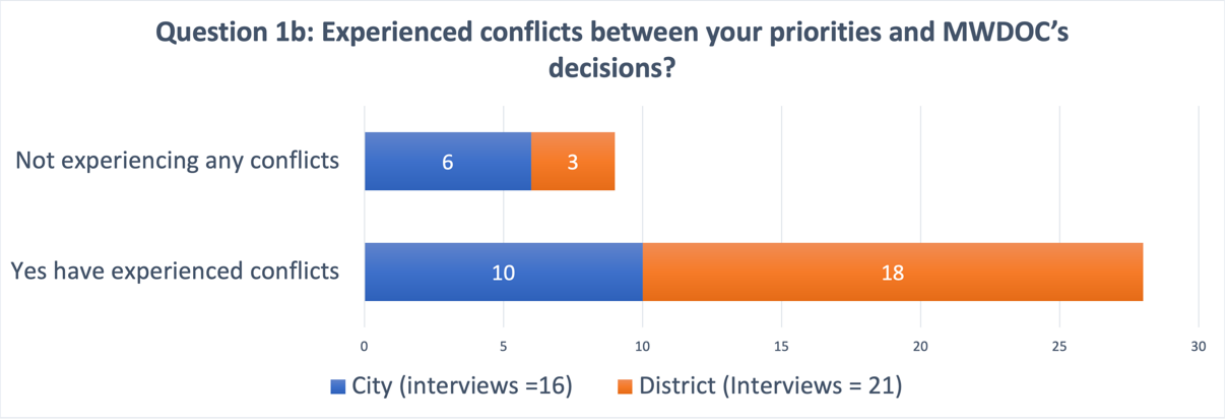
In Governance questions 1-b and 1-c, participants were asked (1-b) if they had experienced conflicts between their agency's priorities and MWDOC's decisions and actions? (1-c) If so, what was the source of conflict? And how could it be resolved?

Question 1b

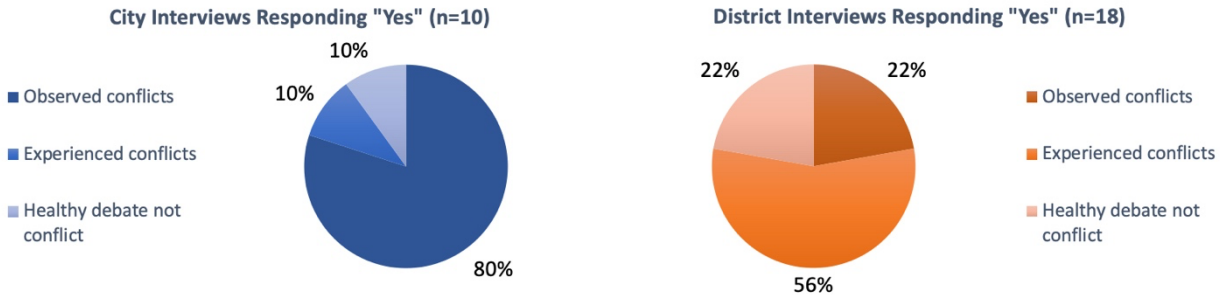
Have you experienced conflicts between your agency's priorities and MWDOC's decisions and actions?

Responses: Most have experienced conflicts. Some say that's a good thing.

In responding to this question, the twenty-eight (28) city and district interviews that acknowledged having "experienced conflicts" can be grouped into three broad categories: (1) agencies that have been directly in conflict with MWDOC decisions, (2) agencies that have indirectly observed conflicts between MWDOC and member agencies, and (3) a small group that have experienced conflicts and view them as "healthy debate."

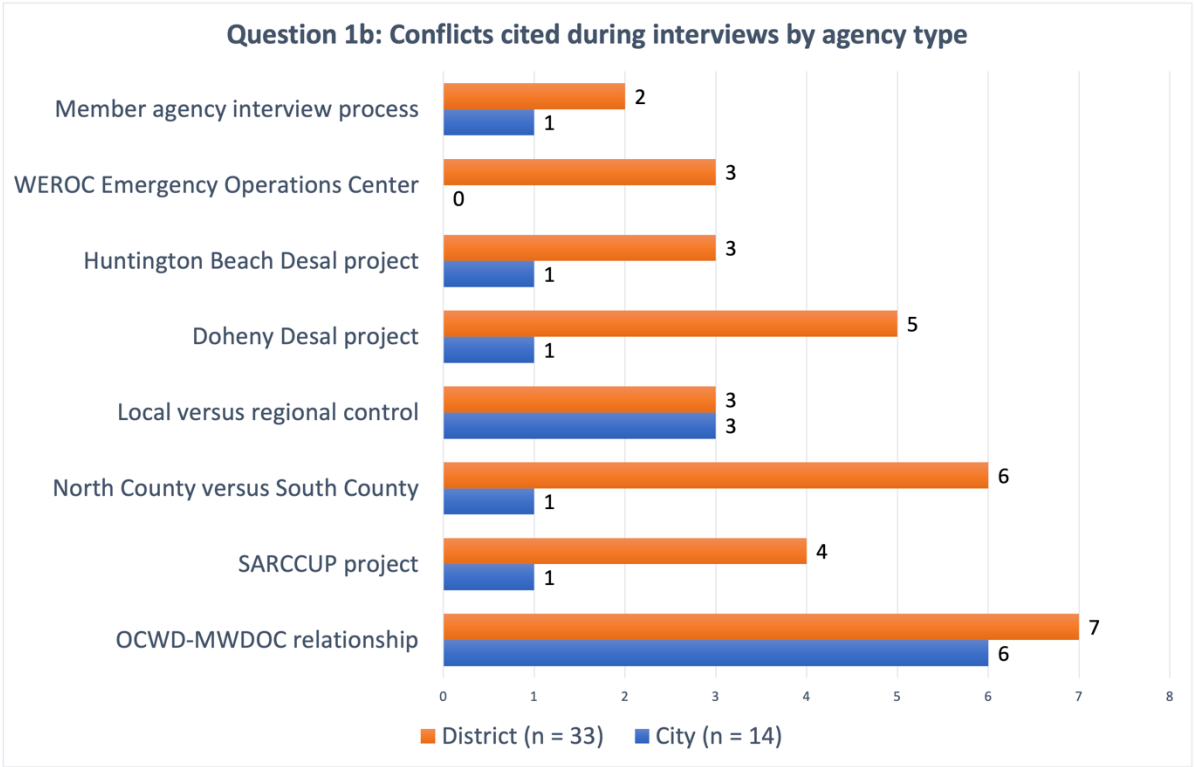


In those interviews where participants stated "Yes," they have experienced "conflicts," the breakdown according to the categories discussed above is provided here.



Responses: Many conflicts mentioned, MWDOC and OCWD relationship stands out

When asked to identify specific conflicts, many examples were provided. Overall, District interviews identified more cases of conflict (33) than City interviews (14). That said, there was one conflict where both District interviews and City interviews were in agreement — the relationship between MWDOC and the Orange County Water District (OCWD). Many respondents expressed general displeasure with the demeanor of both agencies' general managers, with some explicitly refusing to lay blame on one agency or the other.



Note: This graph counts interviews where a specific conflict was mentioned. Some participants identified more than one conflict during the interview.

While both cities and districts agreed on the need for improving the relationship between OCWD and MWDOC, cities were less likely to cite specific issues regarding areas of conflict. For districts, many of the specific examples were cases involving disputes between MWDOC and OCWD.

Question 1c

If so, what is the source of the conflict? How might it be resolved?

Response: MWDOC should support Member Agency projects

Some districts focused on MWDOC's influence over local project decisions as a repeated source of conflict. Most agreed that decisions regarding local projects belong at the city and district level. Consequently, many resent MWDOC taking a public position that they see as impeding local project development and initiatives. If local agencies have determined that a specific project or program is worthy of their investment, they believe MWDOC should be supporting those decisions at the regional level. During the interviews, some participants held the opinion that MWDOC was not helpful in the SARCCUP program, participating in a manner that left them disappointed in MWDOC's behavior.

Related Interview Excerpts

MWDOC/OCWD need to work together especially when it starts to affect items like SARCCUP – it became territorial. Who should do what?

Management | District |North County

An example of conflict? SARCCUP.

Management | City | North County

MWDOC is creating conflict with actions intended to control local project or program development. That's inconsistent with their views of the best means of achieving regional reliability and resilience. Examples include SARCCUP, as well as Huntington Beach desal."

Management | District | North County.

2. Policies

Context Statement

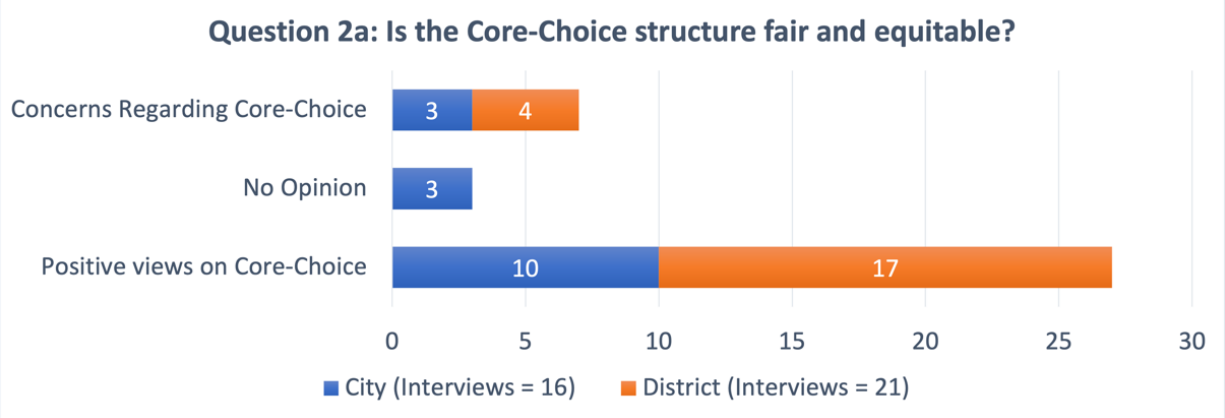
MWDOC has developed policies and programs that strive to meet its revenue requirements while avoiding charges for services that a member agency can provide for itself.

Question 2a:

Has your agency found the recovery of both fixed rates and subscription (choice) charges a fair and practical way of addressing this issue?

Responses: Core-Choice praised by most. Categorization a concern for some.

While the core/choice program is widely supported, the on-going assignment of activities and projects to one or the other of these categories remains a source of concern with some member agencies. In one instance, it was suggested that the process for deciding whether budget items be included in the Choice category be made more formal, with clear criteria for the basis of assignment. In some cases, this opinion resulted from Core projects that were seen to have produced little or no value for specific member agencies.



The process and methodology for justifying new Core initiatives could use further development in the view of some member agencies who appreciate the framework overall.

Related Interview Excerpts

A bit of a compromise around the expansion of MWDOC services and how they should be categorized. Every once in a while, there is a question about choice versus core, and which costs should go into each category.

Management | District | South County

Generally, some planning functions and some public information functions of MWDOC seem unnecessary, though stakeholder agencies pay for them as part of core services.

Governance | District | South County

Additional choice services simply justify a growing administrative overhead and bringing contracted services in-house (for example, water loss) that are not needed.

Governance | District | South County

Agree with the choice program, although object to many programs that have been considered core projects that should have been choice. They primarily benefited South County or were unneeded.

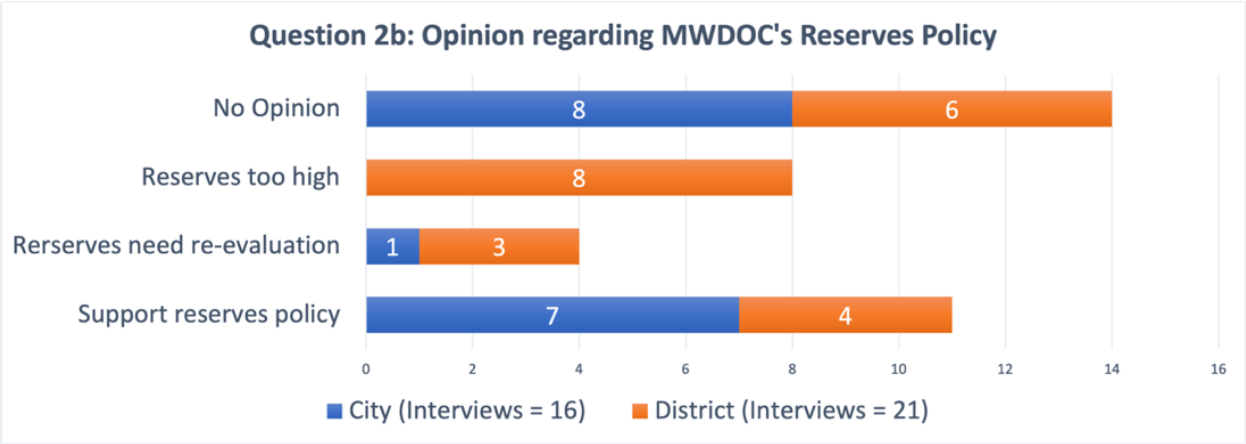
Management | District | North County

Question 2b

What is your opinion regarding MWDOC's current reserves policy?

Responses: Many have no opinion. Many feel the policy needs revisiting.

Responses to question 2b generally fell into four categories: (1) participants who did not know what the policy is and had no opinion and participants who looked up the policy and still had no opinion, (2) participants who believe the current reserves are too high, (3) participants who knew the policy and believed it should be reevaluated and possibly revised, and (4) those participants who supported the policy and MWDOC's authority to set it. As indicated in the figure below, concerns regarding the policy were primarily expressed by Districts, while member agencies that are Cities generally supported or had no opinion regarding the policy.



3. Process

Context Statement

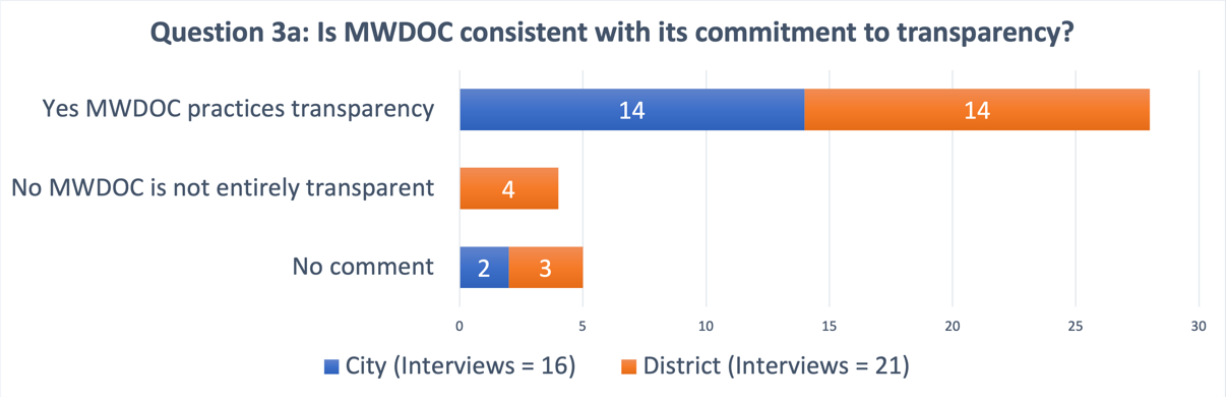
MWDOC is committed to transparency and accountability in government. This commitment entails providing publicly accessible, factual information to allow good and just governance, and to assist our stakeholders and members of the public in understanding how the district operates.

Question 3a:

Is your experience consistent with MWDOC's commitment?

Responses: Availability and access to public information praised

Most participants agreed that MWDOC lived up to its commitment of transparency. Information is available and directly accessible for anyone who wants to search for it. Further, MWDOC staff was frequently credited with helping member agencies get needed information.



When the discussion moved from the transparency of information to the decision-making process, many respondents expressed dissatisfaction with the number, sequence, and timing of meetings. Sequence, in this context, meaning when in the process member agencies are solicited for their input. Timing meaning time of day. Additional comments regarding the member agency manager meeting structure and management were offered.

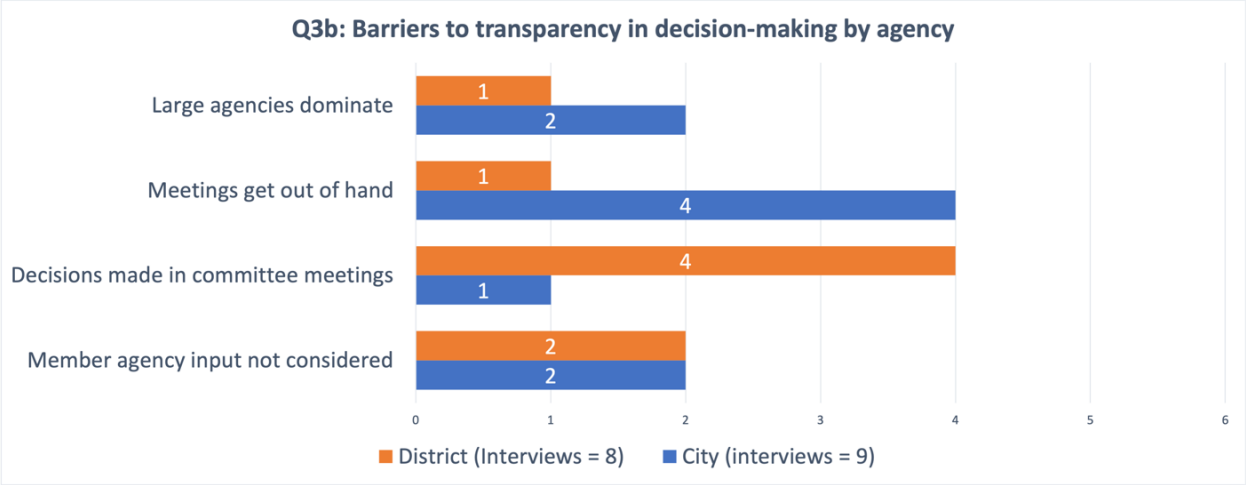
Question 3b:

Can you suggest ways in which MWDOC can improve its decision-making process and public transparency?

Responses: Decision-making process does not incorporate input from agencies

While MWDOC received positive responses regarding transparency of information, many participants distinguished between (1) the availability of information, and (2) the openness and receptivity of the decision-making process to member agency input. They often characterized

communications with MWDOC as a one-way flow of information from MWDOC to member agencies. Many member agencies appreciate the regular updates received from MWDOC, particularly cities that do not have the resources to stay current on all water issues. For others, the perceived lack of interest from MWDOC's board in their opinions regarding issues directly affecting their agencies was a point of frustration.



Related Interview Excerpts

MWDOC should be more forthcoming in seeking input from member agencies.

Management | District | North County

I receive plenty of information, but it is not always clear what is done with my input.

Governance | District | South County

Our MWDOC director very rarely reaches out to us. We need to go to him.

Management | District | South County

Board needs to do a better job. Needs of the member agencies are very different.

Governance | District | North County

Staff will take issues to a MWDOC Committee that have not been discussed with the member agencies, then the Committee and the Board routinely approve, even when member agencies have questions.

Management | District | North County

MWDOC may think that holding multiple meetings means it's communicating. But often, the results of the meetings are that MWDOC digs its heels in and refuses to change.

Governance | District | North County

"NO! The board has too many consent items on the agenda."

Governance | District | South County

 *The meeting structure should be revised. Almost everything happens in committees. Most of the full Board Meeting is voted on the consent calendar. Hard to attend all six committee meetings — "frustrating."*

Management | District | North County

 *First time we see issues is in committee. Requested MWDOC give general managers a heads up, but "directors are paying no attention to us."*

Governance | District | South County

 *Decision-making could be improved by having discussions with member agency managers "well before the budget lands." Let the managers have input early — well ahead of the budget release.*

Management | City | South County

 *Directly elected board members are not interested in the retail agencies and there's no easy way to fix it.*

Management | District | South County

4. Roles and Responsibilities

Beliefs and perceptions regarding MWDOC's roles and responsibilities were frequently at the heart of individual responses throughout each interview. This area of discussion was the most widely divergent among member agencies. Said another way, there is no broad consensus among member agencies regarding what MWDOC should undertake beyond its fundamental role of serving as a Member Agency at the Metropolitan Water District.

Context Statement

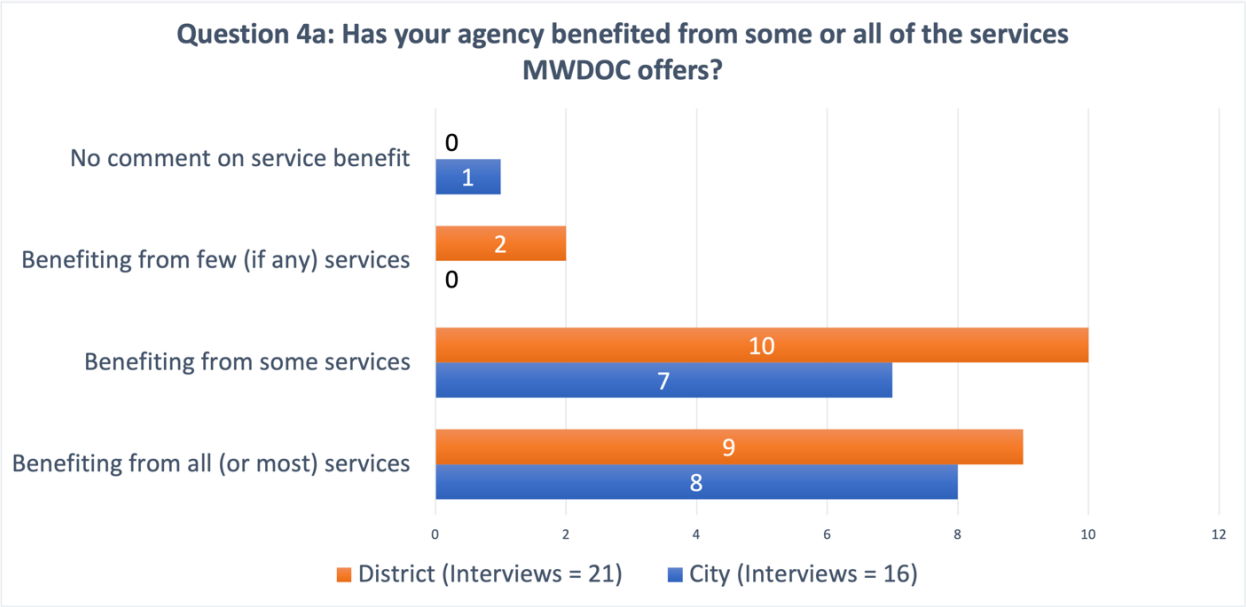
In addition to serving as the Metropolitan Water District member agency representing Orange County (except for the cities of Anaheim, Fullerton and Santa Ana), MWDOC fills many other roles. They include: regional water planning, water supply development, public information and outreach, water use efficiency, and emergency preparedness. These activities are provided as either core or subscription (choice) services.

Question 4a

Has your agency benefited from some or all of these services?

Responses: Almost all member agencies perceive benefits from MWDOC

In response to this question, most respondents agreed that their agencies benefit from some or most of the services offered by MWDOC. Two agencies felt strongly that they received few, if any, benefits among the core and choice services offered.

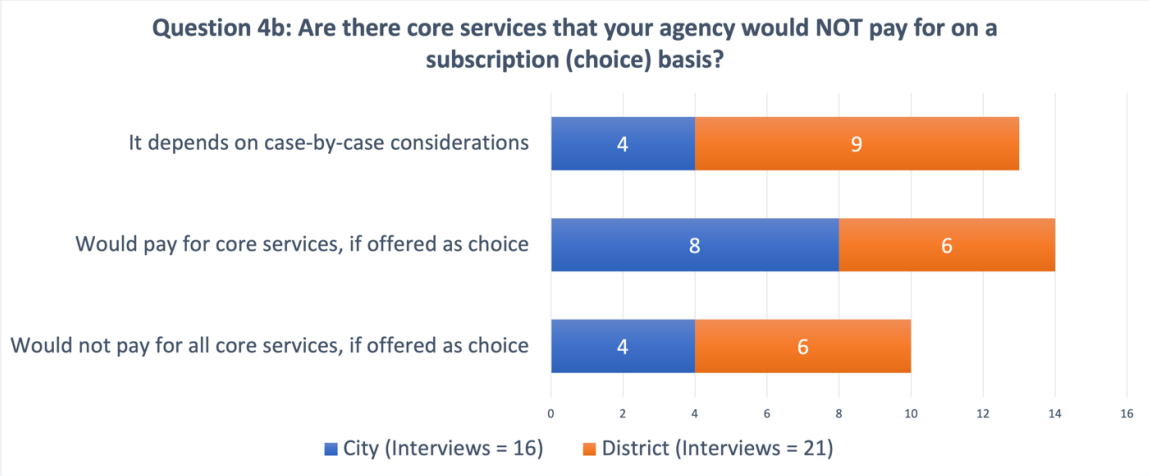


Question 4b

Are there core services that your agency would not choose to receive if they were offered on a subscription basis? Explain?

Responses: Views vary widely on MWDOC's appropriate role and core services

Question 4b raised policy issues that elicited both discussions and additional considerations. Are there core services that do not benefit your agency? Should MWDOC be providing them? If so, should your agency be paying for them? The most frequent responses to these questions were positive regarding MWDOC's core services and their willingness to pay. Many expressed appreciation for everything MWDOC provides — however they represented 38% of the interviews.



Related Interview Excerpts "Would Pay for Core Services"

👍 *"Not encountered a situation where MWDOC has overstepped its jurisdiction."*

Governance | District | South County

👍 *"No, appreciate everything that MWDOC does."*

Management | City | North County

👍 *"MWDOC doing what it should be doing."*

Management | City |North County

👍 *"Totally benefit from all of it."*

Management | City | North County

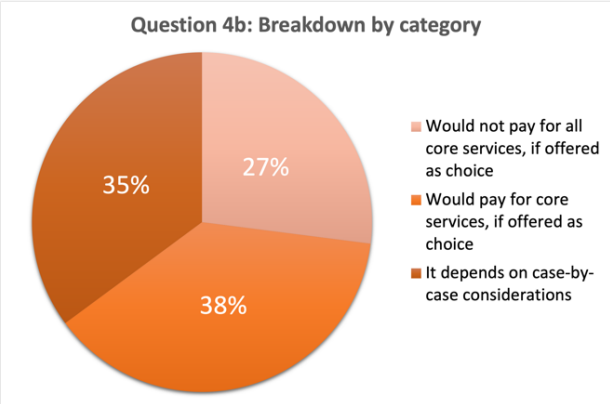
👍 *Believes in the need for a regional agency like MWDOC and the strength it provides.*

Management | City | North County

👍 *"I know we're covered." Very impressed with MWDOC's staff. They're "ahead of the curve."*

Governance | District | South County

The remaining interviews could be separated into two categories: (1) strongly held views (27%) that MWDOC has ventured into core services they believe go beyond its mission, and (2) those less concerned about limits on MWDOC's activities and more focused on not paying for services where they perceive no benefits (35%).



Establishing a clearer understanding of the boundaries around MWDOC's scope of activities was seen by a few as an important goal of the survey. For others, the extent of MWDOC's activities were seen as best addressed on a case-by-case basis. The strongest resistance, expressed by some, was targeted at MWDOC's active involvement as the developer of local projects. MWDOC's public support for local projects was seen as appropriate and desirable by most respondents. Public criticism of member agency projects was frowned upon by many.

Consideration of MWDOC's roles and responsibilities usually hinged on the respondent's answer to one of the following questions:

1. Does the activity directly benefit my agency?
2. Does the activity benefit the entire service area, including my agency?
3. Does the activity benefit a subset of member agencies, not including my agency?
4. Does any agency benefit from the activity?

Further, to the extent respondents believed that the costs of an activity would be recovered in choice charges, there was a greater willingness to endorse MWDOC taking on tasks that did not directly benefit them. The more skeptical respondents distrusted MWDOC's ability and willingness to fully allocate overhead costs to large-scale choice activities.

Related Interview Excerpts *"It Depends"*

MWDOC should focus more on regional conservation rather than water supply development.

Management | District | North County

Sees MWDOC as having a role in water supply development. Believes OC needs desal as an option. Question is "How do we pay for it?" and "Who pays?"

Governance | District | North County

Things only get squishy when MWDOC is involved with water supply development. Less clear whether or not MWDOC should take on that role.

Management | District | North County

Not black and white on where MWDOC should be involved or not.

Governance | District | South County

Core/choice was a super cool approach that resolved a lot of issues. But, don't want to subsidize when specific to other member agency.

Management | District | South County

Their role beyond that? "It depends." Can only decide on a project-by-project basis.

Governance | District | South County

Related Interview Excerpts "Would NOT Pay"

Yes. There are services that are in "core" that should be in "choice"

Governance | District | South County

MWDOC has no role to be out front on water supply development. They do have a role supporting it, however.

Management | District | South County

Do not want to see MWDOC developing and owning pumps and pipes. MWDOC should be an advocate for local supply development.

Management | District | North County

Water supply development should be on the choice side. Not opposed to MWDOC owning projects but thinks benefiting agencies should pay.

Management | City | South County

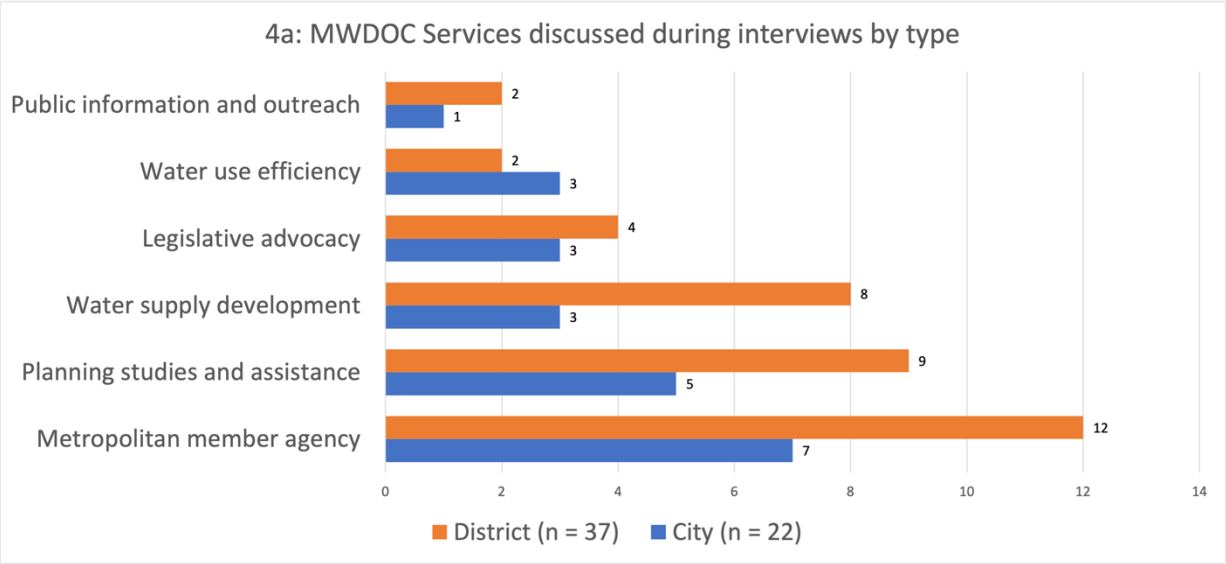
If the services only benefit a few agencies, we would likely not choose them on a choice basis.

Management | City | North County

Unsure regarding county-wide planning. "How much of that needs to be done?"

Management | District | South County

When the discussion shifted to the benefits of MWDOC's core services and choice services framework, opinions often became more complicated. First, both cities and districts acknowledged the success of the core-choice structure — especially as it relates to demand management and water use efficiency services.



(Note: This graph counts interviews where a specific MWDOC service was mentioned. Some participants identified several services during the interview.)

- Water Use Efficiency widely supported
- Water Resources Planning accepted without enthusiastic support
- Water Supply Development split between supporting efforts versus leading development

In its role as a Metropolitan Member Agency, cities generally accepted and appreciated MWDOC's role representing them at Metropolitan. A few districts were critical of MWDOC's effectiveness, on their behalf, at Metropolitan.

Related Interview Excerpts

MWDOC's Role as Metropolitan Member Agency

MWDOC should be an advocate for us at the Metropolitan level.

Governance | District | South

MWDOC's primary mission should be serving as its member agencies' representative at MWD and as the administrator of MWD programs in their service area.

Governance | District | North

Working with MET deserves attention, guiding MET along to support desal.

Management | City | South

"I don't feel very connected to Metropolitan and what's going on there."

Management | District | North

MWDOC doesn't do a good job representing us at MWD.

Management | District |South

We would appreciate more engagement during the development of Metropolitan positions. Don't currently feel "part of the conversation."

Management | District | North

Biggest issue is our actual representation on the Metropolitan Board. Sees MWDOC as dismissive and condescending.

Governance | District | North

Asked to be a part of discussions at MWD regarding groundwater issues but rarely included unless invited directly by MWD.

Management | District | North

As a regional water planner, MWDOC received high praise for its capabilities, combined with some questions regarding the value of certain deliverables to their own agency. Assistance provided to cities for the preparation of Urban Water Management Plans and other required submittals was widely appreciated by respondents.

Related Interview Excerpts

MWDOC's Role Providing Water Planning and Assistance

MWDOC does well with regional water planning. There's value there. Somebody has got to do it.

Governance I District | North County

They are a good regional water planning agency. No evidence that anything comes of it.

Management | District | South County

👍 *Regarding regional water planning, "It's somebody's job. MWDOC is probably in the best position to do it."*

Governance | District | North County

👍 *"Absolutely. Who else would be the proper agency to do it?" Appreciates MWDOC taking this role. Regional planning function allows for a holistic approach.*

Management | District | South County

👍 *Appreciates MWDOC's support during the preparation of Urban Water Management Plans and the Resilience and Risk reports.*

Governance | City | North County

👍 *Appreciates MWDOC's role in long-term planning*

Management | District | North County

👍 *"In the planning role, I suppose that any information is beneficial but can't quantify the value."*

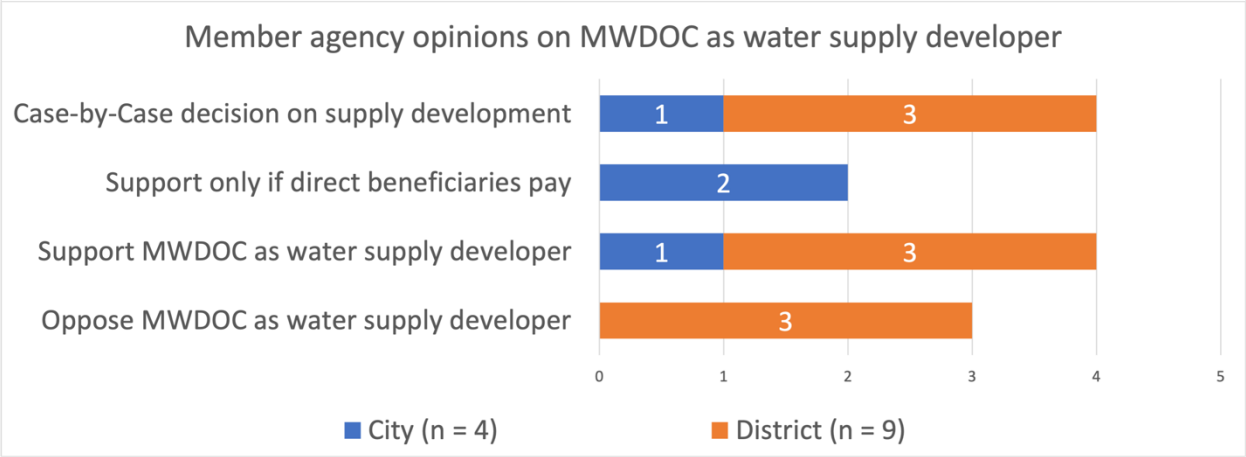
Management | City | North County

👎 *Reliability studies that include project-by-project comparisons are debatable.*

Management | District | North County

MWDOC's Role as Water Supply Developer

Among a small group of interviews (13), MWDOC's role as a water supply developer was the most divisive topic discussed. As indicated above, it was one of the core services most mentioned by several member agencies who considered the service beyond MWDOC's mission or were concerned that their agency should not pay any of the costs associated with supply development activities.



5. Interagency Relationships

Context Statement

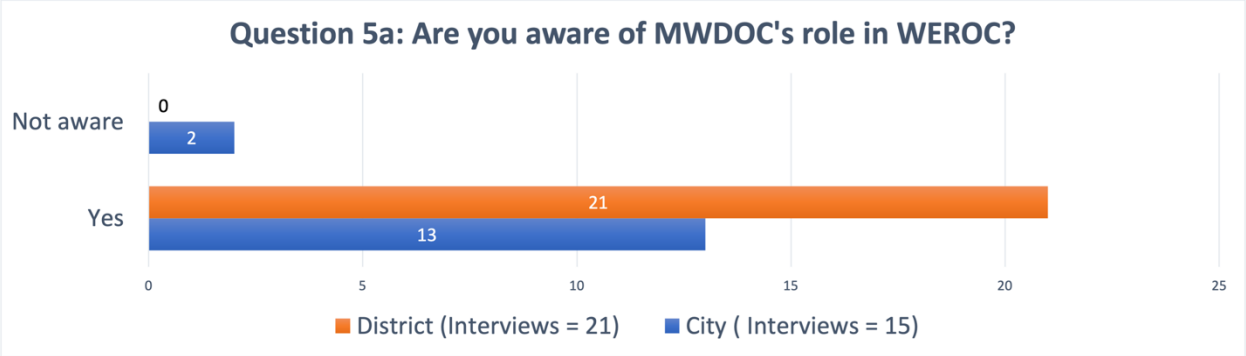
WEROC serves as the county liaison for emergency response and MWDOC provides the administrative structure and support for WEROC.

Question 5a

Are you aware of this county-wide role?

Responses: Awareness high among almost all participants

With two exceptions, respondents were all aware of WEROC and MWDOC's administrative role. Where respondents were outspoken regarding WEROC's performance, they frequently mentioned Vicki Osborn, Director of Emergency Management, for her role in leading the effort.



Related Interview Excerpts

👍 *Yes. Love MWDOC in this role. A great resource. Excellent performance.*

Management | City | North County

👍 *"WEROC has been awesome. Vicki has brought gravitas."*

Management | District | North County

👍 *Yes. No complaints. Vicki is very energetic. This is one of the best things that MWDOC does."*

Management | District | North County

👍 *"Definitely aware." Vicki Osborn is "so good." Can't say enough good things about WEROC.*

Management |City | North County

👍 *WEROC and Vicki Osborn do a great job.*

Governance | District | South County

👍 *Yes. Overall positive thing that MWDOC does. Vicki a solid performer. We use it.*

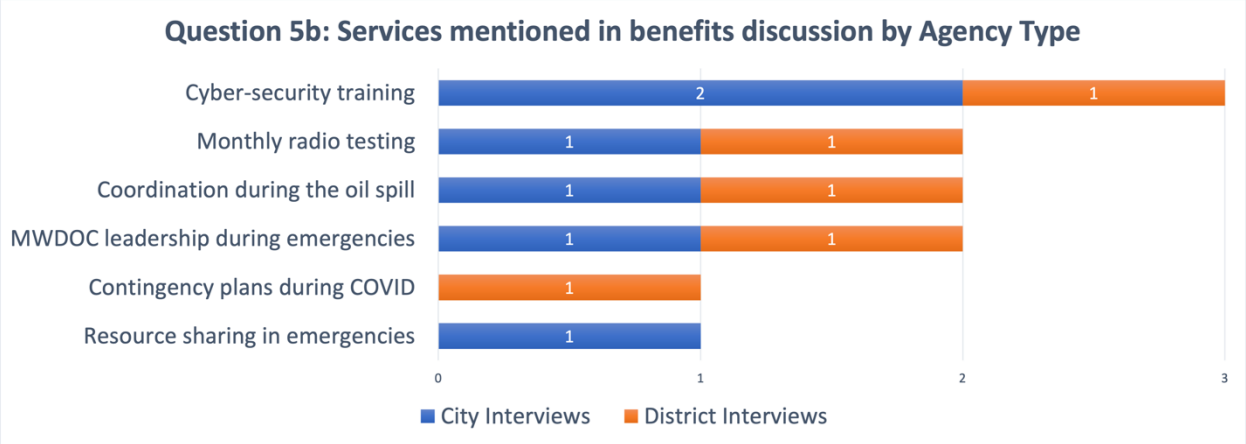
Management | District | South County

Question 5b

If so, does your agency see the benefit of this relationship?

Responses: WEROC's future role and needs unclear to some

In follow-up questions and discussion, those participants who were knowledgeable regarding WEROC often mentioned benefits they appreciated. The specific services that were cited by participants included the following:



Several interviews raised questions regarding WEROC's future role and the resources it expects to need. This concern was accompanied by a reminder that the funding for WEROC is provided by other agencies in addition to MWDOC.

Related Interview Excerpts

Would like to understand what WEROC's ultimate role will be? "Facilitator, or expanded beyond that? What level of services should WEROC provide?"

Management | City | South County

Yes, we see a benefit in the role of MWDOC facilitating water emergency response. Extent of MWDOC role and role of elected officials needs some better definition.

Governance | District | South County

MWDOC funds 50% of the WEROC budget with OCWD contributing 25% and 5 other city/agencies funding the balance.

Governance | District | North County

Largely yes. There's a benefit, but MWDOC is overstating the need. Vicki is good, but a $1.2 million facility is overreach."

Governance | District | South County

6. Other Topics and Issues

Question 6

Are there any other topics or issues that you think should be addressed in this review?

When asked for any additional input that the respondent wished to provide, many topics were raised. One topic appeared more frequently than any other as calling for improvement — the relationship between OCWD and MWDOC. Many respondents were adamant about the need to improve the communications, cooperation, and collaboration between these two overlapping agencies with complementary responsibilities for groundwater and imported water respectively. To quote one respondent, "We can do better."

Related Interview Excerpts

Looking for better working relationship between MWDOC and OCWD. They should be working together. Or at least just talk to one another, period. There's a lack of trust there.

Management | District | North County

The OCWD and MWDOC general managers "hate each other, and the public knows it." They're too entrenched.

Governance | District | North County

Conflict between the GMs at MWDOC and OCWD is resented.

Management | City | North County

Looking for more of a JPA kind of relationship between groundwater and imported water supply.

Governance | District | South County

MWDOC and OCWD have a fractured relationship. Groundwater and imported water in Orange County should be merged. "Is there any desire to do that? No."

Governance | District | North County

Relationship between OCWD and MWDOC is "at an all-time low."

Governance | District | North County

The conflict between OCWD and MWDOC needs to be resolved. GMs should conduct themselves more professionally.

Management | City | North County

Not taking sides, but before conflicts arise, talk with one another. It's about process.

Management | City | North County

The two GMs need to do something about it.

Governance | District | North County

Acknowledgments

Sincere thanks to the many water leaders and professionals throughout Orange County who took time out of their schedules to participate in these interviews. You were outspoken and candid, while demonstrating a desire to be helpful. Most interviews reflected the common themes presented in this report. At the same time, every interview was unique. Each participant provided new perspectives and personal insights, making every discussion a learning experience that was much appreciated.

Special thanks to Tina Dubuque, who scheduled every interview, prepared information for participants, took thorough notes to supplement the author's notes, and was always considerate, thoughtful, and in good spirits during over forty hours of discussion.

Appendix A: Interview Participants by Member Agenc

Member Agency	Name	Title	Role
City of Brea	Steven Vargas	Mayor	Governance
	Bill Gallardo	City Manager	Management
	Michel Ho	Deputy Director Public Works	Management
	Rudy Correa	Superintendent Public Works	Management
City of Buena Park	Mike McGee	Water Services Superintendent	Management
	Doug Brodowski	Operations Manager	Management
City of Fountain Valley	Hye Jin Lee	Director of Public Works	Management
	Mark Sprague	Field Services Manager	Management
City of Garden Grove	Samuel Kim	Water Services Division Manager	Management
City of Huntington Beach	Sean Crumby	Director of Public Works	Management
	Alvin Papa	Deputy Director Public Works	Management
City of La Habra	Jose Medrano	Mayor Pro Tem	Governance
	Brian Jones	Water and Sewer Manager	Management
	Robert Ferrier	Asst to City Manager	Management
City of La Palma	Mike Belknap	Community Services Director	Management
	Jake Chavira	Water Supervisor	Management
City of Newport Beach	Mark Vukojevic	Utilities Manager	Management
City of Orange	Mark Murphy	Mayor	Governance
	Diaz Jose	Water Manager	Management
City of San Clemente	David Rebensdorf	Utilities Director	Management
City of Seal Beach	Steve Myrter	Public Works Director	Management
City of Tustin	Ryan Gallagher	City Councilor	Governance
City of Westminster	Scott Miller	Water Superintendent	Management
East Orange Water District	Doug Davert	Board Director	Governance
	David Youngblood	General Manager	Management
El Toro Water District	Mike Gaskins	Board President	Governance
	Dennis Cafferty	General Manager	Management
Emerald Bay Service District	John Marconi	Board President	Governance
	Mike Dunbar	General Manager	Management
Golden State Water Company	Ken Vecchiarelli	General Manager, Orange County	Management
Irvine Ranch Water District	Peer Swan	Board Director	Governance
	Paul Cook	General Manager	Management
	Paul Weghorst	Exec. Director Water Policy	Management
Laguna Beach County Water District	Robert Whalen	Board President	Governance
	Debbie Neev	Commission Chair	Governance
	Keith Van Der Maaten	General Manager	Management
Mesa Water District	Marice DePasquale	Board President	Governance
	Paul Schoenberger	General Manager	Management
Moulton Niguel Water District	Brian Probolsky	Board President	Governance
	Joone Lopez	General Manager	Management
	Matt Collings	Asst General Manager	Management
Orange County Water District	Steven Sheldon	Board Director	Governance
	Mike Markus	General Manager	Management
Santa Margarita Water District	Chuck Gibson	Board Director	Governance
	Daniel Ferons	General Manager	Management
Serrano Water District	Greg Mills	Board Director	Governance
	Jerry Vilander	General Manager	Management
South Coast Water District	Rick Erkeneff	Board Director	Governance
	Rick Shintaku	General Manager	Management
Trabuco Canyon Water District	Fernando Paludi	General Manager	Management
Yorba Linda Water District	Phil Hawkins	Board President	Governance
	Brett Barbre	General Manager	Management

Appendix B: Questions Provided to Participants

Introductory Remarks:

The purpose of this interview is to provide MWDOC's twenty-eight member agencies an opportunity to share their views with MWDOC and the other member agencies regarding their future needs and expectations, as well as an assessment of past performance. The interviews have been organized to include two separate discussions with a governing decision-maker and the general manager from each member agency. Broad topics and questions are presented below.

Topics and Questions:

1. **Governance:** MWDOC is governed by a seven-member Board of Directors. Each director is elected to a four-year term by Orange County voters who reside within one of the seven divisions in the MWDOC service area. At the same time, MWDOC's twenty-eight [now twenty-seven] member agencies have their own individual priorities and needs.

    a. How well does MWDOC balance the priorities of its member agencies with the broader regional needs of the service area as a whole?

    b. Have you experienced conflicts between your agency's priorities and MWDOC's decisions and actions?

    c. If so, what is the source of the conflict? How might it be resolved?

2. **Policies:** MWDOC has developed policies and programs that strive to meet its revenue requirements while avoiding charges for services that a member agency can provide for itself.

    a. Has your agency found the recovery of both fixed rates and subscription (choice) charges a fair and practical way of addressing this issue?

    b. What is your opinion regarding MWDOC's current reserves policy?

    c. Are there other policies that you have found beneficial? Ineffective? Why?

3. **Process:** MWDOC is committed to transparency and accountability in government. This commitment entails providing publicly accessible, factual information to allow good and just governance, and to assist our stakeholders and members of the public in understanding how the district operates.

    a. Is your experience consistent with MWDOC's commitment?

b. If not, can you suggest ways in which MWDOC's can improve its decision-making process and public transparency?

c. As a member agency, are you provided with the information, consultation, and communications needed to fully inform you throughout the decision-making process?

4. **Role and Responsibilities:** In addition to serving as the Metropolitan Water District member agency representing Orange County (except for the cities of Anaheim, Fullerton and Santa Ana), MWDOC fills many other roles. They include: regional water planning, water supply development, public information and outreach, water use efficiency, and emergency preparedness. These activities are provided as either core or subscription (choice) services.

   a. Has your member agency benefited from some or all these services?

   b. Are there core services that your agency would not choose to receive if they were offered on a subscription basis? Explain?

   c. Can you identify any MWDOC programs, projects, or activities that deserve either more attention or less attention?

5. **Interagency Relationships:** MWDOC serves as the county liaison for emergency response.

   a. Are you aware of this county-wide role?

   b. If so, does your member agency see the benefit of this relationship?

   c. If not, why?

6. **Other:** Are there any other topics or issues that you think should be addressed in this review?

Item No. 5

INFORMATION ITEM
June 6, 2022

TO: **Planning & Operations Committee**
(Directors Tamaribuchi, Nederhood, McVicker)

FROM: **Robert Hunter, General Manager**

Staff Contact: Damon Micalizzi

SUBJECT: **2022 OC Water Summit Update**

STAFF RECOMMENDATION

Staff recommends the Public Affairs & Legislation Committee: Receive and file the report.

COMMITTEE RECOMMENDATION

The committee recommends (To be determined at Committee Meeting)

DETAILED REPORT

Speakers are being booked for the 2022 OC Water Summit. The event '***Californa Dreamin' – Western Water Projects and How to Build Them,*** will be held at Disney's Grand Californian Hotel on Friday, September 16, 2022.

Delta Watermaster, Michael George is confirmed to moderate a discussion on issues in the Bay Delta. Also confirmed is Fritz Coleman, who will serve as master of ceremonies and moderate a panel discussing Climate Change and Drought. Assemblyman Devin Mathis who was invited to present on ACA 13, the Water Infrastructure Funding Act is also confirmed. The program will also include sessions on the Delta, infrastructure projects vital to achieving sustainability in California, and mechanisms to fund and build them.

The next meeting of the OC Water Summit Planning Committee will be held on Monday, June 13th.

ENGINEERING & PLANNING	
East Orange County Feeder No. 2 (EOCF#2) Emergency Pilot Program	Staff and Means Consulting are working with Metropolitan (MET) on defining and phasing a scope of work for emergency pump-in of local water supplies into EOCF #2 under MET Admin Code 4519: Emergency Deliveries of Member Agency Water Supplies in Metropolitan's System. The program is intended to enhance water supply reliability in the event of a prolonged emergency. This is a multi-year effort. The intended outcome of this effort is the establishment of an emergency pump-in program for EOCF#2 as provided by MET Admin Code 4519 as well as a set of guidelines for MET member agencies to use to establish their own emergency pump-in programs. Hazen & Sawyer is also providing technical assistance for this effort. Staff have also been working with MET staff on a potential cost share for the project. Staff met with the Orange County EOCF #2 Joint Power Agreement members and capacity right holders to discuss the pilot project on March 31, 2022. Background information and key points/questions were presented to the group. A follow up meeting will be scheduled in late June once JPA members have had a chance to review the information, to discuss clarifications of key points and to determine how best to move forward with the Pilot Project. Staff met with Moulton Niguel WD and Orange County WD on May 16, 2022 to discuss the scope of work developed with MET. MNWD is currently reviewing the scope to see how their design efforts with the City Santa Ana will fit into the scope.
Economic Benefit Studies and Modeling Work to Quantify the Benefits of Local Projects in the Context of MET's 2020 Integrated Resources Plan (IRP)	Dr. Sunding, Dr. Walrod, Dr. Boarnet, and Dr. Browne presented the preliminary findings to the MWDOC Member Agencies Managers Meeting on May 19, 2022 where input and questions were provided by the agencies. A detailed presentation and report of the findings is included in this month's P&O packet.
Reliability Study Update	Staff are working with CDM Smith on an update to the reliability study. The update will look at a total of 5 scenarios that include recent information including; demand forecasts from the 2020 Urban Water Management Plans, information from MET's 2020 IRP process, increased uncertainty with the Delta Conveyance Project, improved climate change impact information, and updated project cost information where available. A presentation on the scope and status of the Reliability Study update was given at the May 2022 MWDOC Member Agencies Managers meeting. Several of the agencies provided their input which will be incorporated into the study.

	A presentation and write up of the status of the study is included in this month's P&O packet.
Doheny Ocean Desalination Project	South Coast Water District (SCWD) continues to develop the Doheny Ocean Desalination Project. SCWD is currently working through multiple due diligence items to move the project forward including; permitting, plant sizing and siting, financing, and project delivery method. SCWD anticipates having all necessary permits by end of Summer 2022 and estimates an on-line date of 2026, if approved by the SCWD Board. SCWD held a Special Board Meeting on September 2, 2021 to discuss the financial implications of the project. Clean Energy Capital (CEC) presented a water cost analysis for the project where CEC presented cost projections for a 2 MGD project with an estimated 1st year water cost of $1,928/AF in 2021$, and a 5 MGD project with an estimated 1st year water cost of $1,479/AF in 2021$ (later updated to $1,807/AF in 2027$ vs $1,545/AF MET Rate in 2027$). On March 9, 2022 the San Diego Regional Water Quality Control Board approved the Tentative Orders related to the NPDES permits for discharge associated with operation of the Doheny Desalination Project. This is an important step forward toward realization of this project. On April 14, 2022, Dudek presented information to the SCWD Board on a conceptual study of Ocean Water Augmentation for the Doheny Desalination Project. The study considered utilizing Direct Potable Reuse (DPR) source water by two alternative methods from the JB Latham Wastewater Treatment Plant to augment raw ocean water supplies to the proposed Doheny Desalination Project. The proposed conceptual raw water augmentation could potentially become a future phase of the ocean desalination project, and was identified by the name: Doheny Ocean Pure Water Augmentation (DOPWA). This concept was based on the proposition that the challenges of ocean desalination and DPR could be offset by each other's advantages. The conceptual project proposes 5 MGD of product water from each source (recycled and ocean source water) to produce a combined total of 10 MGD of potable water. The report indicated that the gross cost of water in 2021 dollars for the DOPWA concept is similar in price to the cost of desalinated water from the Doheny Desalination Project as shown below. Gross Water Cost (without MET LRP incentive) • 5 MGD Doheny Ocean Desalination Project $2,081/AF • DOPWA Raw Water Augmentation $2,227/AF • DOPWA Treated Water Augmentation $1,954/AF Further study is also needed to determine the impacts on ocean desalination brine mixing in the San Juan Creek Ocean Outfall from reduced wastewater discharges.

	SCWD anticipates Coastal Commission consideration of a Coastal Development Permit in the Fall 2022, depending on the CCC calendar.
Poseidon Resources Huntington Beach Ocean Desalination Project	On May 12, 2022, the California Coastal Commission (CCC) unanimously voted to reject the Poseidon's Coastal Permit application to construct and operate a seawater desalination facility in Huntington Beach. Some of the CCC's key reasons for rejecting the permit included the concern for marine life mortality due to the proposed use of open ocean intakes and the inability to appropriately mitigate those impacts; as well as the inconsistency of continuing to build along the coast given sea level rise issues. On May 18, 2022, Scott Maloni, Vice President of Poseidon Water, made a public comment at the OCWD Board meeting and thanked OCWD for their support. He stated that the CCC's decision brings an end to the Huntington Beach desalination project assuming there is not a legal challenge to the determination by the CCC. Mr. Maloni stated he does not believe Poseidon intends to file a challenge.
San Juan Basin Authority	The San Juan Basin Authority (SJBA) has been conducting a hydrogeology study of the San Juan Basin to better understand how groundwater flows through the lower portions of San Juan Basin under various conditions. How groundwater flows in the vicinity of Stonehill Drive is important due to potential impacts on pumping within the basin, and also may potentially influence pumping for the Doheny Desalination project. A technical review panel, consisting of three teams of hydrogeologists, have presented their preliminary findings at a special meeting on May 12, 2022. The presentation is available from the SJBA website: https://www.sjbauthority.com/meetings/meetings-2022.html (2022-05-12 SJBA Board Meeting TRP). The preliminary findings are: 1. The Basin behaves like two separate areas or 'buckets' that are connected by bedrock ledge area in the vicinity of Stonehill Drive. The bedrock ledge operates similar to a spillway; which although not a boundary, does somewhat restrict flows under normal groundwater conditions. 2. Groundwater flows through the bedrock ledge area (spillway) are greatly restricted between the upper and lower portions of the basin when groundwater levels are low. This occurs during dry or excessive pumping periods. 3. Pumping on either side of the spillway (north or south) influences portions of the basin on the other side of the spillway. Without recharge and with continued pumping, groundwater levels at the divide could decline precipitously.

	4. Saline intrusion in the basin result from seasonal or longer-term declines in freshwater recharge coupled with pumping. Pumping south of the spillway exacerbates saline intrusion more than pumping to the north. Pumping to the north contributes by restricting the flow of freshwater across the spillway. The Technical Review Panel is recommending additional geologic and geophysical assessment of the spillway area. They area also recommending additional monitoring of groundwater levels and flow across the spillway.
Shutdowns	**Diemer Water Treatment Plant** MET is planning to repair a chlorine diffuser pipe at the Diemer WTP which will require a seven-day full-plant shutdown. A meeting was held on February 3, 2022 to inform MET of the agencies' local supply conditions for this calendar year. MET reported that the diffuser pipe was not an imminent failure issue. Shutdown dates for repair of the Diemer chlorine diffuser pipe are being reevaluated by MET staff at this time. **Orange County Feeder** MET is planning to reline and replace valves in a section of the Orange County Feeder from Bristol Ave to Corona Del Mar – this is the last section of this 80-year-old pipeline to be lined. MET has delayed the relining project and has proposed new shutdown dates of September 18, 2022 through June 16, 2023. **Orange County Feeder Extension** MET is planning to reline 300-linear feet of the OC Feeder extension affecting the City of Newport Beach, IRWD and LBCWD. MWDOC and the City have held meetings with MET staff and MET's traffic consultant to review details of the Traffic Control Plan. MET has delayed the relining project by one year and has proposed new shutdown dates of June 18, 2023 through July 14, 2023. **Orange County Reservoir (OC Feeder)** The decommissioning of the Orange County Reservoir has been rescheduled to March 20, 2023 through March 25, 2023. This work will affect the cities of Brea and La Habra. **Lake Mathews Facility Shutdown** MET has cancelled the shutdown of the Lake Mathews Facility, previously scheduled to begin on March 14, 2022 due to low State Water Project supplies. This shutdown will be rescheduled for the 2022-2023 shutdown season. The following agencies will be affected during the shutdown: OCWD, YLWD, Serrano WD, IRWD, TCWD, ETWD, SMWD, MNWD, and the City of San Clemente.

	Allen-McColloch Pipeline MET has completed 50% of the preliminary design of the AMP Prestressed Concrete Cylinder Pipe (PCCP) rehabilitation and is expected to complete the design by 2023. Preliminary design work currently underway includes identifying priority reaches, developing access locations, conducting geotechnical assessments, modeling a surge analysis, conducting real property assessments, identify permitting requirements and development of a feeder isolation plan. A draft project schedule will be developed at the completion of preliminary design. Rehabilitation of individual reaches will be based on the ongoing condition assessments, priorities, and shutdown scheduling. MET plans to inspect additional PCCP sections of the AMP in FY 2023-24. MWDOC staff continue to lead working group meetings with the impacted AMP agencies to discuss options to reduce the number of shutdowns needed for the AMP PCCP rehabilitation project while also helping to increase reliability toward future MET shutdowns. Two potential sites have been identified for construction of a possible pump station to enhance the ability to accommodate longer shutdown durations for the rehabilitation project and provide continuing future long term reliability benefits for future MET shutdowns. MWDOC has formally proposed to MET staff a conceptual cost share savings incentive approach following well established public works contractor cost share incentive programs that would allow for a sharing of realized cost savings. Staff looks forward to MET's response. **Upper Feeder** MET sent notification that an emergency repair to the Upper Feeder at the Santa Ana River is needed. Temporary repairs were made in April 2022 to an expansion joint installed in 2018 to keep the feeder in operation to continue to provide Colorado River water to the region. MET believes the repair will be sufficient until a shutdown can be scheduled to install a new expansion joint.
Meetings	
	Charles Busslinger and Chris Lingad held meetings with IRWD and MET in April and May 2022 to discuss the startup plan of the Baker Water Treatment Plant following IRWD's shutdown of the plant due to maintenance.
	Charles Busslinger and Chris Lingad held meetings with CDM Smith May 2022 to discuss the Orange County Water Reliability Study update.
	Chris Lingad attended a hydraulic model kickoff meeting held by SCWD and Black & Veatch on April 21, 2022. SCWD is the first agency to utilize the hydraulic model and they will be looking at modeling different planning scenarios on the JRWSS and Doheny Desalination Project.

	Charles Busslinger and Chris Lingad attended a meeting with Mesa Water and MET on May 4, 2022 to discuss logistics for the upcoming Orange County Feeder shutdown.
	Charles Busslinger and Chris Lingad attended a meeting with MET staff on May 5, 2022 to discuss the final steps for completing the OC-70 meter analysis.
	Charles Busslinger, Joe Berg, and Chris Lingad attended the kickoff meeting with SMWD and consultants WSC and M. Cubed on May 12, 2022 to discuss the schedule and work for the Water Use Efficiency Economic Analysis project.
	Charles Busslinger and Chris Lingad held a meeting with Huntington Beach staff on May 17, 2022 to discuss planned maintenance and upgrades to the OC-35 service connection.
	Charles Busslinger met with Moulton Niguel WD and Orange County WD on May 16, 2022 to discuss the scope of work for the East OC Feeder #2 Emergency Pilot Project.
	Charles Busslinger attended an Aliso Creek Watershed Collaboration meeting on May 25, 2022 to review findings of a revised plan for restoration of the lower portion Aliso Creek watershed.
	Charles Busslinger attended a meeting on the progress of the design of the Emergency Operations Center on May 17, 2022. Design is estimated to be completed by September 2022.
	Charles Busslinger attended a meeting on May 31, 2022 of the South OC Watershed Management Area Integrated Regional Watershed Management Proposition 1 Project Review Committee. The committee will score projects for the remaining IRWM funding available to Orange County under Prop 1.

General Manager Report
WEROC Status Report

May 2022

COVID-19 (CORONA VIRUS) COORDINATION

- As of 5/31, there were 10,847 new cases reported in the last two-week period, and the county is averaging about 21 new cases a day per every 100,000 residents but with the at home tests, unless people are seeing their physician or self-reporting, it is hard to say exactly how accurate these numbers are. The key statistic to track the medical system, on 5/31, hospitalizations were at 140 people and 18 who required intensive care. Overall, the Orange County healthcare system remains stable.
- With the current surge being seen with the Omnicron Stain, the main message right now is that we should expect to have people testing positive for COVID and needing to be out of the office for longer than the recovery period of a cold, for the foreseeable future. With that in mind, our message with member agencies focuses on business continuity and dealing with the ongoing probability of being less than 100% staffed.
- California's State of Emergency for COVID-19 remains in place, and there is no update as to when the termination will occur. I will not that Nevada ended its state of emergency on May 20th.

MAY INCIDENTS/EVENTS (NON-COVID)

**The following event(s) in which WEROC provided information, coordination and response to the EOC/CP.

- Coastal Fire 5/11/22

Vicki can provide an additional oral update to WEROC activities specific to the event as required/requested including the post fire recovery and planning or provide an presentation at a future committee meeting.

COORDINATION/PARTICIPATION WITH MEMBER AGENCIES AND OUTSIDE AGENCIES MEETINGS OUTSIDE OF PROGRAMS AREAS AND EMERGENCY RESPONSE

- Vicki attended the California Emergency Services Association (CESA) Conference May 2-5.
- On 5/4, Daniel attended the Orange County Intelligence Assessment Center (OCIAC) Cyber Security Tabletop Exercise. Part of the scenario included impacts to water infrastructure. MWDOC Public Affairs, and SMWD joined WEROC at the exercise
- On 5/10, Vicki attended the ISDOC Executive Committee Meeting and provided an Operational Area Update.
- On 5/13, Vicki attended the WACO meeting and provided a WEROC update.
- On 5/17, Vicki attended the County Board of Supervisor Special meetings as the representative for water and wastewater mutual aid in regards to the ratification of the proclamation for the Coastal Fire.
- On 5/18, Vicki attended the USACE Carbon Canyon Dam Tabletop Exercise. This event was held virtually and covered the USACE operations and specific on notification and procedures in relation to the Carbon Canyon Dam.
- On 5/18, Vicki and Janine attended the planning meeting focusing on the revision of the Operational Area Disease Outbreak Annex. Vicki is providing recommendations as it relates to our water and wastewater agencies.
- On 5/18, Vicki attended the MWDOC Managers meeting and provided a WEROC update.
- On 5/19, Vicki attended the Trabuco Canyon Water District Board Meeting and gave a presentation on the WEROC program and future activities.
- On 5/24, Vicki attended the CalOES High Frequency Communications Equipment Grant Program overview. On 5/31, WEROC received an award letter for $58,396 as a sub recipient of the grant to purchase and install the high frequency radio equipment. This is another interoperable system WERCO will be able to communicate with the County and the State during emergencies.
- On 5/25, in partnership with Orange County Water District, we hosted a joint employee earthquake preparedness fair in the parking lot. The event was well received by employee and had various vendors providing disaster information and resources.
- On 5/25, Vicki attended the El Toro Emergency Drinking Water Supply Plan planning meeting. This will be a project that will be compassed into the regional water supply

plan that was started by the previous WEROC Director but was not completely implemented.

- On 5/26, Janine conducted an AlertOC training with the member agencies.
- 5/27 was Daniel Harrison's last day with WEROC. He accepted a new position in the state of Florida and is relocating his family for a new chapter in their lives. Daniel was a great employee and will be deeply missed.

PLANNING AND PROGRAM EFFORTS

AWIA

- WEROC and MWDOC financial completed the reconciliation of the AWIA project. All agencies that did not spend out their funding to 100% will receive a refund in accordance with the contract.

Cyber Security

- WEROC continues to send out important information to the Cyber Security Distribution Group as received from DHS or the OCIAC.

WEROC Emergency Operations Center Project/Funding

- WEROC Emergency Operations Center Funding continues to be pursued by WEROC Staff. This includes the submission of the project for Federal grants and appropriation opportunities.
- On 4/28, WEROC received the support letter from CalOES Director Mark Ghilarducci which was a requirement in order to show edibility for the appropriations funding.
- On 5/17, Vicki and Charles attended Design Meeting with Brady to cover updated plans, and information related to the phase 1 design.

Operational Area and Member Agency Plan Review

Vicki has reviewed and provided written changes or feedback to the following:

- Orange County Operational Area – Disease Outbreak Annex
- County of Orange - Yorba Linda Dam ERP

Status of Water Use Efficiency Projects
May 2022

Description	Lead Agency	Status % Complete	Scheduled Completion or Renewal Date	Comments
SoCal Water$mart Residential Indoor Rebate Program	MWDSC	Ongoing	Ongoing	In April 2022, 118 high efficiency clothes washers and 5 premium high efficiency toilets were installed in Orange County. To date, 126,176 high efficiency clothes washers and 60,830 high efficiency toilets have been installed through this program.
SoCal Water$mart Commercial Rebate Program	MWDSC	Ongoing	Ongoing	In April 2022, no commercial devices were installed in Orange County. To date, 111,490 commercial devices have been installed through this program.
Industrial Process/ Water Savings Incentive Program (WSIP)	MWDSC	Ongoing	Ongoing	This program is designed to improve water efficiency for commercial customers through upgraded equipment or services that do not qualify for standard rebates. Incentives are based on the amount of water customers save and allow customers to implement custom water-saving projects. Total water savings to date for the entire program is 1,291 AFY and 6,349 AF cumulatively.
Flow-Monitoring Device Rebate Program	MWDSC	Ongoing	Ongoing	In April 2022, 7 flow-monitoring devices were installed in Orange County. To date, 22 flow-monitoring devices have been installed through this program.
Smart Timer Rebate Program	MWDSC	Ongoing	Ongoing	In April 2022, 117 residential and 32 commercial smart timers were installed in Orange County. To date, 32,904 smart timers have been installed through this program.

Description	Lead Agency	Status % Complete	Scheduled Completion or Renewal Date	Comments
Rotating Nozzles Rebate Program	MWDSC	Ongoing	Ongoing	In April 2022, 100 rotating nozzles were installed in Orange County. To date, 574,483 rotating nozzles have been installed through this program.
Rain Barrel Rebate Program	MWDSC	Ongoing	Ongoing	In April 2022, 6 rain barrels were installed in Orange County. To date, 8,666 rain barrels have been installed through this program.
Turf Removal Program	MWDOC	Ongoing	Ongoing	In April 2022, 27 rebates were paid, representing $276,811.85 in rebates paid this month in Orange County. To date, the Turf Removal Program has removed approximately 24 million square feet of turf.
Spray to Drip Rebate Program	MWDOC	Ongoing	Ongoing	In April 2022, 19 rebates were paid, representing $104,098 in rebates paid this month in Orange County. To date, the Spray to Drip Program has converted approximately 1.6 million square feet of standard spray irrigation to drip irrigation.
Recycled Water Retrofit Program	MWDSC	Ongoing	Ongoing	This program provides incentives to commercial sites for converting dedicated irrigation meters to recycled water. To date, 182 sites, irrigating a total of 1,672 acres of landscape, have been converted. The total potable water savings achieved by these projects is 3,687 AFY and 19,767 AF cumulatively.

Public & Governmental Affairs Activities Report
April 27, 2022 – May 31, 2022

Member Agency Relations	Public Affairs Staff: • Staffed a booth at the Trabuco Canyon Water Awareness Day • Ricky the Rambunctious Raindrop appearance at a Santa Margarita Water District Event • Staffed a booth at the Bolsa Chica Earth Day Event • Designed, printed, and distributed the summer bill insert • Provided support to Moulton Niguel Water District and Golden State Water District and their represented schools for Metropolitan Water District of Southern California's 2022 Solar Cup competition. • ***Speakers Bureau: Presented on drought outreach at the Orange County Water Use Efficiency Workgroup Meeting*** • Prepared and shared drought collateral with Orange County member agencies and partners that included 75 unique messages including 18 water-saving tips as well as 34 social media graphics each with a unique persona and tip for saving water Government Affairs Staff: • Participated in a meeting with SMWD staff and Director Chuck Gibson regarding salinity control on the Colorado River
Community Relations	Public Affairs Staff: • Provided giveaway items for a Career Fair at Santiago Canyon College • Planned the Water Awareness Poster Contest Awards Ceremony at Shipley Nature Center and invited winning families Governmental Affairs Staff: • Attended the ACC-OC Regulatory and Legislative Committee meeting (4/28) • Attended the OCBC Legislative Committee meeting • Participated in the ACC-OC Energy, Environment and Water Committee • Attended the ACC-OC Regulatory and Legislative Committee meeting (5/26) • Coordinated with OCBC staff to make a presentation on the WEROC EOC to their Infrastructure Committee meeting in June
Education	Public Affairs Staff • ***Speakers Bureau: Attended two (2) Metropolitan Water District of Southern California Education Coordinator meetings and participated as a guest speaker on drought in education*** • Attended the bi-monthly California Department of Water Resources Water Education Committee meeting • ***Speakers Bureau: Hosted a Project WET Orange County teacher training with Orange County Department of Education and Department of Water Resources. Participated as a guest speaker on Orange County water supply and reliability issues.***

	• Participated in the bi-weekly California Environmental Literacy Initiative's Green Careers Innovation Hub • Attended MET's 2022 Solar Cup Awards Ceremony • Provided information regarding MWDOC Choice K-12 School Programs to the City of Fullerton, City of Brea, City of Orange, Mesa Water, Yorba Linda Water District • Shared a Stormwater Leadership Project student presentation opportunity with the City of Santa Ana and City of San Clemente • Met with Ignited Education to discuss a partnership with the Water Energy Education Alliance

Media Relations	Public Affairs Staff
	• Prepared and distributed content for social media
	• Prepared and submitted two articles to ACWA:
	  ○ https://www.acwa.com/news/huntington-beach-makes-waves-with-water-wise-art-displays/
	  ○ https://www.acwa.com/news/mwdoc-public-affairs-manager-and-local-artist-unveils-stella-13/
	• Worked with HashtagPinpoint to film five (5) Garden Smart videos with the University of California Cooperative Extension (UCCE) Master Gardeners of Orange County
	• Met with various members of the media to discuss drought, reliability, infrastructure projects and regulations
	• Distributed weekly Critical Mention news reports to MWDOC Board of Directors and staff

Special Projects	Public Affairs Staff: • Participated in an Orange County Cyber Disruption Resiliency Workshop and led a water treatment plant scenario • Responded to MWDOC department requests for website information and published website updates • Participated in several preliminary OC Water Summit Planning Meetings • Attended Supervisors Academy - Ideas into Action training • Attended a Regional Update on Southern California Water Supplies webinar hosted by Orange County Water District with the Metropolitan Water District of Southern California • Met with the Centers of Excellence, BAYWORK, and Cuyamaca College to review statewide water and wastewater survey questions • Prepared content for MWDOC eCurrents newsletter Governmental Affairs Staff: • Staffed the ISDOC Quarterly Luncheon, featuring guest speaker Neil McCormick of CSDA • Completed the CSUF course, "Leading Change in Organizations" • Attended the ACWA Spring Conference, including numerous sessions, in Sacramento • Staffed the ISDOC Executive Committee meeting

	• Completed the CSUF course, "Designing and Delivering Effective Presentations" • Staffed the WACO Committee featuring speakers from MWD on the drought and outreach response • Staffed the WACO Planning meeting • Completed the CSUF course, "Group Facilitation – An Art Form" • Booked speakers from Sites Reservoir for the July WACO meeting
Legislative Affairs	Governmental Affairs Staff: • Participated in the ACWA Region 10 State Legislative Committee prep meeting • Attended the ACWA State Legislative Committee meeting (4/29) • Attended the ACWA Federal Affairs Committee meeting • Participated in the CSDA Brown Act working group meeting • Participated in the CMUA Regulatory and Legislative Committee meetings • Attended the California Natural Resources Agency webinar on climate and water investments in the Governor's budget • Attended the CSDA Legislative Days event in Sacramento • Met with Assembly Member Laurie Davies, re: WEROC EOC and AB 2142 (tax exemption for turf rebates) • Attended the ACWA State Legislative Committee meeting (5/20)